Pediatric Clinical Practice Guidelines for Acute Procedural Pain: A Systematic Review

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**OBJECTIVE:** To systematically review the quality of existing practice guidelines for acute procedural pain in children and provide recommendations for their use.

**METHODS:** A systematic search was conducted on Medline, Embase, CINAHL, PsycINFO, and Scopus from 2000 to July 2013. A gray literature search was also conducted through the Translating Research Into Practice database, Guidelines International Network database, and National Guideline Clearinghouse. Four reviewers rated relevant guidelines using the Appraisal of Guidelines for Research and Evaluation (AGREE) II Instrument. Screening of guidelines, assessment of methodological quality, and data abstraction were conducted by 2 pairs of raters. Disagreements in overall assessments were resolved through consensus.

**RESULTS:** Eighteen guidelines from 4930 retrieved abstracts were included in this study. Based on the AGREE II domains, the guidelines generally scored high in the scope and purpose and clarity of presentation areas. Information on the rigor of guideline development, applicability, and editorial independence were specified infrequently. Four of the 18 guidelines provided tools to help clinicians apply the recommendations in practice settings; 5 were recommended for use in clinical settings, and the remaining 13 were recommended for use with modification.

**CONCLUSIONS:** Despite the increasing availability of clinical practice guidelines for procedural pain in children, the majority are of average quality. More transparency and comprehensive reporting are needed for the guideline development process. Pediatrics 2014;133:1–16
Pain is a complex phenomenon that affects people of all ages. Children who are hospitalized undergo multiple painful procedures on a daily basis.\(^1^\) For example, hospitalized infants experience a median of 10 (range, 0–51) painful procedures per day.\(^1^\) Stevens and colleagues\(^5^\) reported that children experienced an average of 6.3 (range, 1–50) painful procedures per day across 32 Canadian inpatient pediatric hospital units. Since the 1980s, researchers have been examining pain in children and reporting negative physiologic, psychological, and emotional consequences associated with untreated pain.\(^6^\)–\(^10^\) Appropriate pain assessment is needed before painful procedures to determine the patient’s baseline condition and, after the procedure, to evaluate the effectiveness of pain management strategies. Despite the development of validated pain assessment measures\(^11^\)–\(^14^\) and the identification of a wide repertoire of effective pain management strategies, this evidence often is not effectively translated into practice. Consequently, acute procedural pain often is under-assessed and managed in current pediatric clinical settings.\(^2^\)\(^,^\)\(^3^\)

Guidelines are defined as “systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances.”\(^7^\)\(^,^\)\(^8^\) Over the past decade, numerous pediatric pain practice guidelines have been developed; however, little is known about the methodological quality of these guidelines. The purpose of this systematic review was to evaluate the quality of existing pediatric clinical practice guidelines on acute procedural pain and to provide recommendations for their use in clinical practice.

**METHODS**

**Search Strategy**

A systematic search of 5 electronic databases (Medline, Embase, CINAHL, PsycINFO, and Scopus) was conducted from 2000 to July 2013. Search terms included guidelines, neonate, infant, newborn, low birth weight, child, pediatric, adolescent, teen, pain, painful, painless, discomfort, uncomfortable, cry, crying, cried, and cries. A comprehensive gray literature search was also conducted through the Translating Research Into Practice database, the Guidelines International Network database, and the National Guideline Clearinghouse using the Google search engine. Reference lists from the retrieved articles were also checked for relevant guidelines. A hospital librarian assisted in the development and implementation of the search strategy.

**Study Selection**

Titles and abstracts were reviewed independently by 2 pairs of reviewers (G.L., O.K.; A.S., J.Y.). All disagreements were resolved through consensus or a third reviewer. Published and unpublished guidelines were included if they focused on hospitalized or non-hospitalized neonates, infants, children, or adolescents aged 0 to 18 years and pain assessment or management of acute procedural pain. Guidelines in languages other than English and unpublished hospital-specific guidelines were excluded. For guidelines with >1 version, only the most updated versions were included.

**Data Extraction**

Data were abstracted independently by 2 reviewers (G.L., A.S.). Data abstracted from the relevant guidelines included targeted age groups, objectives, key pain assessment and management recommendations, and general comments by the reviewers.

**Quality Assessment**

The methodological quality of all relevant guidelines was assessed using the Appraisal of Guidelines for Research and Evaluation (AGREE) II Instrument.\(^15^\) The AGREE Instrument was originally developed by a group of international guideline developers and researchers\(^15^\)–\(^17^\) and published in 2003 to appraise the quality of guidelines. The original AGREE Instrument included 23 items categorized into 6 quality domains.\(^15^\)–\(^17^\) The measure has been translated into multiple languages and has been cited in >100 publications.\(^17^\) An updated version, the AGREE II, published in 2009,\(^16^\) included a new user’s manual and revisions of 12 items from the original AGREE instrument.\(^16^\) Most revisions were word changes to increase clarity, with the exception of the deletion of 1 item, which stated, “The guideline has been piloted among end users.” A complete list of specific changes from the original AGREE Instrument is available in a separate article.\(^15^\) In addition, scaling of responses in the AGREE has been changed from a 4-point to a 7-point Likert scale, which may influence the process of scoring clinical practice guideline evaluations.

The AGREE II Instrument\(^16^\) is designed to appraise guidelines developed by organizations at all levels (ie, local, regional, national, international, and affiliated government organizations) and in different settings. It is intended for use by health care providers, guideline developers, policymakers, and educators. The AGREE II quality domains include scope and purpose (3 items), stakeholder involvement (3 items), rigor of development (8 items), clarity of presentation (3 items), applicability (4 items), and editorial independence (2 items). Each of the 25 items is scored on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). A quality score is calculated for each domain using the formula provided in the AGREE II user manual. Domain scores are calculated by adding the scores of individual items within a domain, then scaling the total as a percentage of the maximum possible score for that domain. Thus, the
RESULTS
Results of Literature Searches
A total of 4930 abstracts were retrieved, and 18 (16 from electronic databases, 2 from the gray literature search) were included in the review (Fig 1). Of the 18 guidelines, 7 focused on neonates or infants only, and 11 included infants and children 0 to 18 years old.

AGREE II Ratings
Scaled domain percentages and overall assessments for each guideline, plus the overall average percentage for all 18 guidelines and recommendations, are described in Table 1. A summary of the AGREE II domains of included guidelines are discussed in this section.

Scope and Purpose
Scope and practice is the "overall aim of the guideline, the specific health questions and target population" of the guideline. The overall mean domain score and SD was 80.9% ± 19.2%. Half of the 18 guidelines (n = 9) scored >85% in the scope and purpose domain, indicating that the overall objectives, target population, and health questions of the guideline were clearly described.

Stakeholder Involvement
Stakeholder involvement is the extent of involvement by all participants in the guideline development process. Whether the views and preferences of the target population have been sought or...
incorporated by the guideline developers is also considered. In this domain, scores were variable, ranging from 22.2% to 100.0%, with a mean and SD of 50.5% ± 19.1%. Unlike the scope and purpose domain, 17 of the 18 (94%) guidelines had domain ratings lower than 85%, indicating that the guideline development group membership was not described, and the views and preferences of targeted patients were not sought.

**Rigor of Development**

Rigor of development evaluates the process used to gather and synthesize evidence and the methods to develop and update the recommendations. The overall average score and SD was 47.3% ± 28.2%. Only 7 guidelines (39%) included a systematic method to evaluate the risk of bias of the evidence in the guidelines (eg, Taddio and colleagues, using the Cochrane Risk of Bias Table).

**Clarity of Presentation**

Clarity of presentation examines the language, structure, presentation, and format of the guideline. This domain captures whether recommendations are specific and whether different options for managing the procedure are clearly presented. Raters also reviewed whether key recommendations are easily identifiable and well organized. The overall mean domain score was 85.7% ± 15.4%. Twelve guidelines (66.7%) received >85.0% in the domain score. Key recommendations were easily identifiable in the guidelines. In particular, reviewers found guidelines easiest when recommendations were presented in summarized boxes, algorithms, or a diagram format.

**Applicability**

Applicability evaluates whether a guideline provides information to anticipate barriers and facilitators in guideline implementation, strategies to improve uptake, and resource implications for application. The average domain score rating was 25.5% ± 33.7%. Fourteen guidelines (77%) scored below 50% for this domain. These guidelines did not indicate how the guideline recommendations could be translated into clinical practice. Strategies for monitoring or auditing criteria such as process or outcome measures were not often discussed.

**Editorial Independence**

Editorial independence is designed to evaluate whether the development of recommendations is biased with competing interests or affected by funding bodies. The average domain score rating was 28.7% ± 33.8%. Eight guidelines (44.4%) did not provide a statement about sources of funding or describe how the competing interests were recorded and addressed.

**Overall Assessment**

Overall, 5 guidelines scored highly (≥6) using the AGREE II criteria and provided excellent resources for clinicians. These guidelines are recommended for clinical practice. Of the 5 guidelines, 2 were specific to

<table>
<thead>
<tr>
<th>Author (y)</th>
<th>Scope and Purpose</th>
<th>Stakeholder Involvement</th>
<th>Rigor of Development</th>
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<th>Applicability</th>
<th>Editorial Independence</th>
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<td>Mean domain score</td>
<td>80.9</td>
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<td>19.1</td>
<td>28.2</td>
<td>15.4</td>
<td>33.7</td>
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<td>YWM</td>
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Y, yes; YWM, yes, with modifications.
neonates and infants,24,26 and 3 were developed for a broad range of infants and children 0 to 18 years old.29,34,37 These guidelines adhered strictly to the AGREE II criteria and provided tools to bridge the evidence–practice gap. They also provided information on potential risks and adverse effects of each recommended intervention. The remaining 15 guidelines received an overall rating of 3.5 to 5.0 out of 7.0 and included a broad range of recommendations that were not clearly described according to the AGREE II specifications.

Summary of Recommendations
The 5 highest AGREE II–rated guidelines’ objectives, key recommendations, and reviewers’ comments are described in Table 2. These guidelines included recommendations that were specific to a targeted age group and procedures. One guideline29 provided recommendations for pain assessment practices only, 2 guidelines24,37 provided recommendations on pain management practices only, and 2 guidelines26,34 provided recommendations for both pain assessment and management practices. Pain assessment recommendations for children 0 to 18 years old were provided in 3 guidelines26,29,34 recommending that self-report be obtained from children whenever possible; for nonverbal children, appropriate validated composite behavioral measures should be used to assess pain; and pain assessment should be documented before, during, and after painful procedures and assessed as frequently as other vital signs.

Pain management strategies were recommended by age and types of procedures in 4 guidelines.24,26,34,37 Four major categories of pain management strategies were recommended: environmental, physical, pharmacological, and psychological interventions. Environmental recommendations included minimizing the number of painful procedures (eg, the use of venipuncture rather than heel lance in neonates, reducing environmental noise and light, and keeping a calm environment during the procedure).24 Physical strategies included the use of kangaroo care, nonnutritive sucking (NNS), and facilitated tucking.24,26 Mothers were encouraged to breastfeed their infants during acute painful procedures.24,26,34,37 For pharmacological pain management, 24% sucrose (with or without NNS) was recommended for acute, single-event procedures such as heel lance, venipuncture, and immunizations, by all the pain guidelines including infants.24,26,34,37 Topical anesthesia such as lidocaine–prilocaine 5% cream or patch was recommended for venipuncture, heel lance, lumbar puncture, transurethral catheterization, and vaccination in 5 guidelines.24,34,37 For acute procedures associated with perceived higher pain intensity (eg, lumbar puncture, chest tube insertion or removal), opioids, regional anesthesia, and general anesthesia were recommended.24,26,34,37 Psychological interventions were recommended for children >3 years of age. Most commonly, distraction was recommended for blood sampling, intravenous cannulation, bladder catheterization, and immunizations.34,37 Slow, deep breathing or blowing and tactile stimulation were recommended during immunizations for children >4 years of age.37

DISCUSSION
A very small proportion of all existing pediatric clinical pain practice guidelines met the inclusion criteria. The AGREE II Instrument provided a systematic, reliable, and valid approach to assess and identify comprehensive guidelines that could be recommended for clinical practice. Guideline evaluation using the instrument has been reported in other reviews of guidelines.39–43 To the best of our knowledge, this is the first systematic review evaluating pediatric pain clinical practice guidelines.

Strengths and Limitations of Recommended Guidelines
Based on the AGREE II evaluation, 5 clinical pediatric pain guidelines were recommended.24,26,29,34,37 A strength of these guidelines is the rigorous approach taken in appraising current evidence. Specifically, 4 guidelines24,26,29,34 used the Scottish Intercollegiate Guidelines Network (SIGN) system44 to attribute a level of evidence before making a recommendation. Taddio and colleagues87 used a similar but modified system,45 along with the Cochrane Risk of Bias table, to appraise the quality of evidence. Spence and colleagues26 used the AGREE instrument to evaluate neonatal unit pain guidelines in 17 hospitals in Australia and consolidated the best evidence into 1 guideline. This guideline included specific tools (eg, audit tool and algorithms for procedural pain) for acute pain management in neonatal units.

The use of a formal critical appraisal tool strengthens the guidelines as recommendations are formulated based on levels and grades of evidence. This evidence is then carefully synthesized into recommendations and good practice points for clinicians to apply in clinical practice. The 5 highest-rated guidelines presented recommendations in a clear, concise, specific, and easy-to-follow format. This clarity is important because it allows clinicians to easily identify the key recommendations in busy clinical settings. The guideline with the highest AGREE II domain scores was developed by Taddio and colleagues37 on pain management during immunizations in children 0 to 18 years old. This guideline met all the AGREE II criteria, provided recommendations, highlighted recommendations
<table>
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<tr>
<th>Author (y)</th>
<th>Age Group</th>
<th>Objectives</th>
<th>Key Pain Assessment and Management Recommendations</th>
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</table>
| Bennet et al (2009)     | 0–18 y    | • To identify reliable and valid pain intensity measures for acute painful procedures  
• To provide pain scale algorithm for clinicians to use in clinical settings  
• To make recommendations about timing and triggers for pain assessment | General recommendations:  
• Pain should be anticipated in neonates and children at all times; consider other factors that may influence the expression and assessment of pain (eg, language, ethnicity, and culture factors).  
• Written information about advice on pain assessment and management should be provided to parents upon discharge from hospital.  
• Self-report should be obtained from children whenever possible. If a child is unable to verbalize pain (eg, neonates, preverbal children), use an appropriate validated composite behavioral measure to assess pain.  
• Numerous validated pain scales are provided for each age group with and without cognitive impairment displayed in pain scales algorithm.  
• Pain should be assessed at regular intervals.  
• Initial pain assessment should be documented and reevaluated at regular intervals.  
• Consider other factors that may influence the expression and assessment of pain (eg, language, ethnicity, and culture factors).  
• Guide to selection of pain scales (eg, Premature Infant Pain Profile for neonates; Faces, Legs, Arms, Cry, Consolability for children >3 years of age). | Length: 73 pages.  
SIGN system used to attribute a level of evidence to all included studies.  
Information on editorial independence not specified. |
TABLE 2 Continued

<table>
<thead>
<tr>
<th>Author (y)</th>
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| Howard et al (2012)     | 0–18 y    | ● To provide evidence-based information on pain management strategies for children undergoing painful medical procedures or after surgery  
● To summarize current evidence for the efficacy of analgesic strategies, along with other nonpharmacological interventions  
● To provide recommendations and good practice points (contains supplementary material: Appendices 1–3 for technical report, implementation, cost-effectiveness, audit, and research implications) | Pain assessment:  
● Self-report of pain is preferred whenever possible.  
● No individual measure can be applied to all children or all contexts.  
● Pain assessment measures by age group are listed in Table 1 (eg, Faces, Legs, Arms, Cry, Consolability for newborn–3 y old; Visual Analogue Scale or Numeric Rating Scale for ≥7 years old)  
● An observational measure should be used in combination with self-report for children who are 3–5 y of age. | Length: 102 pages including appendices.  
SIGN system used to attribute a level of evidence to all included studies.  
Information on editorial independence not specified.  
Overall, guideline tightly adheres to AGREE II criteria. |
# Table 2 Continued

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<td></td>
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<td>• Breastfeeding should be encouraged during the procedure whenever feasible.</td>
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<td>• Sucrose is recommended for acute procedural pain (e.g., heel lance, venipuncture, retinopathy of prematurity eye examinations, nasogastric tube replacement, immunization).</td>
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<td>• Topical local anesthesia is recommended for venipuncture, heel lance, lumbar puncture, urine sampling.</td>
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<td>• Nonpharmacological interventions (e.g., NNS, kangaroo care, swaddling, facilitated tucking) are recommended for brief painful procedures (e.g., heel lance, retinopathy of prematurity examinations, immunization).</td>
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<td>Older children:</td>
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<td>• Topical local anesthesia is recommended for blood sampling, intravenous cannulation, and lumbar puncture.</td>
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<td>• Psychological interventions (e.g., distraction or hypnosis) are recommended for blood sampling, intravenous cannulation, bladder catheterization, and immunizations.</td>
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<td>• Behavioral interventions are recommended for lumbar puncture.</td>
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<td>• Pharmacological interventions (e.g., opioid) are recommended for higher-pain procedures such as chest drain insertion and removal and change of dressings in children with burns.</td>
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<td>• Pharmacological intervention preparations, dosage, side effects, and toxicity are stated clearly in Table Series 6.</td>
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<td>Author (y)</td>
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SIGN system used to attribute a level of evidence to all included studies.  
Information on inclusion and exclusion criteria from search, procedure for updating the guideline, and monitoring and auditing criteria not specified. |
|                  |           | To develop a guideline based on evidence and clinical practice to prevent and control neonatal procedure pain.                                                                                                           | • Environmental (eg, use venipuncture rather than heel lance, controlling or reducing light and noise), behavioral (eg, kangaroo care, NNS), and nonpharmacological interventions (eg, facilitated tucking) are recommended for each procedure. |                                                                                                                                                                                                                                  |
|                  |           | To provide a background and summary of acute pain in the NICU                                                                                                                                                                                                                      | • If possible, plan the acute painful procedure far from mealtimes and from any other painful invasive procedure to allow for recovery. Also avoid interrupting sleep. |                                                                                                                                                                                                                                  |
|                  |           | To provide recommendations for neonatal procedural pain management (summary of environmental, behavioral, and nonpharmacological pain interventions [Table 2] and summary of analgesic and anesthetic medications [Table 3]) | • Monitor pain at baseline and during and after the procedure using a validated pain measure.  
• Plan no other invasive procedures for at least 2 hours after the procedure.  
Specific recommendations:  
• Sucrose and NNS are recommended for heel lance and venipuncture, arterial puncture, percutaneous central venous catheter insertion, and lumbar puncture.  
• Local topical anesthesia is recommended for venipuncture, arterial puncture, percutaneous central venous catheter insertion, immunizations, lumbar puncture, and retinopathy of prematurity examinations.  
• Systemic pharmacological interventions (eg, opioid, muscle relaxant) are recommended for higher-pain procedures. |                                                                                                                                                                                                                                  |
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| Spence et al (2010) | Neonates and infants | • To develop a guideline to facilitate the implementation of newborn pain management evidence into practice  
• To appraise guidelines used in 17 neonatal units in Australia and to appraise current evidence for best practice in neonatal pain management  
• To provide key pain assessment and management recommendations | Pain assessment:  
• A lack of behavioral responses (eg, crying and movement) does not necessarily indicate a lack of pain.  
• Pain should be assessed as frequently as other vital signs.  
• Infants at risk for neurological impairment also respond to painful stimuli.  
• Guide on how to use pain assessment measures (Table 5) but no specific validated measures recommended.  
• Algorithm for procedural pain and pain assessment (Figures 2 and 3).  
Pain management:  
• Use the least painful method of undertaking specific procedures.  
• Nonpharmacological interventions such as positioning, swaddling, NNS, and familiar odors are recommended for all procedures.  
• Sucrose or breastfeeding should be used for short-duration, single-event procedures (eg, heel lance and venipuncture).  
• Opioids (bolus or continuous infusion) is recommended for infants with ongoing pain or postoperative pain.  
• Regional anesthesia (eg, epidural) can be used for procedures on the trunk or limbs as an adjunct to general anesthesia. | Length: 9 pages.  
• AGREE instrument used to appraise hospital guidelines and guide development of this guideline.  
• SIGN system used to attribute a level of evidence to all included studies.  
• External review before publication, potential resource implications, and conflict of interest statement not specified. |
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<tr>
<th>Author (y)</th>
<th>Age Group</th>
<th>Objectives</th>
<th>Key Pain Assessment and Management Recommendations</th>
<th>Comment</th>
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| Taddio et al (2010) | 0–18 y | • To develop a clinical practice guideline to manage acute procedure-related pain for children undergoing vaccine injections  
• To provide a summary of acute pain in children during immunizations  
• To provide clinical recommendations based on age group  
• To provide information to facilitate implementation of guideline | • Parents could assist in coordinating pain relief strategies (eg, distraction, deep breathing, holding the child) during painful procedures.  
Specific recommendations for each age group during immunizations:  
Infants:  
• Breastfeeding is recommended during immunization when feasible.  
• Sucrose is recommended for infants ≤12 mo of age who cannot be breastfed during procedure.  
Intramuscular injection technique:  
• Inject the least painful brand during vaccination if >1 commercial brand of a vaccine is available and they are interchangeable.  
Position of child:  
• Do not place children in a supine position during vaccination.  
• Infants and children should be held by a parent in a position that is comfortable for both of them.  
• Excessive restraint may increase the child’s distress.  
Order of injections:  
• Administer the most painful vaccine last when administering multiple vaccines sequentially to reduce pain.  
Children: | Length: 13 pages.  
Level of evidence used to grade recommendations.  
Cochrane Risk of Bias tool used to assess quality of studies.  
Overall, met all the AGREE II criteria. |
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<td></td>
<td>0–15 y of age: Topical anesthesia (eg, EMLA) is recommended.</td>
<td>2 mo to 11 y: Clinician-led distraction techniques are recommended.</td>
<td>3 y of age: Use of child-led distraction and breathing (slow, deep breathing or blowing during vaccination) techniques and combined psychological interventions are recommended.</td>
<td>4 y of age: Use tactile stimulation (eg, offer to rub or stroke the skin near the injection site with moderate intensity) before and during vaccination. Generally, do not tell children that it will not hurt.</td>
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<td></td>
<td>Recommendations with insufficient evidence (should not be used until there is sufficient evidence):</td>
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<td></td>
<td>Skin-cooling techniques, use of simultaneous injections rather than sequential injections, and the use of a specific route of administration for vaccines.</td>
<td></td>
<td>There is also no evidence demonstrating benefit of administering oral analgesics (eg, acetaminophen or ibuprofen) to reduce pain at the time of injection.</td>
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<td>Implementation of guideline:</td>
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<tr>
<td></td>
<td>Guide to pain management for parents and caregivers (Appendix 1).</td>
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<td>Guide to pain management for health care providers (Appendix 2).</td>
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<td>Tool to assess and document pain (Appendix 3).</td>
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within sufficient evidence, and advised against using these recommendations until additional evidence is gathered. For example, Taddio and colleagues\(^{37}\) recommended that clinicians should administer the most painful vaccine last when administering multiple vaccine injections to reduce pain instead of administering injections simultaneously.

Despite overall high quality scores for all 5 recommended guidelines, a few areas were identified for improvement. For example, it was suggested that researchers should provide more information on potential resource implications associated with recommendations.\(^{24,26}\) In addition, an explicit statement of whether the guideline has been externally reviewed by experts before its publication along with information about the procedure for updating the guidelines should be included.\(^{24,26}\) In all guidelines in this review, seeking the views and preferences of the target population remained a challenge, especially in guidelines focused on infants and young children.\(^{24,26,29}\) An obvious solution would be to ask the neonates’ parents or caregivers for their views and preferences as they act as advocates for their children.

**Strengths and Limitations of Pediatric Pain Clinical Guidelines**

Overall, only 1 guideline\(^{37}\) addressed every item in each of the AGREE II domains. However, the scope and purpose and clarity of presentation domains received the highest average domain scores across all guidelines. This finding was consistent with systematic reviews that evaluated guidelines on pelvic pain management,\(^{39}\) thyroid cancers,\(^{43}\) and acute low back\(^{46}\) in adults using the AGREE or AGREE II Instruments and reported a similar trend in domain scores.

Clarity of presentation was one of the easiest domains to score because it was clear whether a guideline included specific and unambiguous management recommendations for different conditions and age groups. This finding attests to the importance of using a systematic method to synthesize and present findings.\(^{25,26,29,34,37}\) The scope and purpose domain received the second highest scores, suggesting that most guideline developers have comprehensively reported the target population and research questions for the guidelines. This is vital for guideline developers, because busy clinicians need to be able to efficiently identify guidelines for pain assessment and management that are relevant and feasible in their clinical practice setting. A few of the more recent guideline authors also attempted to ensure that the rigor of the evidence was included in the guidelines. The increase in transparency in reporting methods may be attributed to movements such as the Consolidated Standards of Reporting Trials Statement, a tool for assessing the reporting quality of randomized controlled trials.\(^{47}\) and grading the quality of evidence and recommendations using the Grading of Recommendations Assessment, Development and Evaluation.\(^{48}\) These movements encourage researchers to transparently and systematically report the design, data collection, results, and discussion sections of each study, ultimately providing clinicians with comprehensive information to judge the quality of the relevant evidence.

Similar to the recommended guidelines, the majority of the remaining guidelines in this review scored the lowest in the stakeholder involvement, editorial independence, and applicability domains. For example, in the stakeholder involvement domain, reviewers were asked to rate whether the views and preferences were sought from the target population. To address this issue for nonverbal populations, some researchers reported that they had consulted parents during the guideline development.\(^{27,34,36}\) However, none of the guidelines specified the outcomes and information gathered from these stakeholders or how that information was used to inform recommendations, as required in the AGREE II Instrument.

The applicability domain had the lowest overall average rating. Most guidelines did not provide potential users with specific recommendations or tools to implement guidelines in their clinical settings. Lack of attention to this area perpetuates difficulties using guidelines in practice, regardless of their quality and the strength of the evidence base. Future guidelines should include additional information about the clinical applicability and feasibility testing of such guidelines. For example, a description of the facilitators (eg, supportive leadership) and barriers (eg, lack of time and resources) for guideline implementation, along with cost–benefit analyses, audit tools, and procedures to upgrade the guideline, are warranted.

In the editorial independence domain, although some researchers reported a single conflict of interest statement, they did not include the methods by which potential competing interests were sought or a description of how the competing interests influenced the guideline process and development of recommendations. Although many guidelines specified the sources of funding for their work, additional information on the role of the funding body in the development of the guideline is needed. Guideline developers may not be aware of the AGREE II criteria; thus, an initial step would be to create an awareness strategy for targeted audiences. However, the clarity of presentation, applicability, and editorial independence domains may be affected...
by editorial requests of journals in which guidelines are published. Overall, results from this review reveal that most pediatric pain guidelines need improvement. This finding is not dissimilar to those of many other systematic reviews of guidelines targeting other health conditions (eg, endocrine disorders, acute gastroenteritis, and cardiovascular disease). Unlike another review, in which authors showed an increase in domain scores in more recent guidelines, we did not find the same trend in our review. Possible reasons could be a lack of awareness of the AGREE II criteria or inadequate or lack of reporting them. The process of evaluating evidence underlying the guideline recommendations is essential to improving the quality of guidelines. Therefore, future guideline developers should adhere to the AGREE II criteria during the guideline development process to improve the quality of guidelines and to provide the best resources for clinical practice.

**Strengths and Limitations of the AGREE II Instrument**

A key strength of this review was the inclusion of multiple reviewers who participated in the screening, quality rating, and data extraction processes. The use of the AGREE II Instrument with established reliability and validity added credibility to the ratings and conclusions. This measure has broad applicability to a variety of health care professionals and settings because of its generic nature and it provides a framework to evaluate the guidelines by focusing on a comprehensive set of domains. This comprehensiveness allows reviewers to systematically evaluate each guideline in a specific, detailed, and objective fashion. Despite its strengths, several challenges with this study and the AGREE II scoring exist, particularly when one is deciding which guidelines would be recommended for use. Similar to Polus and colleagues in their appraisal of World Health Organization guidelines using the AGREE II Instrument, reviewers found that providing an overall assessment score was challenging. This difficulty could be related to the lack of scoring detail provided in the AGREE II training resource, which did not specify how scores corresponded with decisions for recommending the guideline for use in practice. Reviewers were required to interpret their scores based on the ratings obtained by each of the domains in the AGREE II Instrument. Therefore, reviewers in this systematic review developed rating criteria a priori to facilitate decision-making about the guideline recommendation process. However, the criteria to decide whether a guideline is to be recommended are based on authors' judgment. Furthermore, readers should be cautioned that AGREE II scores should be interpreted in the context of the clinical setting. The term stakeholder could be defined more broadly in the AGREE II criteria to ensure that the criteria are more applicable in pediatric contexts (eg, inclusion of parents and health care provider views). Finally, the current study is potentially susceptible to bias because the assessors were not blinded to authors or year of guideline publication.

**Implications**

Despite extensive research on pediatric pain assessment and management interventions, only a small number of evidence-based clinical practice guidelines exist. Furthermore, the majority of these guidelines have not included adequate information that would increase their use by clinicians. Most guidelines in this review were lengthy and provided ambiguous recommendations for clinicians. Results from this review provide implications for future research and guideline use in clinical practice.

Because lack of quality in pediatric pain guidelines may be related to a lack of awareness of the AGREE II criteria, the AGREE II Instrument should be promoted to increase awareness of a structured, theoretically based approach for improving the quality of future practice guidelines. In addition, researchers should evaluate the feasibility and clinical utility of guidelines implemented in a variety of practice contexts. The present review could be extended through a comprehensive evaluation using the AGREE II Instrument to systematically review pediatric pain clinical practice guidelines for acute prolonged or chronic pain in children.

The aim of guideline development is to facilitate use of the best evidence in clinical practice. To aid in this endeavor, guideline developers must ensure that guidelines are being rigorously developed and reported in a detailed, specific, and transparent manner through a valid and reliable approach. In this way, guidelines can be well positioned to assist practitioner and patient decision-making about appropriate health care for specific clinical circumstances. However, guidelines alone will not guarantee changes in practice, and a plan for their implementation and evaluation is essential to bridge the evidence-to-practice gap. Therefore, their integration in multifaceted knowledge translation strategies must be evaluated in terms of both process implementation and clinical outcomes. Ultimately, clinical outcomes in children who are undergoing multiple painful procedures will improve only when research evidence is disseminated through rigorously developed clinical practice guidelines that are effectively implemented in practice.
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REFERENCES
28. Fein JA, Zempsky WT, Cravero JP; Committee on Pediatric Emergency Medicine and Section on Anesthesiology and Pain Medicine;


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*Pediatrics*; originally published online February 2, 2014;
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