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Measuring Musculoskeletal Pain in Infants, Children, and Adolescents

Musculoskeletal pain is common in children and adolescents. As many as half of all children and adolescents report experiencing musculoskeletal pain at least once a month, and as many as a third report persistent or recurrent musculoskeletal pain.^{70,75} Musculoskeletal pain is known to have a substantial impact on the everyday life of children and adolescents. For example, in those who report musculoskeletal pain, approximately 40% report that it interferes with daily activities and sports participation, 20% report missing school/work, 20% to 30% take medication, and more than half seek health care, all of which are associated with significant health care costs, espe-

cially for those who experience persistent pain.^{52,58,100,109,110} Critical to the effective management of musculoskeletal pain by clinicians is accurate, reliable, and timely assessment, which is a pivotal component of evidence-based medicine. Specifically,

the valid and reliable measurement of pain is helpful in understanding a person's pain experience, identifying appropriate treatment options, and monitoring change in a person's pain condition, minimizing potential adverse physiological and psychological consequences of unrelieved or inadequately managed pain.^{3,18,34,93,107,111,146}

Fundamental differences exist between the expressions of the pain experience in infants, children, adolescents, and adults, which highlights the need to assess and interpret pain in a way that is specific to each age group. For example, while the definition of pain is universal, "A distressing experience associated with actual or potential tissue damage with sensory, emotional, cognitive and social components,"¹⁵⁹ the way in which these components interact with environmental, developmental, sociocultural, and contextual factors suggests that the way in which infants, children, adolescents, and adults conceptualize, understand, and communicate pain is distinctly different.^{34,35,56,70} For example, the vocabulary by which infants identify pain emerges at around 18 months (eg, "ouch," "ow," "hurt") and continues to develop until they are around 5 years of age, when it

• **SYNOPSIS:** Accurate, reliable, and timely assessment of pain is critical for effective management of musculoskeletal pain conditions. The assessment of pain in infants, children, and adolescents with and without cognitive impairment can be particularly challenging to clinicians for a number of reasons, including factors related to the consultation (eg, heterogeneous patient population, time constraints), the clinician (eg, awareness/knowledge of available pain scales), standardized assessment scales (eg, availability, psychometric properties, and application of each scale), the patient (eg, developmental stage, ability to communicate), and the context in which the interaction took place (eg, familiarity with the setting and physiological and psychological state). As a result, pain is frequently not assessed or measured during the consultation and, in many

instances, underestimated and undertreated in this population. The purpose of this article is to provide clinicians with an overview of scales that may be used to measure pain in infants, children, and adolescents. Specifically, the paper reviews the various approaches to measure pain intensity; identifies factors that can influence the pain experience, expression, and assessment in infants, children, and adolescents; provides age-appropriate suggestions for measuring pain intensity in patients with and without cognitive impairment; and identifies ways to assess the impact of pain using multidimensional pain scales. *J Orthop Sports Phys Ther* 2017;47(10):712-730. doi:10.2519/jospt.2017.7469

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can reliably be used. Similarly, this is the time at which a child begins to develop an understanding of the causes and consequences of pain and the ability to control its expression.^{28,56,127} In the absence of intellectual or cognitive deficit, a child's age may serve as a reasonable and easily measured indicator of level of development, and should be used to guide the way in which pain is measured in children and adolescents.^{56,127,151}

The assessment and measurement of pain in infants, children, and adolescents can be a challenge to clinicians.^{55,140} Reasons for this include factors related to the consultation (eg, heterogeneous patient population, time constraints), the clinician (eg, awareness/knowledge of available pain scales), standardized assessment scales (eg, availability, psychometric properties, and application of each scale), the patient (eg, developmental stage, ability to communicate), and the context in which the interaction took place (eg, familiarity with the setting and physiological and psychological state). As a result, pain is frequently not formally assessed or measured during the consultation, with more informal questioning used (eg, questions such as "Are you ok?" or "Feeling better?") and the presence of pain validated through observation of behavioral cues, such as crying or grimacing.^{103,128,146} Even in populations who are at a higher risk of experiencing musculoskeletal pain (eg, children with cerebral palsy), there are data to suggest that pain is assessed using validated tools in less than 10% of encounters.⁹⁹ The inconsistency in assessment, measurement, and documentation of pain means that, in many instances, pain may be underestimated and undertreated in this population.¹⁴⁶ Reports of hospital audit data suggest that a third of children experience moderate to severe pain during their hospital admission, and documentation of pain assessment varies between 12% and 100% of the time across hospital settings and between clinicians. All too frequently, the assessment, measurement, and documentation of pain do not meet

hospital or professional guidelines.^{99,103,111} Encouragingly, clinical practice has been responsive to knowledge translation and implementation strategies aimed at improving the assessment, measurement, and documentation of pain in children and adolescents.^{53,76} Further work is needed to understand the frequency at which the assessment and measurement of pain are conducted in other health care settings, such as in primary care and community facilities.

Pain is recognized as a core outcome domain by a number of national and international initiatives, such as the Pediatric Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials Consensus Group, the Society for Pediatric Pain Medicine Assessment Task Force, and the National Institutes of Health Toolbox.^{32,57,93} These initiatives promote the use of evidence-based measures of pain intensity and impact in clinical practice and research. Recommendations are the results of formal collaborative processes and methodologies that combine empirical evidence, expert opinion, and clinical utility. The purpose of this paper was to provide clinicians with an overview of scales that can be used to measure musculoskeletal pain in infants, children, and adolescents in a way that is quick, accurate, and reliable. However, few pain scales have specifically been evaluated for this purpose, and suggestions are based on scales that have been evaluated to measure procedural (eg, immunization pain) and nonspecific (eg, musculoskeletal pain) pain, with emphasis on clinical utility. Using the social communication model of pain as a framework,^{35,55} the present article specifically considers factors that may influence the pain experience and expression, reviews the various approaches that can be used to assess and measure pain, provides age-appropriate suggestions for measuring pain intensity in patients with and without cognitive impairment, and identifies ways to assess the impact of pain using multidimensional pain scales. The article incorporates and extends the work of the

previous collaborations outlined above, by identifying and integrating evidence from more recent publications into the measurement of pain in infants, children, and adolescents. Scales designed for use in the intensive care setting (eg, to assess pain in the intubated patient) or solely to assess postoperative pain are not reported in this paper, unless specifically stated. Also, the authors acknowledge that there are aspects of pain beyond pain intensity, such as affective (emotional, unpleasantness) and evaluative (cognitive processes [eg, appraisal of pain]) dimensions, that are not addressed comprehensively in this article.

The Social Communication Model of Pain

The social communication model of pain (FIGURE 1) is a theoretical model that can be used as a framework from which to examine, understand, and approach the assessment and management of pain in individuals of all ages and for those with cognitive impairments.^{35,55} This comprehensive model highlights a number of factors (biological, psychological, and social) related to the individual in pain and the treating clinician that influence how pain is experienced, expressed, and interpreted, and the effectiveness of this communication. The model also considers the social context (interpersonal context) in which the communication of pain occurs and, importantly, recognizes how the communication of pain may differ, whether initiated by the person in pain or elicited by an observer's questioning at presentation or after treatment, when a socially desirable response may be provided. This model places assessment and measurement at the heart of understanding a person's pain experience and highlights the importance of how that information is obtained. The remainder of this paper will consider the measurement and assessment of pain in children and adolescents using the social communication model as a guide.

As suggested by the social communication of pain model, a number of factors related to the individual in pain, clinician,

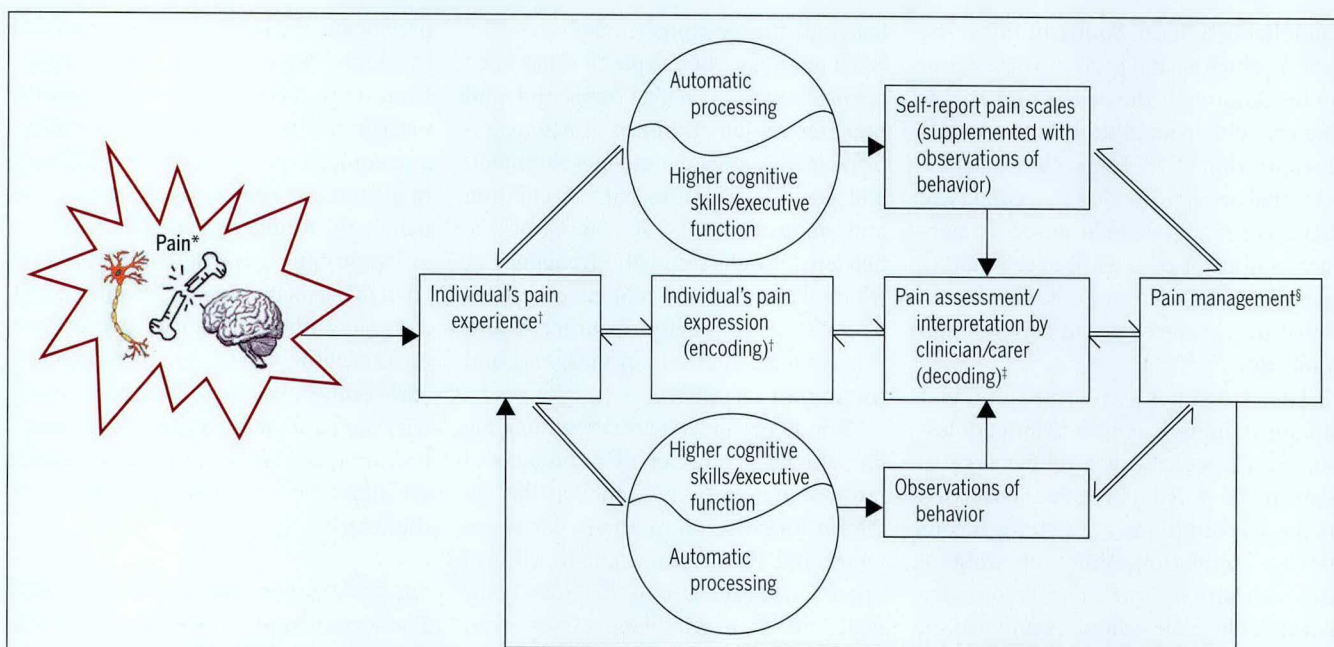


FIGURE 1. The social communication model of pain. *Defined as a distressing experience associated with actual or potential tissue damage, with sensory, emotional, cognitive, and social components (Williams and Craig¹⁵⁹). †Pain experience and expression can be influenced by a number of individual, social, and environmental factors; examples of each of these factors are outlined in **FIGURE 2**. The expression of pain may be verbal, self-reported, or an observation of behavior, and this may be self-initiated by the person in pain or elicited by an observer's question. ‡Pain assessment can be influenced by a number of clinician factors and practical considerations; examples of these are outlined in **FIGURE 2**. §Pain management can include pharmacological, conservative (eg, distraction, relaxation, exercise, education), and environmental interventions. Pain management can be influenced by a clinician/parent or carer appraisal of the situation, their own knowledge/understanding, and beliefs and contextual factors (eg, setting). Adapted from Hadjistavropoulos and Craig (Figure 1, page 555)⁵⁵ and Craig (Figure 1, page 24).³⁵

and context can influence the experience and communication (expression, interpretation) and management of pain. In **FIGURE 2**, we outline some of the key factors that are relevant to the assessment and measurement of pain in children, for example, the cognitive ability of the child to understand concepts such as pain severity or intensity, the burden that a child may feel when questioned by a clinician, and the potential influences of parents who are present within the consultation.

Approaches to Measuring Pain Intensity in Children

The 3 main approaches to measuring pain intensity in children are physiological (how the child's body reacts), observations of behavior (how the child reacts), and self-report (what the child says). It is important to note that the choice of approach will depend on the age and abilities of the child, and that the different approaches are not interchangeable and typically only correlate poorly to moderately with each

other.^{49,157} Ideally, information from each approach may be used simultaneously to provide a detailed understanding of the pain experience, with consideration of both automatic processing and higher cognitive function (**FIGURE 1**).^{35,49,55,157}

Physiological indicators (eg, increased heart rate, blood pressure, sweating) are associated with generalized (nonspecific) stress reaction and more strongly associated with distress and anxiety than self-report pain measures.²² For this reason, physiological indicators should not be used in isolation to estimate presence, quality, or intensity of pain. Further, these indicators habituate over time and are therefore not appropriate for use in acute pain that is continuous or in those with chronic pain.⁶²

Observational measures involve observing an individual's nonverbal behavior (eg, crying, facial expression, torso and limb movements) and interactions (eg, social, appetite). The behavioral response to pain is recognized to be more

of an automatic and reflexive response to actual or potential tissue damage. Parents and carers can often provide specific and helpful information about typical and idiosyncratic pain-related behaviors that reflect different quality or intensity of pain in their child. This information can then be used to inform the selection of appropriate pain management or prevention strategies.^{35,55,153} As cognitive skills and function increase with age, along with the ability to control (eg, suppress, exaggerate, or feign) behavior, observational measures should be used when possible to complement self-report measures of pain (**FIGURE 1**). Observational measures are particularly useful for assessing pain in children aged less than 4 years, who do not have the language skills necessary to communicate pain or lack the comprehension necessary for self-report measures; patients with cognitive or communication impairments (eg, cerebral palsy); and situations in which valid self-report is not possible (eg, ex-

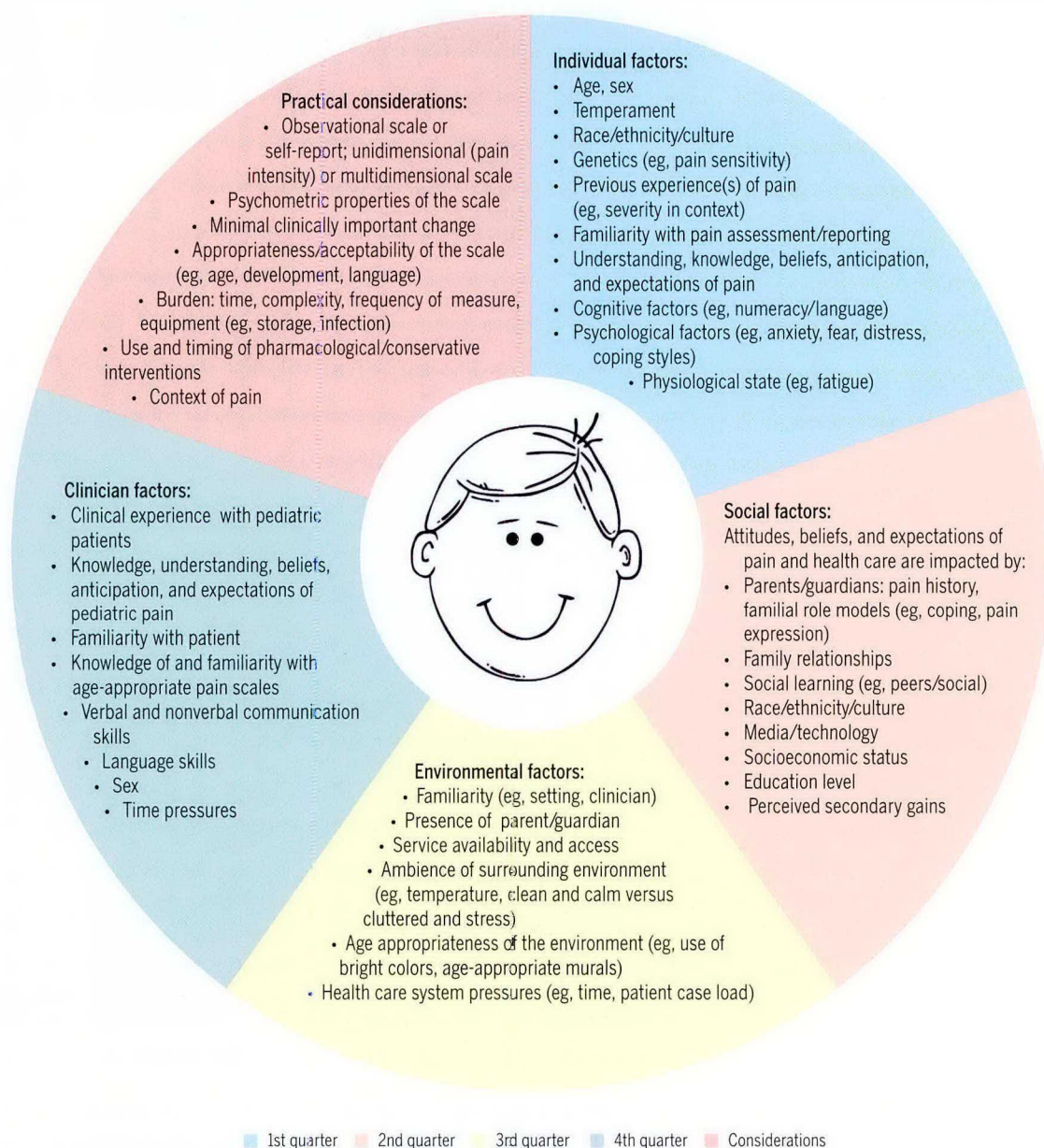


FIGURE 2. Factors (biological, psychological, and social) related to the individual in pain, the clinician, and the context that influence how pain is experienced, expressed, and assessed.^{61,81,114,151,153,161}

treme distress) or the credibility of the self-report is in doubt.⁵⁵

The most direct and reliable approach to measuring pain in those who are able to communicate their experience is self-report.^{129,140} The ability of a child to understand and report the presence and intensity of pain requires cognitive skills, including receptive language and understanding, knowledge and memory of pain, executive function (eg, cognitive

flexibility, working memory), and the ability to understand and estimate magnitudes and symbolic processing.^{28,66,151,152} These skills begin to emerge as early as 3 years of age and gradually develop to enable the accurate and reliable self-reporting of pain intensity by children aged 5 years (on average) or older. While screening tasks (eg, counting, comprehension, and seriation) are available, these are time consuming and do not predict a

child's ability to accurately and reliably self-report pain beyond age alone.^{28,155} The association between a child's age and cognitive skills highlights the need to measure pain using different pain scales in children of different ages, such as a more simplified scale (with fewer response options) for younger children.^{28,152}

Proxy Report While input from parents/guardians has a place in the assessment of pain in children, clinicians should be

mindful of overreliance on this information. Numerous studies have shown discrepancies between reports of pain from parents and children. Studies in the general population of healthy children show that parents typically underreport pain in their children.^{30,69,79} In contrast, studies in children with painful health conditions typically report better concordance, although with a tendency for parents to overestimate pain severity, compared to the child's report.^{33,149}

AGE-APPROPRIATE SCALES

SINGLE-ITEM SCALES OF PAIN INTENSITY are most commonly used to measure pain because they are fast, easy to administer, and closely correlated with the impact of pain on the individual (eg, activity limitations, health care seeking, medication use).¹⁴¹ Reported in **TABLE 1** are operational definitions of the psychometric properties considered in this paper. **TABLES 2** through **4** outline available pain intensity scales, and **TABLE 5** details multidimensional pain scales, with each table including a general description of the scale, age range, psychometric properties, and practical considerations for use. These tables synthesize evidence from several systematic reviews,^{23,32,37,38,43,62,77,83,129,142,153} practice guidelines,¹¹¹ and peer-reviewed articles. The evidence outlined in **TABLES 2** through **4** was used to identify an appropriate pain-intensity scale for each age group, with the suggested scales summarized in **TABLE 6**. The scales that have been suggested for use are based on the authors' judgments, along with consideration of the psychometric properties of the scale, type of pain (eg, procedural versus nonspecific pain), population, and context in which the scale has been evaluated.

Infant (3 Years or Younger)

Observations of behavior are most commonly used in this age group, which typically manifests as crying, facial expression, verbalization, and torso and leg

TABLE 1		OPERATIONAL DEFINITIONS	
Term		Operational Definition	
Reliability		The reproducibility of a measure over different occasions, concerned with minimizing sources of random error so that measures are reproducible. In general, acceptable reliability coefficients for research and clinical purposes are 0.7 or greater and 0.9 or greater, respectively ¹³⁴	
Test-retest		The agreement between observations with the same individuals on at least 2 occasions ¹³⁴	
Interrater		The agreement between different raters/observers of an observational measure of pain ¹³⁴	
Validity		Used to assess whether the scale measures what it intends to measure ¹³⁴	
Face		Whether the pain scale includes appropriate items that appear to measure what they are proposing to measure ¹³⁴	
Content		The assessment of whether the items in the pain measure include the appropriate information and content ¹³⁴	
Criterion		Includes concurrent validity and predictive validity. In concurrent validity, a new pain measure is correlated with a gold standard measure, which is administered at the same time. In general, correlations between the new measure and the gold standard should be at least $r \geq 0.3-0.5$. The magnitudes of the coefficients are hypothesis dependent but should not be so high as to make the new measure redundant. In predictive validity, the correlation of the measure to the criterion variable is determined later ¹³⁴	
Construct		Determines the validity of abstract variables that cannot be directly observed, such as pain. These constructs are assessed by their relationships with other variables ¹³⁴	
Convergent		Evaluates how well items on a pain scale correlate with other measures of the same construct or related variables. In general, correlations between the measure and another measure of the same construct should be $r \geq 0.3-0.5$; however, the magnitudes of the coefficients are hypothesis dependent ¹³⁴	
Discriminant		Evaluates how items on a pain scale correlate with other measures that are unrelated. In general, correlations between the measure and another unrelated measure should be $r < 0.3$; however, the magnitudes of the coefficients are hypothesis dependent ¹³⁴	
Responsiveness		Measures whether the measure is able to identify changes in pain over time when change is expected (eg, after analgesia) (COSMIN taxonomy)	
Interpretability		The meaningfulness of the scores obtained from a pain measure	
Feasibility		How easily a pain measure can be scored and interpreted	
Minimal clinically important change		The smallest difference in score in the domain of interest that patients perceive as beneficial and that would mandate, in the absence of troublesome side effects and excessive cost, a change in the patient's management ⁶⁸	

movements. It is important to note that no scale has been comprehensively evaluated to assess pain in children aged 3 years or younger in primary care settings or in children with chronic or persistent pain.^{37,153} The majority of observational scales have been developed to measure postoperative pain in the hospital setting, but a number of these scales have since been used to assess brief pain associated with medical procedures (eg, venipuncture, immunizations). In the absence of more robust evidence, the scales that have been validated to assess procedural pain are reported in **TABLE 2**.³⁶ Scales that only evaluate postoperative pain or incor-

porate physiological measures (eg, blood pressure, oxygen levels) have not been included, as this information is not readily available or feasible for use by many clinicians.

Suggested Scale: The Face, Legs, Activity, Cry and Consolability (FLACC) Scale The FLACC scale was originally designed and validated for use in infants and children aged 2 months to 7 years to measure postoperative pain.⁹⁴ Since its original development, the scale has been used to measure acute and procedural pain in emergency departments, immunization centers, and various clinical settings (eg, radiology, ambulatory, dental) and

TABLE 2

OBSERVATIONAL SCALES USED TO MEASURE PAIN
IN INFANTS AND CHILDREN 3 YEARS OR YOUNGER

Pain Scale	Description	Age Range	Evidence Available	Strengths	Limitations
Face, Legs, Activity, Cry and Consolability scale ^{5,37,48,93,94,136}	5-item scale measures facial expression, leg movements, activity, cry, and consolability. Each item is scored from 0 to 2. Total score range, 0-10 Originally validated for postoperative pain in children aged 2 mo to 7 y	IAR: 2 mo to 7 y SAR: 2 mo to 16 y	Reliability: intrarater, interrater Validity: convergent, discriminant, criterion Responsiveness Practical considerations: feasibility, user preference	- Validated for acute procedural pain (eg, immunizations and postoperative pain) - Scored on a commonly understood 0-to-10 scale - Translated into Swedish - Recommended by PedIMMPACT³³ - Adapted for children with cognitive impairment (TABLE 4)	- Observation time not specified originally. Subsequent studies have used 15 s and 30 s for acute procedural pain - To date, only tested in postoperative and procedural pain; additional studies are needed to evaluate generalizability - Ambiguity around amount and timing of some items (eg, "jaw clench," consolability)
Child Facial Coding System ^{17,32,54}	Frequency and intensity of 13 facial actions; scored from 0 (no action) to 2 (distinct action [eg, squinting, brow lowering, nostril flare, mouth stretching])	IAR: 2-5 y SAR: 3-7 y	Reliability: interrater Validity: criterion Practical considerations: none	- Validated for children with cerebral palsy; used in children with autism⁹⁸ - Developed from the Neonatal Facial Coding System	Facial actions scored second by second
Children's Hospital of Eastern Ontario Pain Scale ^{36,37,41}	6-item scale (cry, facial expression, verbalization, touching, torso and leg movements) rated on a 4-point scale. Total score range, 4-13	IAR: 6 mo to 6 y SAR: 6 mo to 12 y	Reliability: none Validity: convergent Practical considerations: none	- Well evaluated for postoperative pain - Score based on observable behavior only (ie, does not include items such as consolability)	- Length and scoring system make it impractical - Not validated for acute procedural pain, but has been used for this in intervention studies³⁶
Modified Behavioral Pain Scale ^{136,137}	3-item scale measures facial expression, cry, and movements. Facial expression and movement scored on a 0-to-3 scale and cry on a 0-to-4 scale. Total score range, 0-10	IAR: 4-6 mo	Reliability: intrarater, interrater Validity: convergent, criterion Responsiveness Practical considerations: feasibility, user preference	- Validated to assess acute procedural pain (eg, immunizations) - Scored on a commonly understood 0-to-10 scale	- Evaluated for infants only - Little evaluation done, but used in numerous intervention studies
Neonatal Infant Pain Scale ^{41,84,136}	6-item scale (facial expression, breathing patterns, cry, arm movement, arousal, leg movement). All items scored from 0 (absent/relaxed) to 1 (change from normal), except cry (0-2)	IAR: 0-2 mo	Reliability: interrater Validity: convergent, content, criterion Responsiveness Practical considerations: feasibility, training	- Validated for acute procedural pain (eg, immunizations) - Multidimensional scale taking into consideration factors such as arousal	- Evaluated for infants only, limited applicability - No reports on clinical utility/feasibility

Abbreviations: IAR, intended age range; PedIMMPACT, Pediatric Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials; SAR, studied age range.

in research.³⁷ The FLACC scale is recommended to measure pain in infants (aged 3 years or younger) on the basis that it has been validated to measure acute procedural pain in a variety of settings (eg, outpatient pediatric clinic, emergency department, immunization clinic) and there is no other scale as comprehensively evaluated.

A score of 0, 1, or 2 is given for each of the 5 items. Descriptions of typical behaviors are provided for each item (eg, for the legs, "normal or relaxed position" is a score of 0; "uneasy, restless, tense" is a score of 1; and "kicking, or leg drawn up" is a score of 2). Item scores are summed

to provide a total score from 0 to 10. TABLE 2 contains additional details about the FLACC scale and other observational scales to measure pain intensity in children who are unable to self-report.

Preschool Child (3-5 Years)

Age is the strongest predictor of a child's ability to understand and use self-report pain scales.^{127,155} It is noted, however, that the rate of development is varied. While preschool-aged children (3-5 years of age) are generally less likely to be able to understand self-reported pain scales than older children, some will be able to do so. Experience of pain and prior use of

a scale appear to influence a child's ability to use a pain scale reliably, emphasizing the need to measure pain consistently. It is recommended that pain intensity be captured through self-report in children of this age (if deemed appropriate), supplemented by information from parents/guardians of the child and observation of behavior (FLACC scale).

Suggested Scale: Pieces of Hurt Tool, Supplemented by Parent/Guardian Report and Observation The Pieces of Hurt Tool was designed and validated for use in children aged 4 to 7 years to measure procedural pain at immunization clinics.⁶⁰ The scale has since been used to

[CLINICAL COMMENTARY]

TABLE 3

SELF-REPORT SCALES USED TO MEASURE PAIN INTENSITY IN CHILDREN AND ADOLESCENTS

Pain Scale	Description	Age Range	Evidence Available	Strengths	Limitations
Pieces of Hurt Tool (Hester's poker-chip tool) ^{47,50,60,133,139}	The child is asked, "Did it hurt?" If the child responds yes, then he or she is given 4 chips ("pieces of hurt"). The child is told, "These are pieces of hurt: 1 chip is a little bit of hurt, and 4 chips are the most hurt you could ever have. Do you have 1, 2, 3, or 4 pieces of hurt?" The number of chips is recorded	IAR: 4-7 y SAR: 3-18 y	Reliability: intrarater, inter-rater Validity: convergent, discriminant Responsiveness Practical considerations: acceptable to carers	- Tangible quantity of pain is easier for younger children to understand - Developmentally appropriate (yes/no, followed by limited response options) - Developed in English. Validated in Jordanian and Thai - Validated in recurrent or persistent pain - Can use any items¹³⁹	- Little testing in younger children - Potential bias toward higher pain scores, especially in younger children - Requires the ability to count and estimate quantities using numbers - Infection risk, storage, and availability of tokens
Faces Pain Scale-Revised ^{11,24,61,95,96,106,115,117,129,142-145}	6 line-drawn faces aligned horizontally from an expression of "no pain" (left) to "most pain possible" (right). The child points to the face that shows his or her pain. Standardized instructions are used The original Faces Pain Scale had 7 faces scored on a 0-to-6 scale. It was revised to be compatible with other 0-to-10 scales	IAR: 4-12 y SAR: 3-18 y	Reliability: intrarater Validity: convergent, discriminant, content, criterion Responsiveness Practical considerations: feasibility, interpretability, acceptable to carers	- Scored on a commonly understood 0-to-10 scale - Gender-neutral drawings of faces - Developed in English. Translations: more than 35 languages; validated in French, Thai, and Catalan - Minimal clinically important change: 2/10 (1 face) or 25% - Electronic version available^{115,116}	- Reduced accuracy with decreasing age - Response bias in those under 5 y of age - Skewed pain intensity ratings toward "no pain"; may underestimate pain intensity
Verbal NRS-11 ^{6,23,24,39,95,113,115-117,154}	The child is asked, "On a scale of 0 to 10, where 0 is no pain and 10 is the worst possible pain, tell me what number best represents your pain." The individual responds with a number that reflects his or her pain	IAR: 8-18 y SAR: 6-18 y	Reliability: intrarater Validity: convergent, discriminant, content, criterion Responsiveness Practical considerations: interpretability, acceptable to carers	- Scored on a commonly understood 0-to-10 scale - Adaptable (eg, usual, strongest, lowest pain; pain at rest/with activity) - Developed in English. Translations: Spanish, French - Suitable for those aged 8-20 y and with physical disabilities (eg, cerebral palsy, neuromuscular disease) and chronic pain - Electronic version available^{115,116} - Minimal clinically important change: 1/10	- Requires the ability to count, estimate quantities using numbers, recall pain - Variability in the time period (eg, past week, current pain) and anchors used (eg, worst possible pain, strongest pain) - Further testing required in younger children (6-8 y)
Color Analog Scale ^{20,21,24,91,92,113,115-117,143-145}	VAS with a mechanical device: a plastic slider over a 143-mm-long tetragon, varying from narrow (10 mm) and white (labeled "no pain") to wide (30 mm) and dark red at the end (labeled "most pain"). Range, 0-10	IAR: 5-17 y SAR: 3-18 y	Reliability: intrarater Validity: convergent, discriminant, content, criterion Responsiveness Practical considerations: feasibility, interpretability, user preference, acceptable to carers	- Minimal clinically important change: 1/10 or 15% - May be easier to administer and score than a VAS⁹² - Developed in English. Validated in Spain and India - Electronic version available^{115,116}	- Requires users to have the Color Analog Scale device available - Infection risk
OUCHER (NRS and photographic scale) ^{3,10,87,142}	0-to-10 NRS aligned vertically next to 6 photographs ranging from "no hurt at all" at the bottom (0) to the "biggest hurt you could ever have" at the top (10). (Prior to 2009, scoring was from 0 to 100.)	IAR: 3-7 y SAR: 3-18 y	Reliability: intrarater, inter-rater Validity: convergent, discriminant, content, criterion Responsiveness Practical considerations: interpretability, acceptable to carers	- Various versions (Caucasian, Hispanic, Asian, boy/girl) - Child can choose photographic scale or VAS - Photographic scale (other face scales are line drawings) - Scored on a commonly understood 0-to-10 scale - Evaluated in specific populations (eg, sickle cell)	- Little testing in younger children - Printed OUCHER scale required - Infection risk - Photographs resemble acute pain only - The NRS to the left of the photographs may be confusing for young children (3-7 y)⁸⁷

Table continues on page 719

TABLE 3

SELF-REPORT SCALES USED TO MEASURE PAIN INTENSITY IN CHILDREN AND ADOLESCENTS (CONTINUED)

Pain Scale	Description	Age Range	Evidence Available	Strengths	Limitations
VAS ^{6,8,24,87,116,117,121,122,160}	10-cm vertical/horizontal line with anchors (eg, "no pain," "worst possible pain"). The child marks along the line to indicate the intensity of the pain	IAR: 2-17 y SAR: 3-18 y	Reliability: intrarater, inter-rater Validity: convergent, discriminant, content, criterion Responsiveness Practical considerations: interpretability, acceptable to carers	- Evaluated in several populations (eg, sickle cell, juvenile chronic arthritis) - Minimum clinically significant change: 10 mm (95% CI: 7, 12) - Electronic version available^{115,116} - Recommended for use by PedIMPACT⁹³	- Variability in line length, demarcations, orientation, and anchors (eg, worst pain, strongest pain) - Photocopying the scale may alter the length of the line - Marking on the VAS scale needs to be measured and recorded (potential source of error) - Less reliable in children under 8 y old - One of the least preferred scales
Wong-Baker FACES scale ^{26,32,47,74,87,129,142,160}	6 line-drawn faces aligned horizontally, from a smiling "no hurt" face (left) to a crying "hurts worst" face (right). Range, 0-5 (or 0-10 if each face is 2 points)	IAR: 3-18 y SAR: 9 mo to 18 y	Reliability: intrarater, inter-rater Validity: convergent, discriminant, criterion Responsiveness Practical considerations: feasibility, interpretability, user preference, acceptable to carers	- Developed in English. Translations: more than 10 languages, but not all validated - Preferred face scale - Scored on a commonly understood 0-to-10 scale - Suitable for those aged 8 to 20 y and with physical disabilities and specific conditions (eg, sickle cell)	- Younger children tend to use the extremes²⁷ - May provide higher pain-intensity rating than other face scales^{26,142} - Unclear whether it has interval properties
Word descriptor scales/word graphic scale ^{47,74,138,160}	5 to 6 words to describe pain, from "no pain" to "worst pain." A word is selected to best describe the pain Each word has a number for scoring. Range is from 0 (no pain) to 5 (worst pain)	IAR: 8-17 y SAR: 3-18 y	Reliability: intrarater Validity: convergent, discriminant, criterion Practical considerations: acceptable to carers	- Developed in English. Validated for use in Jordanian - Incorporated into multidimensional scales (eg, Adolescent Pediatric Pain Tool)	- Requires ability to comprehend pain-intensity terms - One of the least preferred scales^{47,74} - May not perform as a continuous scale; pain ratings cluster around words, which reduces sensitivity¹³⁸

Abbreviations: CI, confidence interval; IAR, intended age range; NRS, numeric rating scale; PedIMPACT, Pediatric Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials; SAR, studied age range; VAS, visual analog scale.

measure acute (eg, postoperative), procedural, chronic, and recurrent pain in hospitalized children as young as 3 years of age. The Pieces of Hurt Tool is the recommended pain scale for children aged 3 to 5 years.

The child is asked, "Does it hurt?" If the child says "no," then zero is recorded. If the child responds "yes," then the child is presented with 4 tokens (eg, poker chips) and it is explained that each token represents a "piece of hurt" (1 token is a little bit of hurt, 2 is a bit more, and 4 tokens represent the most hurt you could ever have). The child is then asked, "How many pieces of hurt do you have right now?" The number of tokens is then recorded. Additional details are reported in

TABLE 3.

Child (6-11 Years)

Face scales are consistently preferred by children over numerical, analog, or word descriptor scales.¹⁴² Several versions are available that use either line drawings or photographs (eg, Faces Pain Scale-Revised [FPS-R], Wong-Baker FACES scale, OUCHER scale). While the scales perform similarly, they are not interchangeable due to their different anchors, highlighting the importance of using the same scale consistently. The main limitation of face scales is that pain intensity, a sensory component of pain, is being measured using faces that express the affective dimension of pain. The type of face anchors used by scales (eg, smiling versus neutral) has been found to influence children's responses.^{26,32,142}

Suggested Scale: FPS-R The FPS-R was adapted from the original Faces Pain Scale¹¹ and validated in children 4 to 12 years of age and undergoing a painful procedure (ear piercing), and in an inpatient clinical population.⁶¹ The FPS-R is the recommended pain scale for children aged 6 to 11 years based on considerable evidence in support of its reliability and validity in this age group. The primary strength of the FPS-R compared to other face scales consists of the gender-neutral face anchors that do not convey the affective dimension of pain (eg, smiling, crying).²⁶

The FPS-R consists of a set of 6 line-drawn faces with depictions of increasing levels of pain from left to right. Children are asked to specify which face

TABLE 4

SCALES USED TO MEASURE PAIN IN CHILDREN AND ADOLESCENTS WITH A COGNITIVE IMPAIRMENT*

Pain Scale	Description	Age Range, y	Evidence Available	Strengths	Limitations
Revised FLACC scale ^{29,38,45,88,104-106,150}	5-item scale measures facial expression, leg movements, activity, cry, and consolability. Each item is scored from 0 to 2 (total range, 0-10). Needs input from parent/guardian to identify "baseline" behaviors Includes open-ended descriptor for individual pain behaviors	IAR: 4-19 SAR: 3-18	Reliability: intrarater, interrater Validity: convergent, discriminant, criterion Responsiveness Practical considerations: feasibility, interpretability, user preference, acceptable to carers	- Simple to use, score, and interpret - Scored on a commonly understood 0-to-10 scale - Individualized by parent/carer - Developed in English. Validated in Danish	- Evaluated in postoperative settings only - Underlying motor impairments (eg, spasticity) may affect assessment - Observation time not established; 5 min used in previous testing - Ambiguity around amount and timing of some items (eg, "jaw clench," consolability)
Individualized numeric rating scale ^{38,106,124,125}	Carers provide word descriptors to be used as anchors for their child's pain behaviors from 0 (no pain) to 10 (worst possible pain)	IAR: 6-18	Reliability: interrater Validity: convergent Responsiveness Practical considerations: acceptable to carers	- Uniquely created for each individual using information from carer 1-min observation time	- Minimal psychometric evaluation; not assessed in procedures (eg, injections) - Requires parent-nurse collaboration
Non-communicating Children's Pain Checklist-Revised ^{13-16,38,90}	30 items (6 subscales: vocal, social, facial, activity, body and limb, physiological). Frequency of each behavior from 0 (not at all) to 3 (very). Range, 0-90 Postoperative version: 27 items (total range, 0-81); does not include eat/sleep items	IAR: 3-18	Reliability: intrarater Validity: criterion Responsiveness Practical considerations: interpretability	- Intended for use by parents but can be used by anyone involved in child's care - Has been used in observational studies	- Psychometric properties not assessed in procedures (eg, injections) 10-min observation time before scoring - Validation study used 2-h observation period
Pediatric Pain Profile ^{29,38,45,63-65,104,106}	20 items rated on 4-point Likert scales (0, not at all to 3, a great deal). Used by an observer familiar with the child. Observer completes the scale to establish baseline on a "good day," which is then used as a benchmark for ongoing ratings	IAR: 1-18	Reliability: intrarater, interrater Validity: convergent, criterion Responsiveness Practical considerations: feasibility, interpretability, training, user preference, acceptable to carers	- Developed for use in residential (during normal morning routine in a home, residential care, residential school) and hospital care (postoperative) settings - Parents rated nurse assessment as more accurate than the revised FLACC scale	- Psychometric properties not assessed in procedures (eg, injections) 5-min observation period - Clinical utility may be low due to time required to complete the scale and training³⁸

Abbreviations: FLACC, Face, Legs, Activity, Cry and Consolability; IAR, intended age range; SAR, studied age range.

*All of these scales are observational scales that have been evaluated to assess postoperative pain. None of the above scales have been evaluated to assess procedural-type pain.

best illustrates the amount of pain they are experiencing at that time. Each face is assigned an increasing score from left to right, either 0 to 5 or 0 to 10 (increments of 2). Electronic versions of the FPS-R have also been developed and validated (eg, the Sydney Animated Facial Expressions scale⁶¹ and Painometer app).^{115,116} Additional details are reported in TABLE 3.

Adolescent (12-18 Years)

Suggested Scale: Verbal Numeric Rating Scale-11 The numeric rating scale-11 is one of the most commonly used scales to measure pain intensity in both clinical and research settings, despite only

recently undergoing appropriate psychometric evaluation in children and adolescents. The scale has been validated to measure acute, procedural pain, as well as chronic pain, in a wide range of settings, including schoolchildren receiving immunizations,¹⁵⁴ outpatient pain clinics,¹¹³ and emergency departments.⁶ The numeric rating scale-11 is recommended to measure acute pain in children aged 12 to 18 years due to its simplicity, validity, reliability, and brevity as a pain assessment tool.

The individual is asked, "On a scale of 0 to 10, where 0 is no pain and 10 is the worst possible pain, tell me what number best represents your pain." The individual

responds with a number that reflects his or her pain. The numeric rating scale-11 has also been adapted and validated for use to capture pain intensity for both acute and chronic conditions by short message service and online.^{4,135} Additional details are reported in TABLE 3.

Children and Adolescents With Cognitive Impairment

Children and adolescents with cognitive impairments (eg, cerebral palsy) experience more significant and frequent pain than children without cognitive impairment, and are less likely to receive adequate pain management, indicating the need for specific and appropriate pain

TABLE 5

MULTIDIMENSIONAL PAIN SCALES THAT MEASURE THE IMPACT OF PAIN IN INFANTS, CHILDREN, AND ADOLESCENTS

Pain Scale	Description	Age Range, y	Evidence Available	Strengths	Limitations
Adolescent Pediatric Pain Tool ^{46,67,118,119}	Pain intensity measured on 0-to-100-mm VAS, body chart, and 67 word descriptors to express sensory (37 words), evaluative (8 words), affective (11 words), and temporal (11 words) qualities 5 pain subscale scores: number of pain sites (from body chart), pain-intensity score, number of temporal descriptors (percent), total pain quality, and temporal descriptors	IAR: 8-18 SAR: 8-18	Reliability: none Validity: none Responsiveness Practical considerations: none	- Self-report - Standardized instructions on the scale 3-6 min to complete - Used in a variety of pain conditions (eg, postoperative, sickle cell, traumatic injury, cancer, and minor procedures such as allergy testing) - Developed in English. Translation: Spanish	- Evaluated as single components (eg, body chart and word graphic scale have been evaluated in school, medical, and surgical pain settings), but not entire scale - Evaluation required in complex, recurrent, and chronic pain states - Few descriptors represent neuro-pathic pain - Requires equipment and overlay to score - Children must read or understand English. Some children required assistance
Bath Adolescent Pain Questionnaire ^{42,44,156}	61 items in 7 domains: social functioning, physical functioning, depression, general anxiety, pain-specific anxiety, family functioning, and development. Each item rated on 5-point scale (0 is never, 4 is always), except the development subscale, which is rated from 0 ("very behind") to 4 ("very ahead"). Range, 0-244	IAR: 11-18 SAR: 10-18	Reliability: intrarater Validity: convergent, discriminant, criterion Practical considerations: interpretability	- Initially developed and tested in outpatient rheumatology and multidisciplinary pain clinic - Used to assess chronic pain from perspective of adolescent or parent - Validated in secondary care (eg, rheumatology/pain management clinics)	- Questionnaire length - Complicated scoring, with reverse scoring for some items - Total sum score not clinically useful
Childhood Health Assessment Questionnaire ^{19,78,97,112,123}	Includes disability and discomfort in the last week. Disability includes 30 items and 8 subscales: dressing, grooming, arising, eating, walking, reaching, grip, activities. Each item scored from 0 (no difficulty) to 3 (unable to do it, or "not applicable" if beyond development level). Disability score is the unweighted average of the 8 subscale scores. Discomfort: 10-cm VAS	IAR: 1-19	Reliability: intrarater, interrater Validity: convergent, discriminant, criterion Responsiveness Practical considerations: interpretability	- Evaluated in JIA, cerebral palsy, inflammatory myopathies - Core outcome measure for clinical trials in JIA - Self-report and parent proxy versions 10 min to complete - Validated in 32 countries	- Relatively insensitive to important short-term changes in children with JIA - Evidence of a floor effect
Child Activity Limitations Interview ^{101,102}	8 activities selected from list of 21 options found difficult or bothersome due to pain. Importance and difficulty over the last 4 wk are rated on a 5-point scale from 0 (not important/difficult) to 4 (extremely important). Ratings are summed; total score, 0-32 21-item version: participants report on limitations for all 21 activities. Ratings summed; total score, 0-84	IAR: 8-18	Reliability: interrater Validity: convergent, criterion Responsiveness Practical considerations: acceptable to patients	- Developed in healthy children and validated in chronic or recurrent pain (eg, headache, JIA, sickle cell) - Available as an interview and self-report questionnaire - Child and parent versions - Assesses both active (eg, sports) and routine (eg, going to school) domains - Evaluated in e-diary format	Tested in specific populations. Requires further evaluation
e-Ouch electronic pain diary ^{86,129-131}	Electronic diary with real-time data: pain intensity, unpleasantness, and interference (with activity, mood, walking, stiffness, enjoyment of life, sleep, schoolwork, tiredness, relationships, and control over pain) using a sliding 0-to-100 VAS. Number of painful joints and pain words also selected. Pain ratings captured 3 times per day (on waking, after school, and before bed)	IAR: 9-18	Reliability: none Validity: convergent, discriminant Responsiveness Practical considerations: acceptable to patients	- Developed and tested in JIA - Self-reported scale in real time - Scored by the program, and missing data are summarized - Completing all 3 daily pain ratings takes less than 9 min - Low administrative burden due to electronic capture - Adolescents found it "easy to use" and "learn," "quick to complete," and were "very satisfied"	- Requires further evaluation - Analysis of real-time data collection is complex, potentially limiting its clinical implementation - e-Ouch recorded on a personal handheld device as opposed to an app or online - Prespecified reporting times used in testing

Table continues on page 722

[CLINICAL COMMENTARY]

TABLE 5

MULTIDIMENSIONAL PAIN SCALES THAT MEASURE THE IMPACT OF PAIN IN INFANTS, CHILDREN, AND ADOLESCENTS (CONTINUED)

Pain Scale	Description	Age Range, y	Evidence Available	Strengths	Limitations
Functional Disability Inventory ^{31,73,158}	15 items assessing everyday activities in the past 2 wk (eg, walking up stairs). Each item scored from 0 (no trouble) to 4 (impossible). Scores summed; total score, 0-60	IAR: 8-17	Reliability: intrarater, interrater Validity: convergent, discriminant, content, criterion Responsiveness Practical considerations: feasibility, interpretability	- Evaluated in a variety of conditions (eg, abdominal pain, acute minor illnesses, back pain) - Recommended by PedIMMPACT³³ - Interview or self-report	Largely evaluated in clinical populations
Pain Experience Questionnaire ⁵⁹	15-item questionnaire with 4 subscales: pain severity, pain-related interference, social support, and affective distress. Each item scored on 7-point Likert scale from "not at all" to "very much"	IAR: 7-18	Reliability: interrater Validity: convergent, discriminant, content Practical considerations: none	- Developed and validated in mixed population with chronic pain (eg, fibromyalgia, rheumatoid arthritis, headache) - Self-report and parent scale - Validated in German - Based on Multidimensional Pain Inventory	Requires further evaluation
Pain-QUILT ^{80,81} (previously the Iconic Pain Assessment Tool Version 2)	Web-based tool for tracking pain (quality, intensity, location) using time-stamped records. Pain quality involves choosing from a validated library of pain icons (eg, a matchstick for "burning pain"). Pain intensity: 0-to-10 NRS from "no pain" to "worst pain imaginable." Pain location: dragging and dropping pain icons onto a virtual body map	IAR: 12-18	Reliability: none Validity: none Practical considerations: user preference, acceptable to patients	- Ability to self-report complex sensations associated with chronic pain (eg, "burning") - Real-time data entry - Users able to record information faster than with other electronic pain assessment tools (median completion time, 1.4 min)	- Requires further evaluation - Developed and tested in an adult population and utility tested in adolescent populations
Pediatric Pain Assessment Tool ^{1,2,86}	32 word descriptors, 10-cm VAS; present and worst pain, pain coping strategies, and influence of pain on daily activities. Modeled on McGill Pain Questionnaire, Pediatric Pain Questionnaire	IAR: 5-17	Reliability: none Validity: convergent, discriminant, content Responsiveness Practical considerations: acceptable to patients	- Used JIA, cancer, surgery - Child and parent versions - Children 7-16 y had no problems using scale - Developed in Dutch. Validated in Jordanian. Has been administered to Arab-American children	- Younger children may require assistance - Has been evaluated as single components, not the entire scale
PROMIS Pediatric Pain Interference Scale ^{40,72,147}	Pain interference bank contains 13 questions (8 in the short form). All questions use 7-d recall scored on a 5-point Likert scale, with anchors of 0 ("never") to 4 ("almost always"). Raw score totals can be converted to a T score using reference tables	IAR: 8-18	Reliability: none Validity: convergent, content, criterion Responsiveness Practical considerations: none	- Developed for wide range of conditions (eg, arthritis, rehabilitation, asthma) - Developed using item response theory; users can select appropriate items from a "bank" of questions - Preliminary validation in those with chronic musculoskeletal pain receiving multidisciplinary treatment - Child (8-17 y) and parent proxy (children 5-17 y) versions - Developed in English. Validated in German and Spanish	- Requires further evaluation - Most accurate way to score the scale is through the online assessment center - Scale can be scored manually but requires reference tables to convert to a T score
Teen Nordic Musculoskeletal Screening Questionnaire ⁸⁵	27-item questionnaire, dichotomous responses. The presence of musculoskeletal symptoms and their impact on school attendance, sports, and leisure activity participation over the past 6 mo	IAR: 6-18	Reliability: intrarater Validity: criterion Practical considerations: none	- Musculoskeletal symptom screening tool - Developed and tested in French	Requires further evaluation

Table continues on page 723

TABLE 5

MULTIDIMENSIONAL PAIN SCALES THAT MEASURE THE IMPACT OF PAIN IN INFANTS, CHILDREN, AND ADOLESCENTS (CONTINUED)

Pain Scale	Description	Age Range, y	Evidence Available	Strengths	Limitations
Varni/Thompson Pediatric Pain Questionnaire ^{7,32,51,77,86,108,148}	Assesses chronic pain intensity and location and sensory, evaluative, and affective qualities. Pain intensity measured on 10-cm VAS, body chart (location and number of pain sites), and with 46 word descriptors to assess sensory, evaluative, and affective qualities of pain Modeled on the McGill Pain Questionnaire	IAR: 4-18 SAR: 6-16	Reliability: intrarater, interrater Validity: convergent Practical considerations: training	- Developed and tested in JIA - Assesses chronic pain from perspective of adolescent, parent, or clinician - In various populations (juvenile rheumatoid arthritis, sickle cell, fibromyalgia) - Adapted for children with cerebral palsy - Developed in English. Validated in Norwegian. Translations: Danish, Portuguese, Swedish, French	- Administered by interview 10-15 min to complete. Less than 5 min to score - Younger children likely require assistance
Young Spine Questionnaire ⁸²	For each region of the spine (cervical, thoracic, lumbar): pain presence, frequency, and intensity (Faces Pain Scale-Revised). Also includes function at school, recreation, treatment, and family history of pain. No summary score	IAR: 9-11	Reliability: none Validity: convergent Practical considerations: none	- Iterative development with children aged 9-11 y - Self-report - Developed in Danish. Translated to English	- Requires further evaluation - Validated in narrow age range - Developed and tested in a cross-sectional study; not tested for longitudinal use

Abbreviations: IAR, intended age range; JIA, juvenile idiopathic arthritis; NRS, numeric rating scale; PedIMMFACT, Pediatric Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials; PROMIS, Patient Reported Outcomes Measurement Information System; SAR, studied age range; VAS, visual analog scale.

assessment measures.^{12,89,126} Pain behaviors displayed by children with cognitive impairment are not always comparable to those of children without cognitive impairment, although pain expression has been found to be consistent, observable, and reflective of the presence and severity of pain.^{12,111} Thus, pain measurement tools should be adaptable to reflect individual pain-related behaviors, but ideally also contain standardized items that enable their use in any setting.³⁸ Very few scales are available to assess pain in children with cognitive impairment, and, as seen in **TABLE 4**, these have only been tested in postoperative, residential care, or school settings. No scale has been tested to measure brief procedural, chronic, or recurrent pain in children and adolescents with cognitive impairment. A recommended scale is the revised FLACC scale.

The revised FLACC scale was adapted from the FLACC scale⁹⁴ for use in children and adolescents with cognitive impairment.⁸⁸ The revised FLACC scale is suggested for children and adolescents with cognitive impairment, based on evi-

dence demonstrating valid and reliable measurement of postoperative pain in a hospital setting, the ability of the scale to be individualized, and evidence of its clinical utility. This suggestion is made in the absence of any other more comprehensively evaluated scale.

The revised FLACC scale is essentially the same as the FLACC scale, but it also enables behaviors to be described that are unique to the respondent for each of the 5 behaviors (face, movement of the body and legs, cry, and consolability). Identifying pain behaviors that are unique to the individual requires input from a family member or carer.

Assessing the Broader Impact of Pain Using Multidimensional Pain Scales

While this paper has focused predominantly on the measurement of pain intensity, it is acknowledged that pain experience is complex and contains other dimensions, including affective and evaluative dimensions, as well as the impact pain has on everyday life, including an individual's physical, social, and emotional

functioning and ability to fulfill his or her "role." The social communication model presented at the start of this paper can still be used to conceptualize the communication of these other dimensions of pain, albeit using broader, multidimensional pain scales. Multidimensional pain scales are particularly useful for assessing recurrent and chronic pain, as they can capture various dimensions of the pain experience (including duration, frequency, location, nature, aggravating and easing factors) and how pain impacts everyday life (eg, interference with daily activity or participation in school and sport). This fills a well-accepted need to differentiate between low-intensity transient pain and more persistent pain that has substantial impact on life.¹⁰⁰ Multidimensional scales differ with respect to the factors assessed (eg, psychosocial factors, situational factors, nature of disability) and period of time. Some of the most commonly used multidimensional pain scales for use in children and adolescents with chronic or recurring pain are outlined in **TABLE 5**. No specific scale

[CLINICAL COMMENTARY]

TABLE 6

SUMMARY OF THE SCALES THAT HAVE BEEN SUGGESTED TO MEASURE PAIN INTENSITY FOR EACH AGE GROUP

Age Group	Recommended Scale	Type of Scale	Psychometric Properties Evaluated	Strengths	Limitations
Infant (3 y or younger)	FLACC scale ^{5,37,48,93,94,136}	Observational	Reliability, validity, responsiveness, user preference, patient preference	- Validated for acute procedural pain (eg, immunizations and postoperative pain) - Scored on a commonly understood 0-to-10 scale - Recommended for use by PedIMMPACT⁹³	Additional studies needed to evaluate generalizability
Preschool child (3-5 y)	Pieces of Hurt Tool (Hester's poker-chip tool) ^{47,50,60,133,139}	Self-report	Reliability, validity, responsiveness, patient preference	- Developmentally appropriate scale (ie, yes/no, followed by limited response options) - Validated for recurrent or persistent pain - Validated in Jordanian and Thai - Can use any items¹³⁹ - Recommended for use by PedIMMPACT⁹³	- Little testing in younger children - Potential bias toward higher pain scores, especially in younger children - Requires the ability to count and estimate quantities using numbers - Infection risk, storage, and availability of tokens
Child (6-11 y)	Faces Pain Scale-Revised ^{11,24,61,95,96,106,115-117,129,142,145}	Self-report	Reliability, validity, responsiveness, patient preference	- Scored on a commonly understood 0-to-10 scale - Gender-neutral drawings of faces - Translations: >35 languages; validated in French, Thai, and Catalan - Minimal clinically important change: 2/10 (1 face) or 25% - Electronic version available; Sydney Animated Facial Expressions Scale; Painometer app^{115,116} - Recommended for use by PedIMMPACT⁹³	- Reduced accuracy with decreasing age - Response bias in those under 5 y of age - Skewed pain intensity ratings toward "no pain"; may underestimate pain intensity
Adolescent (12-18 y)	Verbal numeric rating scale-11 ^{6,23,24,39,95,113,115-117,154}	Self-report	Reliability, validity, responsiveness, patient preference	- Scored on a commonly understood 0-to-10 scale - Adaptable (eg, usual, strongest, lowest pain; pain at rest/with activity) - Translations: Spanish, French - Suitable for those aged 8-20 y and for physical disabilities (eg, cerebral palsy, neuromuscular disease) and chronic pain - Electronic version available^{115,116} - Minimal clinically important change: 1/10	- Requires the ability to count, estimate quantities using numbers, recall pain - Variability in the time period (eg, past week, current pain) and anchors used (eg, worst possible pain, strongest pain) - Further testing required in younger children (6-8 y)
Cognitive impairment (4-19 y)	Revised FLACC scale ^{29,38,45,88,104-106,150}	Observational	Reliability, validity, responsiveness, user preference, carer preference	- Simple to use, score, and interpret - Scored on a commonly understood 0-to-10 scale - Individualized by parent/carers - Validated in Danish	- Evaluated in postoperative settings only - Underlying motor impairments (eg, spasticity) may affect assessment - Observation time not established; 5 min used in previous testing - Ambiguity of some items (eg, "jaw clench" and consolability [amount and timing])

Abbreviations: FLACC, Face, Legs, Activity, Cry and Consolability; PedIMMPACT, Pediatric Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials.

has been suggested, as the choice will depend on the purpose of measurement and the health condition being measured (eg, region- or condition-specific scales). Common to many of the scales is identification of impact on school absenteeism, interference with sports participation, interference with activities of daily living, medication use, and health care utilization.

These are acknowledged as important indicators of pain impact in pediatric populations.¹⁰⁰

Another important dimension of pain assessment is fluctuation over time. In addition to the scales outlined in **TABLE 5**, pain diaries are often used to capture information about pain (eg, intensity, frequency, and location) and its effect on behavior

over time. The information collected in a pain diary may provide a more accurate and reliable measure of pain, if completed on a regular basis, by minimizing recall bias. Recent advances in information and communication technology (eg, internet, smartphones) have permitted the development of electronic methods such as e-diaries. Advantages of this electronic

approach over traditional paper-based techniques include minimizing errors in data transfer and transcription, ability to capture time-stamped data, ease of data sharing, increased compliance, and heightened patient satisfaction.⁸¹ Recently, Laloo et al,⁸⁰ Laloo and Stinson,⁸¹ and Stinson and colleagues¹³² have validated a number of web-based and smartphone-based multidimensional electronic pain assessment tools, including e-Ouch, Standardized Universal Pain Evaluations for Rheumatology Providers for Children and Youth, and Pain-QuILT (freely available). These tools can be used in a variety of clinical settings to monitor musculoskeletal pain in children in real time.^{80,81}

GOOD-PRACTICE POINTS

PAIN IN CHILDREN HAS BEEN INADEQUATELY assessed, underestimated, and undertreated for many years.¹⁴⁶ This situation can only be rectified through improved communication of pain from the patient to the clinician at every relevant clinical contact, until it becomes a part of routine care.¹¹¹ Central to the social communication model of pain framework are the various intrapersonal and interpersonal factors that may influence the expression, assessment, and management of pain. Consideration of these factors and the context in which the communication occurs is vital for effective, accurate, and reliable communication of pain, early detection of pain, and timely management (including reassurance and advice). Most importantly, the improved communication of pain has been found to improve patient outcomes (eg, reduction in mean pain scores, improved satisfaction) and reduce health care costs (eg, reduction in length of stay).^{76,120}

An individual's pain experience and expression are determined by a range of biopsychosocial factors that are specific to his or her developmental stage. The clarity of the pain expression can be optimized through the consistent use of valid and reliable pain scales that are

age appropriate and meet the cognitive and communication capabilities of the individual, where available. This means using observational scales of behavior for infants, integrating both observational and self-report scales for children, and primarily using self-report scales for those in later childhood or their teenage years. In all cases, patient self-report of pain should be considered and interpreted alongside knowledge of the context, and supplemented with information gained from observation of behavior and input from parents and guardians, when appropriate. A child's ability to use a pain scale accurately and reliably increases with his or her familiarity with the scale, highlighting the need to introduce and educate children on the use of pain scales early in their life course. By providing children with the vocabulary and skills necessary to express their pain, the clarity of the pain expression can be improved, potentially reducing errors in the interpretation by the observer.

Effective pain assessment and management by clinicians can be enhanced through the consistent use of standardized pain scales within and across health care settings and by the accurate and timely documentation of assessment findings.⁶¹ Advantages of this approach include improved continuity of care for the individual and the ability to generate consistent data for longitudinal comparison of pain over time. Evidence from studies on global perceived effect scales shows that patient-reported outcomes taken over time provide a more accurate understanding of changes in a person's health status compared to recall of improvement/deterioration.⁷¹ The minimal clinically important change has been determined for a number of scales (reported in **TABLE 3** where available), which can assist clinicians to determine the effectiveness of an intervention and provide insight into the meaningfulness of the change for the individual. Areas in need of further development include the assessment and measurement of pain resulting from other mechanisms,

such as neuropathic and central pain, for which there are currently no scales validated for use in children and adolescents. Undoubtedly preferable to the timely assessment and management of pain are practices that can help minimize or prevent the experience of pain. In many instances, pain can be anticipated (eg, procedural, vaccinations, postoperative pain) and proactively managed by clinicians and parents/guardians, using both pharmacological (eg, topical analgesics) and nonpharmacological interventions (eg, distraction). The "It doesn't have to hurt" online video is one such example of providing clinicians and parents/guardians with effective, evidence-based information that can positively influence a child's experience of painful situations.²⁵

CONCLUSION

TO DATE, LITTLE RESEARCH HAS BEEN done to evaluate the use of measures designed for assessment of pain in infants, children, and adolescents outside the hospital setting. This constitutes an important evidence gap, given that primary care, community outpatient, and rehabilitation clinics have frequent contact with infants, children, and adolescents with pain. Though further work is needed, this paper provides clinicians with a pragmatic, evidence-based overview of scales that can be used to measure pain intensity in infants, children, and adolescents, with and without cognitive impairment, and to assess the impact of pain. ●

REFERENCES

1. Abu-Saad HH, Kroonen E, Halfens R. On the development of a multidimensional Dutch pain assessment tool for children. *Pain*. 1990;43:249-256. [https://doi.org/10.1016/0304-3959\(90\)91079-X](https://doi.org/10.1016/0304-3959(90)91079-X)
2. Abu-Saad HH, Uiterwijk M. Pain in children with juvenile rheumatoid arthritis: a descriptive study. *Pediatr Res*. 1995;38:194-197. <https://doi.org/10.1203/00006450-199508000-00010>
3. Agency for Clinical Innovation Musculoskeletal Network. Model of Care for the NSW Paediatric

- Rheumatology Network: Musculoskeletal Network. Chatswood, Australia: Agency for Clinical Innovation; 2013.
4. Alfvén G. SMS pain diary: a method for real-time data capture of recurrent pain in childhood. *Acta Paediatr*. 2010;99:1047-1053. <https://doi.org/10.1111/j.1651-2227.2010.01735.x>
5. Babi FE, Crellin D, Cheng J, Sullivan TP, O'Sullivan R, Hutchinson A. The use of the Faces, Legs, Activity, Cry and Consolability scale to assess procedural pain and distress in young children. *Pediatr Emerg Care*. 2012;28:1281-1296. <https://doi.org/10.1097/PEC.0b013e3182767d66>
6. Bailey B, Daoust R, Doyon-Trottier E, Dauphin-Pierre S, Gravel J. Validation and properties of the verbal numeric scale in children with acute pain. *Pain*. 2010;149:216-221. <https://doi.org/10.1016/j.pain.2009.12.008>
7. Benestad B, Vinje O, Veierød MB, Vandvik IH. Quantitative and qualitative assessments of pain in children with juvenile chronic arthritis based on the Norwegian version of the Pediatric Pain Questionnaire. *Scand J Rheumatol*. 1996;25:293-299.
8. Berntson L, Svensson E. Pain assessment in children with juvenile chronic arthritis: a matter of scaling and rater. *Acta Paediatr*. 2001;90:1131-1136. <https://doi.org/10.1111/j.1651-2227.2001.tb03242.x>
9. Beyer JE, Knott CB. Construct validity estimation for the African-American and Hispanic versions of the Oucher Scale. *J Pediatr Nurs*. 1998;13:20-31. [https://doi.org/10.1016/S0882-5963\(98\)80065-1](https://doi.org/10.1016/S0882-5963(98)80065-1)
10. Beyer JE, Villarruel A, Denyes MJ. The OUCHER: User's Manual and Technical Report. Kansas City, MO: Pain Associates in Nursing; 2009.
11. Bieri D, Reeve RA, Champion GD, Addicoat L, Ziegler JB. The Faces Pain Scale for the self-assessment of the severity of pain experienced by children: development, initial validation, and preliminary investigation for ratio scale properties. *Pain*. 1990;41:139-150. [https://doi.org/10.1016/0304-3959\(90\)90018-9](https://doi.org/10.1016/0304-3959(90)90018-9)
12. Breau LM. Non-communicating children's pain checklist: better pain assessment for severely disabled children. *Expert Rev Pharmacoecon Outcomes Res*. 2003;3:327-339. <https://doi.org/10.1586/147371673.3.327>
13. Breau LM, Burkitt C. Assessing pain in children with intellectual disabilities. *Pain Res Manag*. 2009;14:116-120.
14. Breau LM, Finley GA, McGrath PJ, Camfield CS. Validation of the Non-communicating Children's Pain Checklist-Postoperative Version. *Anesthesiology*. 2002;96:528-535.
15. Breau LM, McGrath PJ, Camfield C, Rosmus C, Finley GA. Preliminary validation of an observational pain checklist for persons with cognitive impairments and inability to communicate verbally. *Dev Med Child Neurol*. 2000;42:609-616. <https://doi.org/10.1111/j.1469-8749.2000.tb00366.x>
16. Breau LM, McGrath PJ, Camfield CS, Finley GA. Psychometric properties of the non-communicating children's pain checklist-revised. *Pain*. 2002;99:349-357. [https://doi.org/10.1016/S0304-3959\(02\)00179-3](https://doi.org/10.1016/S0304-3959(02)00179-3)
17. Breau LM, McGrath PJ, Craig KD, Santor D, Cassidy KL, Reid GJ. Facial expression of children receiving immunizations: a principal components analysis of the child facial coding system. *Clin J Pain*. 2001;17:178-186.
18. Breivik H, Borchgrevink PC, Allen SM, et al. Assessment of pain. *Br J Anaesth*. 2008;101:17-24. <https://doi.org/10.1093/bja/aen103>
19. Brunner HI, Klein-Gitelman MS, Miller MJ, et al. Minimal clinically important differences of the childhood health assessment questionnaire. *J Rheumatol*. 2005;32:150-161.
20. Bulloch B, Garcia-Filion P, Ntricia D, Bryson M, McConahay T. Reliability of the color analog scale: repeatability of scores in traumatic and nontraumatic injuries. *Acad Emerg Med*. 2009;16:465-469. <https://doi.org/10.1111/j.1553-2712.2009.00404.x>
21. Bulloch B, Tenenbein M. Validation of 2 pain scales for use in the pediatric emergency department. *Pediatrics*. 2002;110:e33.
22. Büttner W, Finke W. Analysis of behavioural and physiological parameters for the assessment of postoperative analgesic demand in newborns, infants and young children: a comprehensive report on seven consecutive studies. *Paediatr Anaesth*. 2000;10:303-318. <https://doi.org/10.1046/j.1460-9592.2000.00530.x>
23. Castarlenas E, Jensen MP, von Baeyer CL, Miró J. Psychometric properties of the Numerical Rating Scale to assess self-reported pain intensity in children and adolescents: a systematic review. *Clin J Pain*. 2017;33:376-383. <https://doi.org/10.1097/AJP.0000000000000406>
24. Castarlenas E, Miró J, Sánchez-Rodríguez E. Is the verbal numerical rating scale a valid tool for assessing pain intensity in children below 8 years of age? *J Pain*. 2013;14:297-304. <https://doi.org/10.1016/j.jpain.2012.12.004>
25. Chambers C. It doesn't have to hurt. Available at: <http://itdoesnthavetohurt.ca/>. Accessed December 6, 2016.
26. Chambers CT, Giesbrecht K, Craig KD, Bennett SM, Huntsman E. A comparison of faces scales for the measurement of pediatric pain: children's and parents' ratings. *Pain*. 1999;83:25-35. [https://doi.org/10.1016/S0304-3959\(99\)00086-X](https://doi.org/10.1016/S0304-3959(99)00086-X)
27. Chambers CT, Johnston C. Developmental differences in children's use of rating scales. *J Pediatr Psychol*. 2002;27:27-36. <https://doi.org/10.1093/jpepsy/27.1.27>
28. Chan JY, von Baeyer CL. Cognitive developmental influences on the ability of preschool-aged children to self-report their pain intensity. *Pain*. 2016;157:997-1001. <https://doi.org/10.1097/j.pain.0000000000000476>
29. Chen-Lim ML, Zarnowsky C, Green R, Shaffer S, Holtzer B, Ely E. Optimizing the assessment of pain in children who are cognitively impaired through the quality improvement process. *J Pediatr Nurs*. 2012;27:750-759. <https://doi.org/10.1016/j.pedn.2012.03.023>
30. Chiwaridzo M, Naidoo N. Are parents and adolescents in agreement on reporting of recurrent non-specific low back pain in adolescents? A cross-sectional descriptive study. *BMC Pediatr*. 2015;15:203. <https://doi.org/10.1186/s12887-015-0518-1>
31. Claar RL, Walker LS. Functional assessment of pediatric pain patients: psychometric properties of the Functional Disability Inventory. *Pain*. 2006;121:77-84. <https://doi.org/10.1016/j.pain.2005.12.002>
32. Cohen LL, Lemanek K, Blount RL, et al. Evidence-based assessment of pediatric pain. *J Pediatr Psychol*. 2008;33:939-955; discussion 956-957. <https://doi.org/10.1093/jpepsy/jsm103>
33. Cohen LL, Vowles KE, Eccleston C. Adolescent chronic pain-related functioning: concordance and discordance of mother-proxy and self-report ratings. *Eur J Pain*. 2010;14:882-886. <https://doi.org/10.1016/j.ejpain.2010.01.005>
34. Committee on Psychosocial Aspects of Child and Family Health, Task Force on Pain in Infants, Children, and Adolescents. The assessment and management of acute pain in infants, children, and adolescents. *Pediatrics*. 2001;108:793-797.
35. Craig KD. Social communication model of pain. *Pain*. 2015;156:1198-1199. <https://doi.org/10.1097/j.pain.0000000000000185>
36. Crellin D, Sullivan TP, Babi FE, O'Sullivan R, Hutchinson A. Analysis of the validation of existing behavioral pain and distress scales for use in the procedural setting. *Paediatr Anaesth*. 2007;17:720-733. <https://doi.org/10.1111/j.1460-9592.2007.02218.x>
37. Crellin DJ, Harrison D, Santamaria N, Babi FE. Systematic review of the Face, Legs, Activity, Cry and Consolability scale for assessing pain in infants and children: is it reliable, valid, and feasible for use? *Pain*. 2015;156:2132-2151. <https://doi.org/10.1097/j.pain.0000000000000305>
38. Crosta QR, Ward TM, Walker AJ, Peters LM. A review of pain measures for hospitalized children with cognitive impairment. *J Spec Pediatr Nurs*. 2014;19:109-118. <https://doi.org/10.1111/jspn.12069>
39. de la Vega R, Roset R, Castarlenas E, Sánchez-Rodríguez E, Solé E, Miró J. Development and testing of Painometer: a smartphone app to assess pain intensity. *J Pain*. 2014;15:1001-1007. <https://doi.org/10.1016/j.jpain.2014.04.009>
40. DeWalt DA, Gross HE, Gipson DS, et al. PROMIS® pediatric self-report scales distinguish subgroups of children within and across six common pediatric chronic health conditions. *Qual Life Res*. 2015;24:2195-2208. <https://doi.org/10.1007/s11136-015-0953-3>
41. Duhn LJ, Medves JM. A systematic integrative review of infant pain assessment tools. *Adv Neonatal Care*. 2004;4:126-140.
42. Eccleston C, Jordan A, McCracken LM, Sleed M, Connell H, Clinch J. The Bath Adolescent

- Pain Questionnaire (BAPQ): development and preliminary psychometric evaluation of an instrument to assess the impact of chronic pain on adolescents. *Pain*. 2005;118:263-270. <https://doi.org/10.1016/j.pain.2005.08.025>
43. Eccleston C, Jordan AL, Crombez G. The impact of chronic pain on adolescents: a review of previously used measures. *J Pediatr Psychol*. 2006;31:684-697. <https://doi.org/10.1093/jpepsy/psj061>
 44. Eccleston C, McCracken LM, Jordan A, Slead M. Development and preliminary psychometric evaluation of the parent report version of the Bath Adolescent Pain Questionnaire (BAPQ-P): a multidimensional parent report instrument to assess the impact of chronic pain on adolescents. *Pain*. 2007;131:48-56. <https://doi.org/10.1016/j.pain.2006.12.010>
 45. Ely E, Chen-Lim ML, Zarnowsky C, Green R, Shaffer S, Holtzer B. Finding the evidence to change practice for assessing pain in children who are cognitively impaired. *J Pediatr Nurs*. 2012;27:402-410. <https://doi.org/10.1016/j.pedn.2011.05.009>
 46. Fernandes AM, De Campos C, Batalha L, Perdigão A, Jacob E. Pain assessment using the Adolescent Pediatric Pain Tool: a systematic review. *Pain Res Manag*. 2014;19:212-218.
 47. Gharaibeh M, Abu-Saad H. Cultural validation of pediatric pain assessment tools: Jordanian perspective. *J Transcult Nurs*. 2002;13:12-18. <https://doi.org/10.1177/104365960201300103>
 48. Gomez RJ, Barrowman N, Elia S, Manias E, Royle J, Harrison D. Establishing intra- and inter-rater agreement of the Face, Legs, Activity, Cry, Consolability scale for evaluating pain in toddlers during immunization. *Pain Res Manag*. 2013;18:e124-e128.
 49. Goodenough B, Addicoat L, Champion GD, et al. Pain in 4- to 6-year-old children receiving intramuscular injections: a comparison of the Faces Pain Scale with other self-report and behavioral measures. *Clin J Pain*. 1997;13:60-73.
 50. Goodenough B, Piira T, von Baeyer CL, et al. Comparing six self-report measures of pain intensity in children. *Suffering Child*. 2005;8:1-25.
 51. Gragg RA, Rapoff MA, Danovsky MB, et al. Assessing chronic musculoskeletal pain associated with rheumatic disease: further validation of the Pediatric Pain Questionnaire. *J Pediatr Psychol*. 1996;21:237-250. <https://doi.org/10.1093/jpepsy/21.2.237>
 52. Groenewald CB, Essner BS, Wright D, Fesinmeyer MD, Palermo TM. The economic costs of chronic pain among a cohort of treatment-seeking adolescents in the United States. *J Pain*. 2014;15:925-933. <https://doi.org/10.1016/j.jpain.2014.06.002>
 53. Habich M, Wilson D, Thielk D, et al. Evaluating the effectiveness of pediatric pain management guidelines. *J Pediatr Nurs*. 2012;27:336-345. <https://doi.org/10.1016/j.pedn.2011.06.002>
 54. Hadden KL, LeFort S, O'Brien M, Coyte PC, Guerriere DN. Validity of the Child Facial Coding System for the assessment of acute pain in children with cerebral palsy. *J Child Neurol*. 2016;31:597-602. <https://doi.org/10.1177/0883073815604228>
 55. Hadjistavropoulos T, Craig KD. A theoretical framework for understanding self-report and observational measures of pain: a communications model. *Behav Res Ther*. 2002;40:551-570.
 56. Harbeck C, Peterson L. Elephants dancing in my head: a developmental approach to children's concepts of specific pains. *Child Dev*. 1992;63:138-149.
 57. HealthMeasures. NIH Toolbox. Available at: <http://www.healthmeasures.net/explore-measurement-systems/nihtoolbox>. Accessed March 20, 2017.
 58. Henschke N, Kamper SJ, Maher CG. The epidemiology and economic consequences of pain. *Mayo Clin Proc*. 2015;90:139-147. <https://doi.org/10.1016/j.mayocp.2014.09.010>
 59. Hermann C, Hohmeister J, Zohsel K, Tutas ML, Flor H. The impact of chronic pain in children and adolescents: development and initial validation of a child and parent version of the Pain Experience Questionnaire. *Pain*. 2008;135:251-261. <https://doi.org/10.1016/j.pain.2007.06.002>
 60. Hester NK. The preoperational child's reaction to immunization. *Nurs Res*. 1979;28:250-255.
 61. Hicks CL, von Baeyer CL, Spafford PA, van Koraal I, Goodenough B. The Faces Pain Scale - Revised: toward a common metric in pediatric pain measurement. *Pain*. 2001;93:173-183. [https://doi.org/10.1016/S0304-3959\(01\)00314-1](https://doi.org/10.1016/S0304-3959(01)00314-1)
 62. Huguet A, Stinson JN, McGrath PJ. Measurement of self-reported pain intensity in children and adolescents. *J Psychosom Res*. 2010;68:329-336. <https://doi.org/10.1016/j.jpsychores.2009.06.003>
 63. Hunt A, Goldman A, Seers K, Crichton N, Moffat V, Oulton K. Clinical validation of the Paediatric Pain Profile. *Dev Med Child Neurol*. 2004;46:9-18. <https://doi.org/10.1111/j.1469-8749.2004.tb00428.x>
 64. Hunt A, Wisbeach A, Seers K, et al. Development of the Paediatric Pain Profile: role of video analysis and saliva cortisol in validating a tool to assess pain in children with severe neurological disability. *J Pain Symptom Manage*. 2007;33:276-289. <https://doi.org/10.1016/j.jpainsymman.2006.08.011>
 65. Hunt KA, Franck LS. Special needs require special attention: a pilot project implementing the Paediatric Pain Profile for children with profound neurological impairment in an in-patient setting following surgery. *J Child Health Care*. 2011;15:210-220. <https://doi.org/10.1177/1367493511407942>
 66. Jaaniste T, Noel M, von Baeyer CL. Young children's ability to report on past, future, and hypothetical pain states: a cognitive-developmental perspective. *Pain*. 2016;157:2399-2409. <https://doi.org/10.1097/j.pain.0000000000000666>
 67. Jacob E, Mack AK, Savedra M, Van Cleve L, Wilkie DJ. Adolescent pediatric pain tool for multidimensional measurement of pain in children and adolescents. *Pain Manag Nurs*. 2014;15:694-706. <https://doi.org/10.1016/j.pmn.2013.03.002>
 68. Jaeschke R, Singer J, Guyatt GH. Measurement of health status. Ascertaining the minimal clinically important difference. *Control Clin Trials*. 1989;10:407-415.
 69. Kamper SJ, Dissing KB, Hestbaek L. Whose pain is it anyway? Comparability of pain reports from children and their parents. *Chiropr Man Therap*. 2016;24:24. <https://doi.org/10.1186/s12998-016-0104-0>
 70. Kamper SJ, Henschke N, Hestbaek L, Dunn KM, Williams CM. Musculoskeletal pain in children and adolescents. *Braz J Phys Ther*. 2016;20:275-284. <https://doi.org/10.1590/bjpt-rbf.2014.0149>
 71. Kamper SJ, Ostelo RW, Knol DL, Maher CG, de Vet HC, Hancock MJ. Global Perceived Effect scales provided reliable assessments of health transition in people with musculoskeletal disorders, but ratings are strongly influenced by current status. *J Clin Epidemiol*. 2010;63:760-766.e1. <https://doi.org/10.1016/j.jclinepi.2009.09.009>
 72. Kashikar-Zuck S, Carle A, Barnett K, et al. Longitudinal evaluation of patient-reported outcomes measurement information systems measures in pediatric chronic pain. *Pain*. 2016;157:339-347. <https://doi.org/10.1097/j.pain.0000000000000378>
 73. Kashikar-Zuck S, Flowers SR, Claar RL, et al. Clinical utility and validity of the Functional Disability Inventory among a multicenter sample of youth with chronic pain. *Pain*. 2011;152:1600-1607. <https://doi.org/10.1016/j.pain.2011.02.050>
 74. Keck JF, Gerkensmeyer JE, Joyce BA, Schade JG. Reliability and validity of the Faces and Word Descriptor Scales to measure procedural pain. *J Pediatr Nurs*. 1996;11:368-374. [https://doi.org/10.1016/S0882-5963\(96\)80081-9](https://doi.org/10.1016/S0882-5963(96)80081-9)
 75. King S, Chambers CT, Huguet A, et al. The epidemiology of chronic pain in children and adolescents revisited: a systematic review. *Pain*. 2011;152:2729-2738. <https://doi.org/10.1016/j.pain.2011.07.016>
 76. Kingsnorth S, Joachimides N, Krog K, Davies B, Higuchi KS. Optimal pain assessment in pediatric rehabilitation: implementation of a nursing guideline. *Pain Manag Nurs*. 2015;16:871-880. <https://doi.org/10.1016/j.pmn.2015.07.009>
 77. Kingsnorth S, Orava T, Provedenza C, et al. Chronic pain assessment tools for cerebral palsy: a systematic review. *Pediatrics*. 2015;136:e947-e960. <https://doi.org/10.1542/peds.2015-0273>
 78. Klepper SE. Measures of pediatric function: the Child Health Assessment Questionnaire (CHAQ), Juvenile Arthritis Functional Assessment Report (JAFAR), Juvenile Arthritis Functional Assessment Scale (JAFAS), Juvenile Arthritis Functional Status Index (JASI), and Pediatric Orthopedic Surgeons of North America (POSNA) Pediatric Musculoskeletal Functional Health Questionnaire. *Arthritis Care Res (Hoboken)*. 2003;49:S5-S14. <https://doi.org/10.1002/art.11398>
 79. Kröner-Herwig B, Morris L, Heinrich M, Gassmann J, Vath N. Agreement of parents and

- children on characteristics of pediatric headache, other pains, somatic symptoms, and depressive symptoms in an epidemiologic study. *Clin J Pain*. 2009;25:58-64. <https://doi.org/10.1097/AJP.0b013e31817fc62d>
80. Lalloo C, Kumbhare D, Stinson JN, Henry JL. Pain-QuiLT: clinical feasibility of a web-based visual pain assessment tool in adults with chronic pain. *J Med Internet Res*. 2014;16:e127. <https://doi.org/10.2196/jmir.3292>
81. Lalloo C, Stinson JN. Assessment and treatment of pain in children and adolescents. *Best Pract Res Clin Rheumatol*. 2014;28:315-330. <https://doi.org/10.1016/j.berh.2014.05.003>
82. Lauridsen HH, Hestbaek L. Development of the Young Spine Questionnaire. *BMC Musculoskelet Disord*. 2013;14:185. <https://doi.org/10.1186/1471-2474-14-185>
83. Lavigne JV. Systematic review: issues in measuring clinically meaningful change in self-reported chronic pediatric pain intensity. *J Pediatr Psychol*. 2016;41:715-734. <https://doi.org/10.1093/jpepsy/jsv161>
84. Lawrence J, Alcock D, McGrath P, Kay J, MacMurray SB, Dulberg C. The development of a tool to assess neonatal pain. *Neonatal Netw*. 1993;12:59-66.
85. Legault EP, Cantin V, Descarreaux M. Assessment of musculoskeletal symptoms and their impacts in the adolescent population: adaptation and validation of a questionnaire. *BMC Pediatr*. 2014;14:173. <https://doi.org/10.1186/1471-2431-14-173>
86. Lootens CC, Rapoff MA. Measures of pediatric pain: 21-numbered circle Visual Analog Scale (VAS), E-Ouch Electronic Pain Diary, Oucher, Pain Behavior Observation Method, Pediatric Pain Assessment Tool (PPAT), and Pediatric Pain Questionnaire (PPQ). *Arthritis Care Res (Hoboken)*. 2011;63 suppl 11:S253-S262. <https://doi.org/10.1002/acr.20634>
87. Luffy R, Grove SK. Examining the validity, reliability, and preference of three pediatric pain measurement tools in African-American children. *Pediatr Nurs*. 2003;29:54-59.
88. Malviya S, Voepel-Lewis T, Burke C, Merkel S, Tait AR. The revised FLACC observational pain tool: improved reliability and validity for pain assessment in children with cognitive impairment. *Paediatr Anaesth*. 2006;16:258-265. <https://doi.org/10.1111/j.1460-9592.2005.01773.x>
89. Massaro M, Pastore S, Ventura A, Barbi E. Pain in cognitively impaired children: a focus for general pediatricians. *Eur J Pediatr*. 2013;172:9-14. <https://doi.org/10.1007/s00431-012-1720-x>
90. Massaro M, Ronfani L, Ferrara G, et al. A comparison of three scales for measuring pain in children with cognitive impairment. *Acta Paediatr*. 2014;103:e495-e500. <https://doi.org/10.1111/apa.12748>
91. McConahay T, Bryson M, Bulloch B. Defining mild, moderate, and severe pain by using the color analogue scale with children presenting to a pediatric emergency department. *Acad Emerg Med*. 2006;13:341-344. <https://doi.org/10.1197/j.aem.2005.09.010>
92. McGrath PA, Seifert CE, Speechley KN, Booth JC, Stitt L, Gibson MC. A new analogue scale for assessing children's pain: an initial validation study. *Pain*. 1996;64:435-443. [https://doi.org/10.1016/0304-3959\(95\)00171-9](https://doi.org/10.1016/0304-3959(95)00171-9)
93. McGrath PJ, Walco GA, Turk DC, et al. Core outcome domains and measures for pediatric acute and chronic/recurrent pain clinical trials: PedIMMPACT recommendations. *J Pain*. 2008;9:771-783. <https://doi.org/10.1016/j.jpain.2008.04.007>
94. Merkel SI, Voepel-Lewis T, Shayevitz JR, Malviya S. The FLACC: a behavioral scale for scoring postoperative pain in young children. *Pediatr Nurs*. 1997;23:293-297.
95. Miró J, Castarlenas E, Huguet A. Evidence for the use of a numerical rating scale to assess the intensity of pediatric pain. *Eur J Pain*. 2009;13:1089-1095. <https://doi.org/10.1016/j.ejpain.2009.07.002>
96. Miró J, Huguet A. Evaluation of reliability, validity, and preference for a pediatric pain intensity scale: the Catalan version of the Faces Pain Scale - Revised. *Pain*. 2004;111:59-64. <https://doi.org/10.1016/j.pain.2004.05.023>
97. Morales NM, Funayama CA, Rangel VO, et al. Psychometric properties of the Child Health Assessment Questionnaire (CHAQ) applied to children and adolescents with cerebral palsy. *Health Qual Life Outcomes*. 2008;6:109. <https://doi.org/10.1186/1477-7525-6-109>
98. Nader R, Oberlander TF, Chambers CT, Craig KD. Expression of pain in children with autism. *Clin J Pain*. 2004;20:88-97.
99. O'Connor B, Kerr C, Shields N, Imms C. A systematic review of evidence-based assessment practices by allied health practitioners for children with cerebral palsy. *Dev Med Child Neurol*. 2016;58:332-347. <https://doi.org/10.1111/dmcn.12973>
100. O'Sullivan PB, Beales DJ, Smith AJ, Straker LM. Low back pain in 17 year olds has substantial impact and represents an important public health disorder: a cross-sectional study. *BMC Public Health*. 2012;12:100. <https://doi.org/10.1186/1471-2458-12-100>
101. Palermo TM, Lewandowski AS, Long AC, Burant CJ. Validation of a self-report questionnaire version of the Child Activity Limitations Interview (CALI): the CALI-21. *Pain*. 2008;139:644-652. <https://doi.org/10.1016/j.pain.2008.06.022>
102. Palermo TM, Witherspoon D, Valenzuela D, Dröter DD. Development and validation of the Child Activity Limitations Interview: a measure of pain-related functional impairment in school-age children and adolescents. *Pain*. 2004;109:461-470. <https://doi.org/10.1016/j.pain.2004.02.023>
103. Panigani D, Bevan A. Children's nurses' post-operative pain assessment practices. *Nurs Child Young People*. 2016;28:29-33. <https://doi.org/10.7748/ncyp.28.5.29.s23>
104. Pedersen LK, Rahbek O, Nikolajsen L, Møller-Madsen B. Assessment of pain in children with cerebral palsy focused on translation and clinical feasibility of the revised FLACC score. *Scand J Pain*. 2015;9:49-54. <https://doi.org/10.1016/j.sjpain.2015.06.005>
105. Pedersen LK, Rahbek O, Nikolajsen L, Møller-Madsen B. The revised FLACC score: reliability and validation for pain assessment in children with cerebral palsy. *Scand J Pain*. 2015;9:57-61. <https://doi.org/10.1016/j.sjpain.2015.06.007>
106. Quinn BL, Seibold E, Hayman L. Pain assessment in children with special needs: a review of the literature. *Except Child*. 2015;82:44-57. <https://doi.org/10.1177/0014402915585480>
107. Rabbitts JA, Palermo TM, Zhou C, Mangione-Smith R. Pain and health-related quality of life after pediatric inpatient surgery. *J Pain*. 2015;16:1334-1341. <https://doi.org/10.1016/j.jpain.2015.09.005>
108. Rapoff MA. Pediatric measures of pain: the Pain Behavior Observation Method, Pain Coping Questionnaire (PCQ), and Pediatric Pain Questionnaire (PPQ). *Arthritis Care Res (Hoboken)*. 2003;49:S90-S95. <https://doi.org/10.1002/art.11396>
109. Rathleff MS, Skuldbøl SK, Rasch MN, Roos EM, Rasmussen S, Olesen JL. Care-seeking behaviour of adolescents with knee pain: a population-based study among 504 adolescents. *BMC Musculoskelet Disord*. 2013;14:225. <https://doi.org/10.1186/1471-2474-14-225>
110. Roth-Isigkeit A, Thyen U, Stöven H, Schwarzenberger J, Schmucker P. Pain among children and adolescents: restrictions in daily living and triggering factors. *Pediatrics*. 2005;115:e152-e162. <https://doi.org/10.1542/peds.2004-0682>
111. Royal College of Nursing. Clinical Practice Guidelines: The Recognition and Assessment of Acute Pain in Children. London, UK: Royal College of Nursing; 2009.
112. Ruperto N, Ravelli A, Pistorio A, et al. Cross-cultural adaptation and psychometric evaluation of the Childhood Health Assessment Questionnaire (CHAQ) and the Child Health Questionnaire (CHQ) in 32 countries. Review of the general methodology. *Clin Exp Rheumatol*. 2001;19:S1-S9.
113. Ruskin D, Lalloo C, Amaria K, et al. Assessing pain intensity in children with chronic pain: convergent and discriminant validity of the 0 to 10 numerical rating scale in clinical practice. *Pain Res Manag*. 2014;19:141-148.
114. Ruskin DA, Amaria KA, Warnock FF, McGrath PA. Assessment of pain in infants, children, and adolescents. In: Turk DC, Melzack R, eds. *Handbook of Pain Assessment*. 3rd ed. New York, NY: Guilford Press; 2011:213-241.
115. Sánchez-Rodríguez E, Castarlenas E, de la Vega R, Roset R, Miró J. On the electronic measurement of pain intensity: can we use different pain intensity scales interchangeably? *J Health Psychol*. In press. <https://doi.org/10.1177/1359105316633284>
116. Sánchez-Rodríguez E, de la Vega R, Castarlenas E, Roset R, Miró J. An app for the assessment of

- pain intensity: validity properties and agreement of pain reports when used with young people. *Pain Med.* 2015;16:1982-1992. <https://doi.org/10.1111/pme.12859>
117. Sánchez-Rodríguez E, Miró J, Castarlenas E. A comparison of four self-report scales of pain intensity in 6- to 8-year-old children. *Pain.* 2012;153:1715-1719. <https://doi.org/10.1016/j.pain.2012.05.007>
 118. Savedra MC, Holzemer WL, Tesler MD, Wilkie DJ. Assessment of postoperation pain in children and adolescents using the adolescent pediatric pain tool. *Nurs Res.* 1993;42:5-9.
 119. Savedra MC, Tesler MD, Holzemer WL, Wilkie DJ, Ward JA. Pain location: validity and reliability of body outline markings by hospitalized children and adolescents. *Res Nurs Health.* 1989;12:307-314.
 120. Scafford D, Flynn-Roth R, Howard D, et al. Pain management of children aged 5 to 10 years after adenotonsillectomy. *J Perianesth Nurs.* 2013;28:353-360. <https://doi.org/10.1016/j.jopan.2013.05.010>
 121. Shields BJ, Cohen DM, Harbeck-Weber C, Powers JD, Smith GA. Pediatric pain measurement using a visual analogue scale: a comparison of two teaching methods. *Clin Pediatr (Phila).* 2003;42:227-234. <https://doi.org/10.1177/000992280304200306>
 122. Shields BJ, Palermo TM, Powers JD, Grewe SD, Smith GA. Predictors of a child's ability to use a visual analogue scale. *Child Care Health Dev.* 2003;29:281-290.
 123. Singh G, Athreya BH, Fries JF, Goldsmith DP. Measurement of health status in children with juvenile rheumatoid arthritis. *Arthritis Rheum.* 1994;37:1761-1769.
 124. Solodiuk J, Curley MA. Pain assessment in nonverbal children with severe cognitive impairments: the Individualized Numeric Rating Scale (INRS). *J Pediatr Nurs.* 2003;18:295-299. [https://doi.org/10.1016/S0882-5963\(03\)00090-3](https://doi.org/10.1016/S0882-5963(03)00090-3)
 125. Solodiuk JC, Scott-Sutherland J, Meyers M, et al. Validation of the Individualized Numeric Rating Scale (INRS): a pain assessment tool for non-verbal children with intellectual disability. *Pain.* 2010;150:231-236. <https://doi.org/10.1016/j.pain.2010.03.016>
 126. Stallard P, Williams L, Lenton S, Velleman R. Pain in cognitively impaired, non-communicating children. *Arch Dis Child.* 2001;85:460-462.
 127. Stanford EA, Chambers CT, Craig KD. A normative analysis of the development of pain-related vocabulary in children. *Pain.* 2005;114:278-284. <https://doi.org/10.1016/j.pain.2004.12.029>
 128. Stevens BJ, Harrison D, Rashotte J, et al. Pain assessment and intensity in hospitalized children in Canada. *J Pain.* 2012;13:857-865. <https://doi.org/10.1016/j.jpain.2012.05.010>
 129. Stinson JN, Kavanagh T, Yamada J, Gill N, Stevens B. Systematic review of the psychometric properties, interpretability and feasibility of self-report pain intensity measures for use in clinical trials in children and adolescents. *Pain.* 2006;125:143-157. <https://doi.org/10.1016/j.pain.2006.05.006>
 130. Stinson JN, Petroz GC, Stevens BJ, et al. Working out the kinks: testing the feasibility of an electronic pain diary for adolescents with arthritis. *Pain Res Manag.* 2008;13:375-382.
 131. Stinson JN, Petroz GC, Tait G, et al. e-Ouch: usability testing of an electronic chronic pain diary for adolescents with arthritis. *Clin J Pain.* 2006;22:295-305. <https://doi.org/10.1097/01.aip.0000173371.54579.31>
 132. Stinson JN, Stevens BJ, Feldman BM, et al. Construct validity of a multidimensional electronic pain diary for adolescents with arthritis. *Pain.* 2008;136:281-292. <https://doi.org/10.1016/j.pain.2007.07.002>
 133. St-Laurent-Gagnon T, Bernard-Bonnin AC, Villeneuve E. Pain evaluation in preschool children and by their parents. *Acta Paediatr.* 1999;88:422-427. <https://doi.org/10.1111/j.1651-2227.1999.tb01134.x>
 134. Streiner DL, Norman GR. *Health Measurement Scales: A Practical Guide to Their Development and Use*. 3rd ed. Oxford, UK: Oxford University Press; 2003.
 135. Swain MS, Kamper SJ, Maher CG, et al. Short-term clinical course of knee pain in children and adolescents: a feasibility study using electronic methods of data collection. *Physiother Res Int.* In press. <https://doi.org/10.1002/pri.1669>
 136. Taddio A, Hogan ME, Moyer P, et al. Evaluation of the reliability, validity and practicality of 3 measures of acute pain in infants undergoing immunization injections. *Vaccine.* 2011;29:1390-1394. <https://doi.org/10.1016/j.vaccine.2010.12.051>
 137. Taddio A, Nulman I, Koren BS, Stevens B, Koren G. A revised measure of acute pain in infants. *J Pain Symptom Manage.* 1995;10:456-463. [https://doi.org/10.1016/0885-3924\(95\)00058-7](https://doi.org/10.1016/0885-3924(95)00058-7)
 138. Tesler MD, Savedra MC, Holzemer WL, Wilkie DJ, Ward JA, Paul SM. The word-graphic rating scale as a measure of children's and adolescents' pain intensity. *Res Nurs Health.* 1991;14:361-371. <https://doi.org/10.1002/nur.4770140507>
 139. Thirion J, O'Riordan MA, Stormorken A. Revisiting the Pieces of Hurt pain assessment tool – do the pieces matter? *Ped Pain Lett.* 2015;17:1-4.
 140. Thrane SE, Wanless S, Cohen SM, Danford CA. The assessment and non-pharmacologic treatment of procedural pain from infancy to school age through a developmental lens: a synthesis of evidence with recommendations. *J Pediatr Nurs.* 2016;31:e23-e32. <https://doi.org/10.1016/j.pedn.2015.09.002>
 141. Tiira AH, Paananen MV, Taimela SP, Zitting PJ, Järvelin MR, Karppinen JI. Determinants of adolescent health care use for low back pain. *Eur J Pain.* 2012;16:1467-1476. <https://doi.org/10.1002/j.1532-2149.2012.00178.x>
 142. Tomlinson D, von Baeyer CL, Stinson JN, Sung L. A systematic review of faces scales for the self-report of pain intensity in children. *Pediatrics.* 2010;126:e1168-e1198. <https://doi.org/10.1542/peds.2010-1609>
 143. Tsze DS, Hirschfeld G, Dayan PS, Bulloch B, von Baeyer CL. Defining no pain, mild, moderate, and severe pain based on the Faces Pain Scale-Revised and Color Analog Scale in children with acute pain. *Pediatr Emerg Care.* In press. <https://doi.org/10.1097/PEC.0000000000000791>
 144. Tsze DS, Hirschfeld G, von Baeyer CL, Bulloch B, Dayan PS. Clinically significant differences in acute pain measured on self-report pain scales in children. *Acad Emerg Med.* 2015;22:415-422. <https://doi.org/10.1111/acem.12620>
 145. Tsze DS, von Baeyer CL, Bulloch B, Dayan PS. Validation of self-report pain scales in children. *Pediatrics.* 2013;132:e971-e979. <https://doi.org/10.1542/peds.2013-1509>
 146. Twycross A, Collis S. How well is acute pain in children managed? A snapshot in one English hospital. *Pain Manag Nurs.* 2013;14:e204-e215. <https://doi.org/10.1016/j.pmn.2012.01.003>
 147. Varni JW, Stucky BD, Thissen D, et al. PROMIS Pediatric Pain Interference Scale: an item response theory analysis of the pediatric pain item bank. *J Pain.* 2010;11:1109-1119. <https://doi.org/10.1016/j.jpain.2010.02.005>
 148. Varni JW, Thompson KL, Hanson V. The Varni/Thompson Pediatric Pain Questionnaire. I. Chronic musculoskeletal pain in juvenile rheumatoid arthritis. *Pain.* 1987;28:27-38. [https://doi.org/10.1016/0304-3959\(87\)91056-6](https://doi.org/10.1016/0304-3959(87)91056-6)
 149. Vetter TR, Bridgewater CL, McGwin G, Jr. An observational study of patient versus parental perceptions of health-related quality of life in children and adolescents with a chronic pain condition: who should the clinician believe? *Health Qual Life Outcomes.* 2012;10:85. <https://doi.org/10.1186/1477-7525-10-85>
 150. Voepel-Lewis T, Malviya S, Tait AR, et al. A comparison of the clinical utility of pain assessment tools for children with cognitive impairment. *Anesth Analg.* 2008;106:72-78. <https://doi.org/10.1213/01.ane.0000287680.21212.d0>
 151. von Baeyer CL. Children's self-reports of pain intensity: scale selection, limitations and interpretation. *Pain Res Manag.* 2006;11:157-162.
 152. von Baeyer CL, Chambers CT, Forsyth SJ, Eisen S, Parker JA. Developmental data supporting simplification of self-report pain scales for preschool-age children. *J Pain.* 2013;14:1116-1121. <https://doi.org/10.1016/j.jpain.2013.04.008>
 153. von Baeyer CL, Spagrud LJ. Systematic review of observational (behavioral) measures of pain for children and adolescents aged 3 to 18 years. *Pain.* 2007;127:140-150. <https://doi.org/10.1016/j.pain.2006.08.014>
 154. von Baeyer CL, Spagrud LJ, McCormick JC, Choo E, Neville K, Connelly MA. Three new datasets supporting use of the Numerical Rating Scale (NRS-11) for children's self-reports of pain intensity. *Pain.* 2009;143:223-227. <https://doi.org/10.1016/j.pain.2009.03.002>
 155. von Baeyer CL, Uman LS, Chambers CT, Gouthro A. Can we screen young children for their ability to provide accurate self-reports of pain? *Pain.* 2011;152:1327-1333. <https://doi.org/10.1016/j.pain.2010.12.016>

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pain.2011.02.013

156. Vowles KE, Jordan A, Eccleston C. Toward a taxonomy of adolescents with chronic pain: exploratory cluster and discriminant analyses of the bath adolescent pain questionnaire. *Eur J Pain*. 2010;14:214-221. <https://doi.org/10.1016/j.ejpain.2009.05.004>
157. Walco GA, Conte PM, Labay LE, Engel R, Zeltzer LK. Procedural distress in children with cancer: self-report, behavioral observations, and physio-

logical parameters. *Clin J Pain*. 2005;21:484-490.

158. Walker LS, Greene JW. The Functional Disability Inventory: measuring a neglected dimension of child health status. *J Pediatr Psychol*. 1991;16:39-58. <https://doi.org/10.1093/jpepsy/16.1.39>
159. Williams AC, Craig KD. Updating the definition of pain. *Pain*. 2016;157:2420-2423. <https://doi.org/10.1097/j.pain.0000000000000613>
160. Wong DL, Baker CM. Pain in children: com-

parison of assessment scales. *Pediatr Nurs*. 1988;14:9-17.

161. Young KD. Pediatric procedural pain. *Ann Emerg Med*. 2005;45:160-171. <https://doi.org/10.1016/j.annemergmed.2004.09.019>



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