General

Guideline Title


Bibliographic Source(s)


Guideline Status

This is the current release of the guideline.


Regulatory Alert

FDA Warning/Regulatory Alert

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

August 31, 2016 – Opioid pain and cough medicines combined with benzodiazepines: A U.S. Food and Drug Administration (FDA) review has found that the growing combined use of opioid medicines with benzodiazepines or other drugs that depress the central nervous system (CNS) has resulted in serious side effects, including slowed or difficult breathing and deaths. FDA is adding Boxed Warnings to the drug labeling of prescription opioid pain and prescription opioid cough medicines and benzodiazepines.

Recommendations

Major Recommendations
I. Patient Assessment and Monitoring
- Periodic assessment of airway patency, respiratory rate, and oxygen saturation should be done during emergence and recovery.
  - Particular attention should be given to monitoring oxygenation and ventilation.
  - Routine monitoring of pulse and blood pressure should be done during emergence and recovery, and electrocardiographic monitors should be immediately available.
- Assessment of neuromuscular function should be performed during emergence and recovery for patients who have received nondepolarizing neuromuscular blocking agents or who have medical conditions associated with neuromuscular dysfunction.
- Mental status should be periodically assessed during emergence and recovery.
- Patient temperature should be periodically assessed during emergence and recovery.
- Pain should be periodically assessed during emergence and recovery.
- Periodic assessment of nausea and vomiting should be performed routinely during emergence and recovery.
- Postoperative hydration status should be assessed in the postanesthesia care unit and managed accordingly.
  - Certain procedures involving significant loss of blood or fluids may require additional fluid management.
- Assessment of urine output and of urinary voiding should be done on a case-by-case basis for selected patients or selected procedures during emergence and recovery.
- Assessment of drainage and bleeding should be performed.

II. Prophylaxis and Treatment of Nausea and Vomiting
- Antiemetic agents should be used for the prevention and treatment of nausea and vomiting when indicated.
- Multiple antiemetic agents may be used for the prevention or treatment of nausea and vomiting when indicated.

III. Treatment during Emergence and Recovery
- Administering supplemental oxygen during transportation or in the recovery room should be done for patients at risk of hypoxemia.
- Normothermia should be a goal during emergence and recovery.
  - When available, forced air warming systems should be used for treating hypothermia.
- Meperidine should be used for the treatment of patient shivering during emergence and recovery when clinically indicated.
  - Hypothermia, a common cause of shivering, should be treated by rewarming.
  - Practitioners may consider other opioid agonists or agonist–antagonists when meperidine is contraindicated or not available.

IV. Antagonism of the Effects of Sedatives, Analgesics, and Neuromuscular Blocking Agents
- Specific antagonists should be available whenever benzodiazepines are administered.
  - Flumazenil should not be used routinely, but may be administered to antagonize respiratory depression and sedation in selected patients.
  - After pharmacologic antagonism, patients should be observed long enough to ensure that cardiorespiratory depression does not recur.
- Specific antagonists should be available whenever opioids are administered.
  - Opioid antagonists (e.g., naloxone) should not be used routinely but may be administered to antagonize respiratory depression in selected patients.
  - After pharmacologic antagonism, patients should be observed long enough to ensure that cardiorespiratory depression does not recur.
  - The Task Force reminds practitioners that acute antagonism of the effects of opioids may result in pain, hypertension, tachycardia, or pulmonary edema.
- Specific antagonists should be administered for reversal of residual neuromuscular blockade when indicated.

V. Protocol for Discharge
- The routine requirement for urination before discharge should not be part of a discharge protocol and may only be necessary for selected patients.
• The requirement of drinking clear fluids should not be part of a discharge protocol and may only be necessary for selected patients, determined on a case-by-case basis (e.g., diabetic patients).
• As part of a recovery room discharge protocol, all patients should be required to have a responsible individual accompany them home.
• Patients should be observed until they are no longer at increased risk for cardiorespiratory depression.
  • A mandatory minimum stay should not be required.
  • Discharge criteria should be designed to minimize the risk of central nervous system or cardiorespiratory depression after discharge.

Clinical Algorithm(s)
None provided

Scope

Disease/Condition(s)
• Conditions requiring anesthesia
• Complications of anesthesia, including nausea and vomiting, respiratory and cardiovascular complications, shivering, and hypothermia

Guideline Category
Evaluation
Management
Prevention
Treatment

Clinical Specialty
Anesthesiology

Intended Users
Advanced Practice Nurses
Allied Health Personnel
Nurses
Physician Assistants
Physicians

Guideline Objective(s)
• To improve postanesthetic care outcomes for patients who have just had anesthesia or sedation and
analgesia care

- To evaluate available evidence and provide recommendations for patient assessment, monitoring, and management with the goal of optimizing patient safety
- To update the "Practice Guidelines for Postanesthetic Care: A Report by the American Society of Anesthesiologists Task Force on Postanesthetic Care," adopted by the American Society of Anesthesiologists in 2001 and published in 2002

Target Population

Patients of all ages who have just received general anesthesia, regional anesthesia, or moderate or deep sedation

Note: The Guidelines may need to be modified to meet the needs of certain patient populations, such as children or the elderly. The Guidelines do not apply to patients receiving infiltration local anesthesia without sedation, patients receiving minimal sedation (anxiolysis), or patients receiving intensive care.

Interventions and Practices Considered

Patient Assessment and Monitoring

- Respiratory function assessment
  - Respiratory rate
  - Oxygen saturation (SpO₂)
  - Airway patency
- Cardiovascular function assessment
  - Blood pressure
  - Pulse rate
  - Electrocardiogram (in selected patients)
- Neuromuscular function assessment
  - Physical examination
  - Monitoring of neuromuscular blockade (in selected patients)
- Mental status assessment
- Temperature assessment
- Pain assessment
- Nausea and vomiting assessment
- Fluid assessment (hydration status) and management
- Assessment of urine output and voiding (in selected patients)
- Assessment of drainage and bleeding

Prophylaxis and Treatment of Nausea and Vomiting

- Prophylaxis and treatment of nausea and vomiting with antiemetics, including multiple antiemetic agents

Treatment during Emergence and Recovery

- Supplemental oxygen (for patients at risk of hypoxemia)
- Normalization of patient temperature (forced-air warming systems)
- Pharmacologic agents for the reduction of shivering (meperidine)

Antagonism of the Effects of Sedatives, Analgesics, and Neuromuscular Blocking Agents

- Antagonism of benzodiazepines (flumazenil)
- Antagonism of opioids (e.g., naloxone)
- Reversal of neuromuscular blockade (neostigmine, edrophonium)

Protocol for Discharge
Requiring that patients urinate before discharge (not routinely recommended)
Requiring that patients drink clear fluids without vomiting before discharge (not routinely recommended)
Mandatory minimum stay in recovery (not recommended)
Ensuring that responsible individual is available to accompany patient home

Major Outcomes Considered

- Postanesthetic adverse events (e.g., respiratory and cardiovascular complications, nausea/vomiting, shivering, hypothermia)
- Patient comfort and satisfaction

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Scientific Evidence

Scientific evidence used in the development of these Guidelines is based on findings from literature published in peer-reviewed journals. Literature citations are obtained from PubMed and other healthcare databases, direct internet searches, task force members, liaisons with other organizations, and from hand searches of references located in reviewed articles.

State of the Literature

For these updated Guidelines, a review of studies used in the development of the original Guidelines in 2002 was combined with studies published after approval of the original Guidelines. The scientific assessment of these Guidelines was based on evidence linkages or statements regarding potential relationships between clinical interventions and outcomes. The interventions listed below were examined to assess their relationship to a variety of outcomes related to postanesthetic care management.

Patient Assessment and Monitoring

- Respiratory function
- Cardiovascular function
- Neuromuscular function
- Mental status
- Temperature
- Pain
- Nausea and vomiting
- Fluids
- Urine output and voiding
- Drainage and bleeding

Prophylaxis and Treatment of Nausea and Vomiting

- Single drugs for the prophylaxis of nausea and vomiting
- Multiple medications (vs. single medications) for the prophylaxis of nausea and vomiting
Single drugs for the treatment of nausea and vomiting
Multiple medications (vs. single medications) for the treatment of nausea and vomiting

Treatment During Emergence and Recovery

Administration of supplemental oxygen
Normalizing patient temperature
Forced-air warming systems
Meperidine for shivering
Flumazenil, naloxone, neostigmine, and edrophonium

Protocol for Discharge from Postanesthesia Care Unit

Requiring that patients urinate before discharge
Requiring that patients drink clear fluids without vomiting before discharge
Requiring that patients have a responsible individual to accompany them home after discharge
Requiring a mandatory minimum stay in recovery

For the literature review, potentially relevant clinical studies were identified via electronic and manual searches of the literature. The updated electronic and manual searches covered an 11-yr period from 2002 through 2012. Citations obtained during the updated search were combined with literature reviewed during development of the original Guidelines, resulting in more than 1300 citations that addressed topics related to the evidence linkages. Eighty-two new articles were accepted as evidence, and findings were compared with the original Guidelines, resulting in a total of 619 articles used as postanesthetic care evidence. For reporting purposes in this updated document, only new citations are referenced. A complete bibliography used to develop these Guidelines, organized by section, is available as Supplemental Digital Content 2, http://links.lww.com/ALN/A907.

Number of Source Documents

Eighty-two new articles were accepted as evidence, and findings were compared with the original Guidelines, resulting in a total of 619 articles used as postanesthetic care evidence.

Methods Used to Assess the Quality and Strength of the Evidence

Expert Consensus

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Scientific Evidence

Findings from the aggregated literature are reported in the text of the Guidelines by evidence category, level, and direction. Evidence categories refer specifically to the strength and quality of the research design of the studies. Category A evidence represents results obtained from randomized controlled trials (RCTs), and Category B evidence represents observational results obtained from nonrandomized study designs or RCTs without pertinent controls. When available, Category A evidence is given precedence over Category B evidence in the reporting of results. These evidence categories are further divided into evidence levels. Evidence levels refer specifically to the strength and quality of the summarized study findings (i.e., statistical findings, type of data, and the number of studies reporting/replicating the findings) within the two evidence categories. For this document, only the highest level of evidence is included in the summary report for each intervention, including a directional designation of benefit, harm, or equivocality for each outcome.
Category A

RCTs report comparative findings between clinical interventions for specified outcomes. Statistically significant ($P < 0.01$) outcomes are designated as either beneficial (B) or harmful (H) for the patient; statistically nonsignificant findings are designated as equivocal (E).

**Level 1**: The literature contains a sufficient number of RCTs to conduct meta-analysis, and meta-analytic findings from these aggregated studies are reported as evidence.

**Level 2**: The literature contains multiple RCTs, but the number of RCTs is not sufficient to conduct a viable meta-analysis for the purpose of these Guidelines. Findings from these RCTs are reported as evidence.

**Level 3**: The literature contains a single RCT, and findings from this study are reported as evidence.

Category B

Observational studies or RCTs without pertinent comparison groups may permit inference of beneficial or harmful relationships among clinical interventions and outcomes. Inferred findings are given a directional designation of beneficial (B), harmful (H) or equivocal (E). For studies that report statistical findings, the threshold for significance is $P < 0.01$.

**Level 1**: The literature contains observational comparisons (e.g., cohort, case-control research designs) between clinical interventions for a specified outcome.

**Level 2**: The literature contains observational studies with associative statistics (e.g., relative risk, correlation, sensitivity/specificity).

**Level 3**: The literature contains noncomparative observational studies with descriptive statistics (e.g., frequencies, percentages).

**Level 4**: The literature contains case reports.

**Insufficient Evidence**

The lack of sufficient scientific evidence in the literature may occur when the evidence is either unavailable (i.e., no pertinent studies found) or inadequate. Inadequate literature cannot be used to assess relationships among clinical interventions and outcomes, since such literature does not permit a clear interpretation of findings due to methodological concerns (e.g., confounding in study design or implementation) or does not meet the criteria for content as defined in the "Focus" of the Guidelines.

**Opinion-Based Evidence**

The original Guidelines contained formal survey information collected from expert consultants and a random sample of active members of the American Society of Anesthesiologists (ASA). Additional information was obtained from open-forum presentations and other invited and public sources. All opinion-based evidence relevant to each topic (e.g., survey data, open-forum testimony, internet-based comments, letters, and editorials) was considered in the development of the original Guidelines. However, only the findings obtained from formal surveys are reported. Survey responses from the consultants and ASA members obtained during development of the original Guidelines are summarized in the text of this update and reported in appendix 2 of the original guideline document. No new surveys were conducted for this update.

**Category A: Expert Opinion**

Survey responses from Task Force–appointed expert consultants are reported in summary form in the text, with a complete listing of consultant survey responses reported in appendix 2 of the original guideline document.

**Category B: Membership Opinion**
Survey responses from a random sample of active ASA members are reported in summary form in the text, with a complete listing of ASA member survey responses reported in appendix 2 of the original guideline document.

Survey responses from expert and membership sources are recorded using a three-point scale and summarized based on weighted values. The following terms describe survey responses for any specified issue. Responses are assigned a numeric value of agree = +1, undecided = 0, or disagree = −1. The average weighted response represents the mean value for each survey item.

*Agree*: The average weighted response must be equal to or greater than +0.30 (on a scale of −1 to 1) to indicate agreement.

*Equivocal*: The average weighted response must be between −0.30 and +0.30 (on a scale of −1 to 1) to indicate an equivocal response.

*Disagree*: The average weighted response must be equal to or less than −0.30 (on a scale of −1 to 1) to indicate disagreement.

Category C: Informal Opinion

Open-forum testimony during development of the previous Guidelines, internet-based comments, letters, and editorials are all informally evaluated and discussed during the formulation of Guideline recommendations. When warranted, the Task Force may add educational information or cautionary notes based on this information.

Methods Used to Analyze the Evidence

Meta-Analysis

Systematic Review

Description of the Methods Used to Analyze the Evidence

State of the Literature

Initially, each pertinent study finding was classified and summarized to determine meta-analysis potential. The original Guidelines reported literature pertaining to seven clinical interventions that contained enough studies with well-defined experimental designs and statistical information to conduct formal meta-analyses (see Table 1 in original guideline document). These seven interventions were as follows: (1) prophylaxis of nausea and vomiting, (2) treatment of nausea and vomiting (i.e., ondansetron only), (3) multiple medications for the prophylaxis of nausea and vomiting, (4) supplemental oxygen, (5) forced-air warming systems, (6) meperidine for shivering, and (7) reversal agents to antagonize the effects of sedatives, analgesics, or neuromuscular blocking agents. Review of new literature published after completion of the original Guidelines in 2001 contained a sufficient number of studies to conduct meta-analyses addressing the prophylaxis of nausea and vomiting (see table 2 in the original guideline document).

General variance-based effect-size estimates or combined probability tests were obtained for continuous outcome measures, and Mantel-Haenszel odds ratios were obtained for dichotomous outcome measures. Two combined probability tests were used as follows: (1) the Fisher combined test, producing chi-square values based on logarithmic transformations of the reported P values from the independent studies, and (2) the Stouffer combined test, providing weighted representation of the studies by weighting each of the standard normal deviates by the size of the sample. An odds-ratio procedure based on the Mantel-Haenszel method for combining study results using 2 × 2 tables was used with outcome frequency information. An acceptable significance level was set at P value less than 0.01 (one-tailed). Tests for heterogeneity of the independent studies were conducted to assure consistency among the study results.
DerSimonian-Laird random-effects odds ratios were obtained when significant heterogeneity was found ($P <0.01$). To control for potential publishing bias, a “fail-safe n” value was calculated. No search for unpublished studies was conducted, and no reliability tests for locating research results were done. When available, odds ratio and combined-test findings must all agree for them to be considered significant.

Meta-analysis of new literature reported significant odds ratios for the prevention of nausea and vomiting for the following interventions: dolasetron, granisetron, ondansetron, and dexamethasone (8 mg); findings for metoclopramide and dexamethasone (4–5 mg only) were equivocal. No new combined tests were conducted due to an insufficient number of studies with continuous or interval level data. In the original Guidelines, interobserver agreement among Task Force members and two methodologists was established by interrater reliability testing. Agreement levels using a kappa ($\kappa$) statistic for two-rater agreement pairs were as follows: type of study design, $\kappa = 0.80–1.00$; (2) type of analysis, $\kappa = 0.55–1.00$; (3) evidence linkage assignment, $\kappa = 0.91–1.00$; and (4) literature inclusion for database, $\kappa = 0.78–1.00$. Three-rater chance-corrected agreement values were as follows: (1) study design, $Sav = 0.86$, $Var (Sav) = 0.011$; (2) type of analysis, $Sav = 0.65$, $Var (Sav) = 0.026$; (3) linkage assignment, $Sav = 0.81$, $Var (Sav) = 0.005$; and (4) literature database inclusion, $Sav = 0.84$, $Var (Sav) = 0.045$. These values represent moderate to high levels of agreement. For the updated Guidelines, the same two methodologists involved in the original Guidelines conducted the literature review.

Consensus-Based Evidence

The original Guidelines obtained consensus from multiple sources, including: (1) survey opinion from consultants who were selected based on their knowledge or expertise in difficult airway management, (2) survey opinions solicited from active members of the American Society of Anesthesiologists (ASA), (3) testimony for the previous update from attendees of a publicly held open forum at a major national anesthesia meeting,‡ (4) internet commentary, and (5) task force opinion and interpretation. The rate of return was 50% ($n = 56/112$) for the consultants and 21% ($n = 211/1,000$) for the membership (see Table 3 in the original guideline document). Consultants and ASA members were supportive of all of the interventions, with the following exceptions: (1) routine assessment of urinary output and voiding, (2) routine pharmacologic prophylaxis of nausea and vomiting, (3) nonpharmacologic treatment of nausea and vomiting, (4) supplemental oxygen during transport or in the postanesthesia care unit, (5) routine use of flumazenil and naloxone, (6) requiring that patients urinate before discharge, (7) requiring that patients drink water before discharge, and (8) requiring a minimum stay in recovery. The original Guidelines also included an additional survey sent to the expert consultants asking them to indicate which, if any, of the evidence linkages would change their clinical practices if the Guideline update was instituted. The rate of return was 35% ($N = 39/112$). The percent of responding Consultants expecting no change associated with each linkage were as follows: assessment and monitoring of respiratory function—100%; cardiovascular assessment/monitoring—95%; assessment of neuromuscular function—95%; assessment of mental status—97%; assessment of temperature—95%; assessment and monitoring of pain—100%; assessment of nausea and vomiting—97%; fluid assessment and management—100%; assessment and monitoring of urine output and voiding—95%; assessment of draining and bleeding—100%; prophylaxis of nausea and vomiting—95%; treatment of nausea and vomiting—97%; multiple medications for the prophylaxis of nausea and vomiting—95%; multiple medications for the treatment of nausea and vomiting—97%; administration of supplemental oxygen—100%; normalizing patient temperature—100%; forced-air warming systems—85%; meperidine for shivering—92%; flumazenil for reversal of general anesthesia—95%; flumazenil for reversal of sedation—97%; naloxone for opioid reversal—100%; edrophonium for reversal of neuromuscular blockade—97%; neostigmine for reversal of neuromuscular blockade—100%; not requiring that patients urinate before discharge—92%; not requiring patients to drink water without vomiting before discharge—85%; requiring that patients have a responsible individual accompany them home—95%; and not requiring a mandatory minimum stay in recovery—85%. Eighty-two percent of the respondents indicated that the Guidelines would have no effect on the amount of time spent on a typical case.

‡ American Society of Anesthesiologists Annual Meeting, October, 1999, Dallas, TX.
Methods Used to Formulate the Recommendations

Description of Methods Used to Formulate the Recommendations

The original Guidelines were developed by an American Society of Anesthesiologists (ASA) appointed Task Force of ten members, consisting of anesthesiologists in private and academic practices from various geographic areas of the United States, and two consulting methodologists from the ASA Committee on Standards and Practice Parameters.

The Task Force developed the original Guidelines by means of a seven-step process. First, they reached consensus on the criteria for evidence. Second, original published research studies from peer-reviewed journals relevant to postanesthetic care were reviewed and evaluated. Third, expert consultants were asked to: (1) participate in opinion surveys on the effectiveness of various post-anesthetic care-management recommendations and (2) review and comment on a draft of the Guidelines. Fourth, opinions about the Guideline recommendations were solicited from a sample of active members of the ASA. Fifth, opinion-based information obtained during an open forum for the original Guidelines, held at a major national meeting,‡ was evaluated. Sixth, the consultants were surveyed to assess their opinions on the feasibility of implementing the Guidelines. Seventh, all available information was used to build consensus to finalize the Guidelines. In 2011, the ASA Committee on Standards and Practice Parameters requested the updating of the scientific evidence for this Guideline. This update consists of an evaluation of literature published after completion of the original Guidelines.

‡ Society for Ambulatory Anesthesia 16th Annual Meeting, Indian Wells, CA, May 5, 2001

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

Expert consultants were asked to: (1) participate in opinion surveys on the effectiveness of various postanesthetic care-management recommendations and (2) review and comment on a draft of the Guidelines.

Opinions about the Guideline recommendations were solicited from a sample of active members of the American Society of Anesthesiologists (ASA).

The Guidelines were approved by the ASA House of Delegates on October 17, 2012.

Evidence Supporting the Recommendations
Type of Evidence Supporting the Recommendations
Evidence was obtained from two principle sources: scientific evidence and opinion-based evidence.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits
- Improved perioperative management of patients
- Reduction in postoperative adverse events
- Uniform assessment of recovery
- Improved postanesthetic quality of life
- Streamlined postoperative care and discharge criteria

Potential Harms
Adverse effects of pharmacological interventions

Qualifying Statements

Qualifying Statements
Practice Guidelines are systematically developed recommendations that assist the practitioner and patient in making decisions about health care. These recommendations may be adopted, modified, or rejected according to clinical needs and constraints, and are not intended to replace local institutional policies. In addition, Practice Guidelines developed by the American Society of Anesthesiologists (ASA) are not intended as standards or absolute requirements, and their use cannot guarantee any specific outcome. Practice Guidelines are subject to revision as warranted by the evolution of medical knowledge, technology, and practice. They provide basic recommendations that are supported by a synthesis and analysis of the current literature, expert and practitioner opinion, open forum commentary, and clinical feasibility data.

Implementation of the Guideline

Description of Implementation Strategy
An implementation strategy was not provided.

Implementation Tools
Mobile Device Resources

For information about availability, see the Availability of Companion Documents and Patient Resources fields below.
Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need
Getting Better
Staying Healthy

IOM Domain
Effectiveness
Patient-centeredness
Safety

Identifying Information and Availability

Bibliographic Source(s)

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Adaptation
Not applicable: The guideline was not adapted from another source.

Date Released
2002 Mar (revised 2013 Feb)

Guideline Developer(s)
American Society of Anesthesiologists - Medical Specialty Society

Source(s) of Funding
American Society of Anesthesiologists

Guideline Committee
Task Force on Postanesthetic Care and the Committee on Standards and Practice Parameters

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Financial Disclosures/Conflicts of Interest
Not stated

Guideline Status
This is the current release of the guideline.

Guideline Availability
Electronic copies: Available in Portable Document Format (PDF) and EPUB for eBook devices from the Anesthesiology Journal Web site.
Print copies: Available from the American Society for Anesthesiologists, 520 North Northwest Highway, Park Ridge, IL 60068-2573.

Availability of Companion Documents
None available

Patient Resources
None available

NGC Status
This NGC summary was completed by ECRI on July 13, 2005. The information was verified by the guideline developer on July 20, 2005. This summary was updated by ECRI Institute on July 9, 2013. This summary was updated by ECRI Institute on June 2, 2016 following the U.S. Food and Drug Administration advisory on Opioid pain medicines. This summary was updated by ECRI Institute on October 21, 2016 following the U.S. Food and Drug Administration advisory on opioid pain and cough medicines combined with benzodiazepines.

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