
This has resulted in substantial variation among the methods used to evaluate efficacy and other outcome domains. Lack of consensus has hindered meaningful evaluations across and comparisons among trials, including the ability to use systematic review and meta-analytic tools to identify core outcome measures within the efficacy and patient-centered and/or family-centered domains. Safety will be addressed in a subsequent meeting, and efficiency will not be addressed at this time. These measures encompass depth and levels of sedation, proceduralist and patient satisfaction, patient recall, and degree of pain experienced. Consistent use of the recommended outcome measures will facilitate the comprehensive reporting across sedation trials, along with meaningful comparisons among studies and interventions in systematic reviews and meta-analyses.

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evaluate and compare drugs, protocols, delivery devices, and treatment algorithms used for procedural sedation. Identifying core sedation outcomes and suitable measures to evaluate these outcomes would facilitate comparisons among treatment approaches, which would benefit investigators, clinicians, regulatory agencies, and, most importantly, patients needing procedural sedation. Although investigators may wish to augment a core set of domains with other outcomes that are specific to the situation or intervention being studied, use of a core set of outcome variables among studies would permit comparisons among different patient populations, interventions, and settings. Adoption of standardized outcome domains and measures would also simplify the design of procedural sedation trials and encourage thorough evaluation and reporting of relevant outcomes.

Development of a core set of outcome domains and measurement procedures will also facilitate comparison, pooling, and meta-analyses of data, while leaving investigators free to augment the core set with other sets of their choice. In addition, a core set of domains would encourage more complete investigation and reporting of relevant outcomes so that investigators would not simply present a single outcome while ignoring others. Another advantage is that it would encourage development of cooperative multicenter projects, in which different centers agree to assess the core outcome domains, in addition to any measures selected to evaluate the specific research questions. Finally, a standard set of efficacy outcome domains would simplify the process of designing and reviewing research proposals, manuscripts, and published articles.

The Sedation Consortium on Endpoints and Procedures for Treatment, Education, and Research (SCEPTER) organized a meeting to identify the core sedation outcome domains and suitable measures to evaluate these domains and to develop recommendations for adult and pediatric procedural sedation clinical trials. SCEPTER was established by the Analgesic, Anesthetic, and Addiction Clinical Trial Translations, Innovations, Opportunities, and Networks (ACTTION). The ACTTION public–private partnership was conceived as part of the Critical Path Initiative of the US Food and Drug Administration (FDA). The University of Rochester was awarded a contract and a cooperative agreement grant to provide infrastructure and convene relevant stakeholders to identify and direct the activities of the partnership.

The mission of ACTTION is to identify, prioritize, sponsor, coordinate, and promote innovative activities, with a special interest in optimizing clinical trials, that will expedite the discovery and development of improved analgesic, anesthetic, addiction, and peripheral neuropathy treatments for the benefit of the public health. Stakeholders involved in the leadership of the partnership and collaborating in its activities include multiple professional societies, academic basic and clinical investigators, patients and representatives of patient advocacy organizations, individuals representing government agencies (FDA, National Institutes of Health, the Department of Veterans Affairs, and the Department of Defense), and preclinical and clinical researchers from pharmaceutical and device companies. ACTTION has taken a lead in publishing articles highlighting some of the current problems in reporting the pain clinical trials.6–8 The ACTTION leadership established the SCEPTER consortium to be responsible for activities and research efforts involving the development of improved sedation products. An ACTTION steering committee composed of individuals from the FDA and academia developed the agenda and participant list for the SCEPTER initial meeting. Participants were selected from individuals who had attended a previous FDA meeting on sedation clinical trials and who expressed interest in continued involvement on the basis of a steering committee review of their curriculum vitae for relevant expertise. Denham Ward, MD, PhD, now serves as the chair of SCEPTER.

We summarize the presentations and discussions from this meeting. We also recommend a core set of outcome domains with measures that investigators can consider when designing the future clinical trials of drugs, protocols, or delivery systems for procedural sedation. This meeting focused on the domains of efficacy and patient-centered and/or family-centered measures, whereas the important domain of safety was left to a separate meeting scheduled for the fall of 2016. Our goal was to provide guidance and recommendations for core domains and measures to investigators in academia and industry who design these clinical trials and protocols for use in children and adults and to those who seek to interpret the resulting data.

METHODS
A SCEPTER meeting consisting of individuals representing national and international academia, governmental agencies, and industry was held April 4 to 5, 2014, in Washington, DC. Forty-five individuals were invited to the meeting, and 36 attended, including representatives from the American Society of Anesthesiologists and the American Society for Gastrointestinal Endoscopy. Meeting participants were selected on the basis of participation in previous FDA activities, including a public workshop, nominations from professional societies (eg, American Society of Anesthesiologists and American Society for Gastrointestinal Endoscopy), and recommendations from FDA medical reviewers with expertise in sedation and clinical trial research methods. Invited participants were international adult and pediatric sedation investigators and clinicians from relevant specialties (including anesthesiology, dentistry, emergency medicine, and gastroenterology), 7 individuals from the FDA, and 2 from the industry with expertise in sedation clinical trials. All authors of this article participated in the meeting.

Before the meeting, all participants were sent copies of the set of publications9–18 that presented important aspects of procedural sedation research and the results of recent phase 3 clinical trials to illustrate the diversity of outcomes that were used. A recent systematic review article was not available at the time of the meeting; however, the literature review on which this article was based was presented. The meeting was semistructured, with formal presentations by selected participants that stimulated discussion sessions. The general approach was to reach consensus to the greatest extent possible based on
available data and in-depth discussions with the various experts in attendance.

On the basis of these deliberations, the domains proposed by the Institute of Medicine\textsuperscript{20} were utilized, and the advantages and limitations of available measures for these domains were identified. The initial draft of this article was prepared from notes, presentations, and audio recordings of the meeting, circulated to all authors, and iteratively revised on the basis of comments from the authors. All authors have reviewed the final draft and endorsed its publication.

**RESULTS**

**General Considerations**

Evaluating efficacy and effectiveness of drugs, protocols, and delivery devices for procedural sedation is complex, and investigators must measure appropriate end points to determine whether there are statistically significant and clinically meaningful benefits or adverse outcomes of given interventions. The outcomes assessed in sedation clinical trials should adequately represent all meaningful aspects of sedation, including both patient-centered (or surrogate with respect to the pediatric population and for those who are limited in communication abilities) and clinician-centered measures. As discussed below, because sedation is not 1-dimensional, clinical trials should not restrict assessments to a single-outcome domain.

In studying procedural sedation, a variety of research designs are valid and informative depending on the specific circumstances. In general, the discussion and recommendations that follow focus on prospective studies, especially randomized clinical trials (RCTs). In these studies, the investigators most often examined the multiple aspects of procedural sedation and recommended outcome measures.

**Domains**

Because sedation studies have used a wide variety of outcome domains and measures, informal comparisons and meta-analysis are generally limited and compromised. This variability also limits the extent to which investigators and clinicians are able to evaluate which approaches to sedation may generally be applicable across diverse procedures, rather than being relatively procedure specific. To facilitate such comparisons and evaluations, key outcome domains must first be identified. Such domains would ideally be broadly applicable across sedation RCTs. Outcome domains should match the purpose of the study. Not all domains will be appropriate for all studies, and investigators should consider adding relevant population-specific and procedure-specific outcomes when appropriate. Given the variety of pharmacologic therapies, devices, clinical settings, and specific sedation strategies required in particular settings, we anticipate that it will frequently be necessary to supplement the core outcome domains discussed below.

The Institute of Medicine (IOM) described 6 aims for health care in “Crossing the Quality Chasm.”\textsuperscript{20} Four of these 6 aims are broadly relevant to sedation studies, specifically, that methods should be demonstrably safe, effective, patient- and family-centered, and efficient. Although the remaining 2 aims, timeliness and equality, are important in the broad context of health care delivery, these are generally a function of clinical care environments rather than research per se, and are thus beyond the scope of research design considerations for procedural sedation RCTs. The 4 core domains and general definitions are presented in Table 1 and discussed below.

Although our focus is the assessment of efficacy and effectiveness in procedural sedation, we recommend that each of these 4 broad outcome domains should be considered in the planning and design phase of all procedural sedation RCTs. Not all domains will be necessary for every study, but we recommend that domains should be excluded only after careful consideration. It is also worth noting that these domains can overlap; for example, the proceduralist satisfaction (effectiveness domain) can also depend on the satisfaction of the patient (patient-centered domain). Our recommendations for core outcome domains are provided as guidance for clinical trial design and comparison and are not intended as recommendations for regulatory review or approval requirements or to be used as publication criteria for clinical trial results.

**Safe**

The expectation is that any proposed sedative, delivery device, or practice must be, at the minimum, as safe as or safer than standard practice for the relevant procedures. Side effects and adverse events associated with sedation are an important consideration, and the occurrence of serious sedation-related adverse events will substantially offset any benefit gained by a novel intervention. Therefore, careful definition and monitoring of adverse events are an essential component of all sedation clinical trials.\textsuperscript{21}

| Table 1. Domains for Sedation Studies and Definitions |
|---------------------------------|-----------------|---------------------------------|
| **Domain** | **IOM Definition\textsuperscript{20}** | **SCEPTER Concept of Interest** |
| Safe | Avoid harm to patients from the care that is intended to help them. | Avoid physical or psychological harm. |
| Effective | Provide services based on scientific knowledge to all who could benefit and refrain from providing services to those not likely to benefit. | Proceduralist is satisfied with sedation, including patient cooperation, no more movement than is appropriate for a given procedure, and sedation allowed for successful completion of the procedure. |
| Patient and family centered | Provide care that is respectful of and responsive to individual patient preferences, needs, and values, and ensure that patient values guide all clinical decisions. | Patient, family, or surrogate is satisfied with sedation, including adequate analgesia, amnesia as appropriate, lack of nausea or vomiting, and absence of adverse psychological sequelae. |
| Efficient | Avoid waste, including waste of equipment, supplies, ideas, and energy. | Provision of sedation is economical from the patient, institutional, and societal perspectives. |

Abbreviations: IOM, Institute of Medicine; SCEPTER, Sedation Consortium on Endpoints and Procedures for Treatment, Education, and Research.
Adverse events such as respiratory depression, apnea, hypoxemia, and hemodynamic instability can occur during procedural sedation in adult and pediatric populations. Considerable effort has been made to create standardized definitions and permit formal multi-institutional reporting of adverse events during clinical procedural sedation. Minor complications such as transient arterial oxygen desaturation or need for airway adjustment or interventions (chin lift, neck extension, mandibular thrust, continuous positive airway pressure, and positive pressure ventilation) occur at greater frequency than the less common near misses, making them comparatively easier to assess. However it remains unclear which, if any, correlate with actual adverse events or predict actual patient harm. Even near misses, such as the need for opioid antagonists, airway management, or even emergent intubation or the need for cardiopulmonary resuscitation, are infrequent, thereby requiring large clinical trials to capture reliable outcomes.

Sedation studies, like all RCTs of clinical interventions, should include assessment of safety, including both common and/or minor events and rare and serious events. However, most studies are, by necessity, powered for primary efficacy outcomes rather than for safety, severely limiting the ability to determine whether adverse event rates in the experimental group differ meaningfully from those in the comparison group. At best, only upper bounds on the incidence of adverse events can be determined, which often is of little practical use. It is nonetheless important for investigators to accurately evaluate and record the safety outcomes because unexpected events may be identified and may contribute to future meta-analyses. Again, the domain of sedation safety is critically important, but it will be discussed at a separate meeting, scheduled for the fall of 2016.

Effective

Sedation effectiveness and efficacy have been variously defined in the literature, including the sedation level achieved (as determined by sedation scales), completion of the procedure, use of alternative or additional sedatives or rescue medications, and procedure conditions including lack of movement. An important aspect of some definitions is that they are only useful for specific classes of similar procedures, rather than being broadly applicable. For example, complete immobility is essential for a radiologic imaging procedure, but it is not usually required for fracture reduction. Similarly, whether a procedure was successfully completed may provide little information about the overall experience, including the degree of anxiolysis, amnesia, analgesia and hypnosis achieved for the patient, or the ease, efficiency, and safety of the procedure. In addition, procedures may not be completed successfully despite ideal sedation, perhaps as a result of proceduralist expertise or patient factors that increase difficulty.

Sedation efficacy end points should measure a therapeutic effect of the procedure and be clinically meaningful. One of the primary purposes of sedation is to produce an environment suitable for safely completing the planned procedure to the satisfaction of the proceduralist, the sedationist, and the patient. The proceduralist is probably the most qualified to determine or anticipate whether sedation was effective in a particular context. One advantage of selecting proceduralist satisfaction as a primary measure of efficacy is that it is universally applicable, thus permitting comparisons across adult and pediatric populations and across various procedures.

However, proceduralist satisfaction may not specifically represent the therapeutic or adverse effects of sedation interventions. Therefore, a measure of the sedating effect of the investigational treatment or intervention should also be included. Such measures assess the sedation resulting from the drug, protocol, or device of interest and, ideally, should be captured at frequent intervals throughout procedures. These sedation effectiveness measures should specifically include a measure of sedation level (or depth) that is linked in time to key points in the procedure (eg, the most painful part). A simple overall sedation score may miss sedation scores at key specific times that are critical for proceduralist (and patient) satisfaction.

Patient- and Family-Centered

Together with successful completion of the procedure, patient-centered and/or family-centered outcomes comprise direct assessments of the perceived effect of the sedation experience on patients, parents of child patients, and surrogates for those who are unable to communicate on their own (eg, mentally or physically impaired). These direct assessments include analgesia, anxiolysis, and amnesia as well as the lack of other uncomfortable outcomes such as nausea and vomiting. As with efficacy, the definitions of these components may be highly procedure-specific. For example, noninvasive radiologic imaging procedures may require anxiolysis but may not be painful and therefore not require analgesia. In contrast, analgesia is critical for painful procedures, whereas amnesia may not be critical. For most patients, amnesia for the procedure but not beyond is desirable. However, some patients may view amnesia as a negative consequence of the sedation. Thus, the choice of end points in a given trial needs to be procedure- and context-dependent.

Because the sedative medications for a procedure are given directly to patients by the providers, adherence to the regimen, a concern of many clinical trials, is not generally a concern. An exception might be for a pediatric oncology patient who must return for multiple procedures (eg, radiation therapy), and an unsatisfactory sedation experience could impact on the child, family, or surrogate’s willingness to return for the full treatment regimen.

Although recognizing that patient or family satisfaction with a specific procedure that required sedation may be biased by previous experiences, we recommend that patient or family satisfaction with sedation be considered a core measure for the patient-centered and family-centered outcome domain. As with the satisfaction of the proceduralist, this outcome has the advantage of being broadly applicable across various procedures. Although the expectations of proceduralists may be relatively uniform, expectations of patients will vary widely; therefore, it is important for satisfaction of patients to be assessed within the context of their expectations and previous experiences.

Efficient

Sedation efficiency may affect access to care, but it is primarily an economic outcome domain; it comprises clinical and
Measures

Our evaluation of the psychometric characteristics of measures of sedation focused on their reliability (ie, consistency across multiple measurements and necessary numbers of items in scales) and validity (ie, the extent to which sedation is measured). Few measures were identified that adequately assess the outcome domains of interest. Existing measures were more notable for the absence of psychometric data than actual evidence of validity and reliability (or the lack thereof).

We nonetheless considered the appropriateness of the content and conceptual models of the measures and emphasize those with favorable psychometric properties. In fact, available measures of sedation efficacy are limited, and the best existing measures that were discussed are presented in Table 2.

Efficacy

To demonstrate the efficacy in a procedural sedation clinical trial, a drug, protocol, or device should provide sedation that is clinically sufficient; that is, it provides satisfactory conditions for the completion of the procedure as determined by the proceduralist and is satisfactory to the patient (family or surrogate). Because efficacy in a clinical trial is generally determined by a single primary outcome (eg, sedation score), a clinical trial for procedural sedation with no prespecified secondary outcomes (eg, patient satisfaction) would risk missing alternative important dimensions such as patient satisfaction. Electrophysiologic measures such as processed EEG monitoring were not included because there was an agreement that they currently have limited application in procedural sedation as an end point by themselves.

Sedation

Many sedation scales have been used in procedural sedation trials; some have shown evidence of validity and reliability, providing the best existing methods of determining the sedative properties of a sedation drug or device. These clinical measures of sedation are subjective and can have appreciable interrater and intrarater variability. We therefore recommend that variability among investigators should be considered and reduced by design techniques such as implementing training videos. When auditory and/or physical stimuli are used, they should be readily reproducible and provide consistent intensity from application to application.

Following literature reviews and subsequent discussion, we recommend the Observer’s Assessment of Alertness and Sedation (OAA/S) scale for assessing the sedation level of adults in procedural sedation clinical trials and the University of Michigan Sedation Scale (UMSS) for assessing sedation level in children participating in clinical trials. The OAA/S consists of 4 categories, including responsiveness (5 items), speech (4 items), facial expression (3 items), and eyes (3 items). A composite score corresponding to the lowest sedation level recorded for any of the categories, that is, from 5 (alert) to 1 (deep sleep), is often reported. Modified versions of the OAA/S scale (MOAA/S) have been included in some studies in which the responsiveness category alone is used, although the exact definitions or number of levels are often variable or unreported. The original description of the OAA/S did not include the validation of the 5-point responsiveness scale alone, and it is therefore not recommended. Although the OAA/S was validated for the measurement of the level of alertness, there are other important outcomes, for example, amnesia, or patient satisfaction, for which the OAA/S may not be sensitive. The UMSS is a single 5-point scale with an evidence of validity and reliability in the pediatric procedural setting.

The OAA/S, MOAA/S, and UMSS scales have limitations, particularly in clinical situations involving sedation for nonpainful procedures such as radiologic imaging studies, brainstem auditory evoked potentials, and electroencephalograms. Specifically, these scales require patient stimulation or interaction, both of which would be counterproductive for such procedures. Therefore, the use of the scales needs to be adapted to particular clinical situations. For such procedures, an observational scale that simply categorized the state of the patient would be more appropriate.

The frequency of sedation assessment needs to be tailored to the clinical scenario. The frequency of assessment

<table>
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<th>Table 2. Sedation Effectiveness Instruments</th>
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<tr>
<td><strong>Abbreviation</strong></td>
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<tr>
<td>OAA/S</td>
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could range from the first score obtained at a specific time point after first administration of the sedative to repeated measurements. Repeated assessments of sedation level could provide valuable information on the sedative profile over the continuity of the sedation. Importantly, the need for additional sedative or rescue medication should be captured during any sedation clinical trial and is a necessary component to determine the overall profile of the study drug.

**Proceduralist Satisfaction.** An important goal when evaluating a drug or device for procedural sedation is to determine the conditions that it provides for completion of that procedure. Successful completion of the procedure is not the only important end point to determine the efficacy or safety of a sedative (eg, a procedure could be completed in a patient with inadequate sedation or not completed despite ideal sedative effects). More comprehensive evidence regarding the suitability of a sedative for a given procedure should be provided by the proceduralist based on his or her assessment of the overall circumstances of the procedure with respect to the level of sedation achieved.

Important attributes for evaluating proceduralist satisfaction should include patient cooperation along with unwanted or disruptive movement and apparent analgesia. Inclusion of these components within the broad domain of proceduralist satisfaction is important, although many specific outcomes are highly context-specific. Procedure-specific items can thus be added or substituted within an overall measure of proceduralist satisfaction. For example, perceived pain may not be required in imaging studies, but assessment of the image quality could be important.

The Clinician Satisfaction with Sedation Instrument (CSSI) is the only adequately validated measure available to evaluate proceduralist satisfaction. Although it was developed specifically for use with upper and lower gastrointestinal endoscopy, it can be recommended for other similar procedures (eg, bronchoscopy). The measure includes items evaluating satisfaction with sedation administration, sedation recovery, and overall satisfaction total score and has been validated for various sedation regimens.

Assessment of movement is important in some sedation trials and makes it possible to evaluate the procedural conditions facilitated by a sedative. However, specific movement scales need to be procedure specific and should be determined by the study investigators. For example, “no movement” would usually be required in imaging studies, whereas “a degree of movement” might be acceptable for endoscopy or fracture reduction. For general anesthesia, the use of minimum alveolar concentration is universally used as the median effective dose for movement on skin incision during inhalational anesthesia. Movement per se is not an end point of any existing outcome scale, and we therefore do not make a recommendation for a scale with only movement included. However, movement is included as a component or subscale in validated overall sedation measures such as the Dartmouth Operative Conditions Scale, the COMFORT scale, and the scale proposed by Houpt et al, which have proven reliability in children.

A patient’s response to a painful intervention, as estimated by the proceduralist, is considered an important potential outcome because recall and pain sensitivity will vary among procedures and patients. Validity of an instrument is enhanced if there are data showing correlation between the patient’s (or surrogate’s) and the provider’s scores. Patient self-reporting of pain using the 0 to 10 Numerical Rating Scale (NRS) was identified as the preferred pain assessment tool by the pain, agitation, and delirium (PAD) guidelines for adult intensive care unit (ICU) patients published in 2013. Pain in patients who are unable to self-report can be estimated using either the Behavioral Pain Scale (BPS) or the Critical-Care Pain Observation Tool (COPT) in agreement with the PAD guidelines. The Nurse-Assessed Patient Comfort Score (NAPCOMS) is also a validated tool to record the observer-rated pain scores in patients sedated for colonoscopies and can be recommended in that setting. Williams et al provide a more detailed comparison of these instruments.

The Children’s Hospital of East Ontario Pain Scale (CHEOPS) and the Face, Legs, Activity, Cry, Consolability (FLACC) pain assessment tools are useful outcome measures in pediatric patients, and they are consistent with recommendations for the assessment of pediatric pain. The Dartmouth Operative Conditions Scale (DOCS) includes pain/stress as one of its components.

**Patient (Family or Surrogate) Satisfaction.** Patient, family, and surrogate satisfaction is an additional important aspect of assessing sedation, and such assessments should include the evaluation of perceived pain, unpleasant recall, resumption of normal activities, and other items important to patients. For many of the satisfaction measures, it may be difficult to separate the results of the procedure from the sedation. Except for parents of young children, there are no validated instruments that directly address family or surrogate satisfaction, although many hospital surveys may ask about family satisfaction.

There are 2 validated measures of adult patient satisfaction that can be recommended for procedural sedation. These measures evaluate distinct outcome domains and therefore cannot be interchanged. The Iowa Satisfaction with Anesthesia Scale (ISAS) assesses patient satisfaction with the given sedative itself, distinct from patients’ satisfaction with the preprocedure and postprocedure periods and independent of procedure type. In contrast, the Patient Satisfaction with Sedation Instrument (PSSI) assesses sedation delivery, recall, and side effects specific to colonoscopy and upper endoscopy. Both instruments are reliable and valid based on multiple correlations, yet they are very different, highlighting the importance of procedure-specific differences from patient perspectives (eg, substantial role of pain during procedures including incision). The ISAS may be considered to measure not just patient satisfaction per se but also somatic and emotive components of pain. Parental satisfaction questionnaires exist for pediatric anesthesia. However, they include items not specific to sedation, for example, staff communication, surroundings, and tardiness from scheduled start times. Therefore, we can make no recommendations for the assessment of parental satisfaction with pediatric sedation.
**Pain**
Most sedative drugs are not analgesic and vice versa. Studies should clearly define which component is most important for particular procedures and measure it accordingly and appropriately. As mentioned previously, procedures vary considerably in their analgesic requirements, and confusion can occur when restlessness and pain are inappropriately treated with sedatives, potentially exacerbating the problem. The situation is complicated because pain intensity can vary considerably during a procedure and often stops precipitously when the procedure is completed.

For procedures causing pain, the blunting or the elimination of the perception of pain is an important dimension of patient satisfaction and correlated closely with overall satisfaction. However, for some clinical trials, it may be important to directly assess pain levels. A 0 to 10 NRS is recommended for evaluating patient-reported pain after procedures in agreement with recommendations for the assessment of pain in RCTs and the PAD guidelines for adult ICU patients. In patients who are unable to use an NRS, such as young pediatric patients or the cognitively impaired, the revised Faces pain scale can be substituted.

Patient-reported pain might not be applicable for certain procedure types or patient populations, including those who are unable to provide valid self-reports or otherwise complete the assessment, such as young children. In adult ICU patients who are unable to self-report their level of pain, the BPS and Critical Care Pain Observation Tool are recommended, and these tools may be applicable to procedural sedation but are yet to be specifically validated for procedural sedation.

**Recall**
Recall and intraoperative awareness are complicated and controversial. Recall and awareness during procedural sedation are different. It is often expected that the patient will not have complete amnesia, but this expectation may not always be communicated to the patient. Undesired recall can be assessed as a component of patient satisfaction but should be assessed separately when circumstances permit. The modified Brice score is a validated measure of recall after general anesthesia that can be recommended for measuring the recall after procedural sedation trials, although it has not as yet been validated in this context. As with measures of other outcome domains, the assessment should consider the specific procedure; complete amnesia is not necessary for most sedation procedures and may be undesirable in certain situations. But lack of unpleasant recall is important and, in some circumstances, patients (or parents) may specifically request amnesia, particularly in pediatric patients for whom repeat procedures are anticipated. No measure has been evaluated for pediatric recall and, therefore, no recommendation is possible.

**CONCLUSIONS**
The objective of the first SCEPTER meeting was to establish recommendations for procedural sedation clinical trials. Four core outcome domains were identified: (1) efficacy and effectiveness, (2) safety, (3) patient (and family, if appropriate) outcomes, and (4) efficiency. All were consistent with IOM health care aims. We recommend that these 4 domains be considered during the design of all procedural sedation clinical trials. This meeting did not make recommendations for the important domains of safety and efficiency. The safety domain will be addressed at a subsequent meeting scheduled for the fall of 2016. The 2 additional IOM domains, timeliness and equality, are not included in our recommendations because we believe they have limited relevance in the assessment of sedation drugs, devices, or protocols in clinical trials.

Careful consideration of whether and how to include assessments of each of these 4 domains will ensure that the most meaningful information is obtained about the sedation intervention. Ideally, such assessments would be conducted for the majority of sedation clinical trials. When assessment of a given domain is not applicable in a given study, investigators should present the rationale for its exclusion.

We recommend measures listed in Table 3 based on their generally acceptable psychometric properties and their relatively broad applicability across various procedures and populations. To ensure that the patient’s perspective is included, a measure from the patient-centered group should be used in conjunction with a measure from the efficacy/effectiveness group. As with the recommendations for core outcome domains, our recommendations provide guidance for clinical trial design and interpretation and should not be considered a recommendation for requirements for regulatory review or approval, or for publication of trial results. Procedural sedation is used in a wide variety of settings and patient populations. Consequently, appropriate outcome measures should be selected for a particular clinical trial depending on the trial objectives, specific procedure, and intervention being tested. Recommended measures can be supplemented with context-specific measures judged to be appropriate by investigators for capturing a specific outcome of interest or for exploratory purposes. The administration method and frequency for these measures will depend on the procedure and study design; specific recommendations regarding these aspects of outcome assessment are beyond the scope of this article.

Table 3. Recommended Core Outcome Measures

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<th>Domain</th>
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<td>Efficacy/effectiveness</td>
<td>Sedation level: adults—OAA/S&lt;sup&gt;28&lt;/sup&gt;</td>
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<td></td>
<td>Pediatrics—UMSS&lt;sup&gt;28,31&lt;/sup&gt;</td>
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<td></td>
<td>Use of additional (rescue) sedation CSS&lt;sup&gt;33&lt;/sup&gt;</td>
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<tr>
<td>Proceduralist satisfaction</td>
<td>Observed pain: adults—BPS, CPOT, NAPCOMS&lt;sup&gt;41&lt;/sup&gt;</td>
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<tr>
<td></td>
<td>Pediatrics—CHEOPS, FLACC Movement: no validated measure</td>
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<tr>
<td>Patient and family centered</td>
<td>ISAS, PSSI&lt;sup&gt;33&lt;/sup&gt;</td>
</tr>
<tr>
<td>(as appropriate)</td>
<td>Recall Modified brice&lt;sup&gt;46&lt;/sup&gt;</td>
</tr>
<tr>
<td>Patient satisfaction</td>
<td>Pain NRS&lt;sup&gt;26&lt;/sup&gt;; NRS-Faces (if unable to complete NRS)&lt;sup&gt;37&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Abbreviations: BPS, Behavioral Pain Scale; CHEOPS, Children’s Hospital of East Ontario Pain Scale; CPOT, Critical-Care Pain Observation Tool; CSS, Clinician’s Satisfaction with Sedation Instrument; FLACC, Face, Legs, Activity, Cry, Consolability; ISAS, Iowa Satisfaction with Anesthesia Scale; NAPCOMS, Nurse Assessed Patient Comfort Score; NRS, Numerical Rating Scale; OAA/S, Observer’s Assessment of Alertness/Sedation; PSSI, Patient Satisfaction with Sedation Instrument; UMSS, University of Michigan Sedation Scale.
The design and reporting of clinical trials for sedation need to follow good practices.53–55 The subjective nature of many of the tools requires the details of their actual use be reported, including the training of the evaluator.

The development of core outcome measure recommendations for adult and pediatric procedural sedation clinical trials has been challenging and hampered by the limitations of existing measures of sedation outcome. Although we have made recommendations for several measures that should be utilized in the design of clinical trials of new sedation drugs, protocols, and devices, there is an evident need to follow good practices.

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