



Complete Summary

GUIDELINE TITLE

Evidence based clinical practice guideline for anesthesia, analgesia and sedation following arterial switch operation.

BIBLIOGRAPHIC SOURCE(S)

Cincinnati Children's Hospital Medical Center. Evidence based clinical practice guideline for anesthesia, analgesia and sedation following arterial switch operation. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2001 Jan 22. 8 p. [14 references]

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INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT

CATEGORIES

IDENTIFYING INFORMATION AND AVAILABILITY

SCOPE

DISEASE/CONDITION(S)

Physiologic stress, pain, agitation, and discomfort following arterial switch operation

GUIDELINE CATEGORY

Evaluation
Treatment

CLINICAL SPECIALTY

Anesthesiology
Cardiology
Critical Care
Pediatrics
Surgery

INTENDED USERS

Advanced Practice Nurses
Nurses
Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

To provide a clinical guideline for anesthesia, analgesia, and sedation following arterial switch operation

TARGET POPULATION

These guidelines are intended primarily for use in neonates (age ≤ 30 days) who have undergone an arterial switch operation (with or without ventricular septal defect closure).

The guidelines do not address all considerations needed to manage those with the following:

Adverse/allergic reaction to morphine, fentanyl, lorazepam, or midazolam

INTERVENTIONS AND PRACTICES CONSIDERED

Assessment

1. Assessment of hemodynamic stability as indicated by the mean arterial pressure (electrocardiographic monitoring), left atrial pressure (via transthoracic catheter), and urine output
2. Assessment of pain relief, patient comfort, and level of sedation, as indicated by behavioral assessment and absence of tachycardia or hypertension

Treatment

1. Fentanyl infusion
2. Concurrent use of midazolam or lorazepam with the fentanyl infusion to ensure adequate sedation
3. Provision of adequate analgesia and sedation using as needed doses of morphine and midazolam once the fentanyl infusion has been discontinued

MAJOR OUTCOMES CONSIDERED

- Physiologic stress response to cardiac surgery
- Pain control
- Sedation
- Risk for adverse hemodynamic events
- Adverse effects of narcotics, such as respiratory suppression

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Not stated

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The recommendations contained in this guideline were formulated by an interdisciplinary working group which performed systematic and critical literature reviews, using a grading scale, and examined current local clinical practices.

During formulation of these guidelines, the team members have remained cognizant of controversies and disagreements over the management of these patients. They have tried to resolve controversial issues by consensus where possible and, when not possible, to offer optional approaches to care in the form of information that includes best supporting evidence of efficacy for alternative choices.

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

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The guidelines have been reviewed and approved by senior management, Legal Services, the Institutional Review Board, the hospital's Pharmacy and Therapeutics, Clinical Practices, Executive, and other committees and other individuals as appropriate to their intended purposes.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Each recommendation is followed by evidence grades (A-X) identifying the type of supporting evidence. Definitions of the evidence grades are presented at the end of the "Major Recommendations" field.

Clinical Assessments

1. It is recommended that hemodynamic stability be maintained as indicated by mean arterial pressure >45, left atrial pressure <15, and urine output >1cc/kg/hr. Physical exam should indicate adequate perfusion.

Note 1: Continuous monitoring of electrocardiogram (ECG) and arterial blood pressure via an arterial line is recommended (Local Expert Consensus [E]).

Note 2: Continuous monitoring of left atrial pressure with a transthoracic catheter is recommended (Local Expert Consensus [E]).

2. It is recommended that adequate pain relief is provided as indicated by behavioral assessment and the absence of otherwise unexplained tachycardia or hypertension.
3. It is recommended that patient comfort and sedation be maintained as indicated by behavioral assessment. The patient should not be at risk for inadvertent self-removal of lines and/or tubes.

Treatment Recommendations

1. It is recommended that a fentanyl infusion at 10 micrograms/kg/hr be started on all post-operative arterial switch patients and maintained for at least 6 hours. The infusion should be discontinued if the patient has had no signs or symptoms of low cardiac output (mean arterial pressure <45, urine output <1 cc/kg/hr, persistent base deficit >-4 despite correction with sodium bicarbonate [NaHCO₃] or increase in lactate level >0.5 mg/dl/hr) and is therefore considered a good candidate for extubation in the next 24 hours.

Note 1: A continuous infusion of high-dose fentanyl is maintained to blunt the physiologic stress response that occurs as a consequence of cardiac surgery (Anand, Hansen, & Hickey, 1990 [D]; Anand & Hickey, 1992 [B]). Because cardiac output decreases for at least the first 6 hours following cardiopulmonary bypass, it is recommended that the infusion be continued for at least this length of time (Wernovsky et al. 1995 [A]).

Note 2: Because of the redistribution of fentanyl into lipid tissue, long-term infusion may result in prolongation of side effects such as apnea well beyond termination of the infusion [Fentanyl package insert]. Therefore, once pain management, rather than hemodynamic stability, becomes the primary reason for narcotic use, it is desirable to use bolus dosing of a less lipophilic agent such as morphine and to discontinue the fentanyl infusion (Local Expert Consensus [E]).

Note 3: Ongoing metabolic acidosis caused by the continued production of lactic acid has been associated with a poor outcome following cardiac surgery in infants and children. (Charpie et al. 2000 [C]; Munoz et al., 2000 [C]).

2. It is recommended that midazolam (0.1 mg/kg/dose every 1-2 hours) or lorazepam (0.1 mg/kg/dose every 6–8 hours) be given concurrently with the fentanyl infusion to ensure adequate sedation in addition to anesthesia/analgesia.

Note: Because of the variability in neonatal response to fentanyl and because of rapid development of tolerance to its sedative effects (in contrast to respiratory depressant effects), additional use of benzodiazepines is often necessary to maintain adequate sedation (Arnold et al., 1991 [C]).

3. It is recommended that adequate analgesia and sedation be provided using as needed doses of morphine (0.1 mg/kg/dose) and midazolam (0.1 mg/kg/dose) once the fentanyl infusion has been discontinued.

Note: The longer half-life of morphine makes it a better choice for intermittent dosing than fentanyl. The histamine release associated with morphine should be well tolerated hemodynamically by patients who are otherwise stable 6 hours after cardiopulmonary bypass (Murat et al. 1988 [C]; Hamon et al., 1996 [C]; Katz & Kelly, 1993 [C]; Saarenmaa et al., 1999 [A]; Saarenmaa, Neuvonen, & Fellman, 2000 [C]; Santeiro et al., 1997 [C]; Arnold et al., 1991 [C]).

Definitions:

Evidence Based Grading Scale:

- A: Randomized controlled trial: large sample
- B: Randomized controlled trial: small sample
- C: Prospective trial or large case series
- D: Retrospective analysis
- E: Expert opinion or consensus
- F: Basic laboratory research
- S: Review article
- M: Meta-analysis
- Q: Decision analysis
- L: Legal requirement
- O: Other evidence
- X: No evidence

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

[References open in a new window](#)

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence is identified and classified for each recommendation (see "Major Recommendations") using the following scheme:

Evidence Based Grading Scale:

- A: Randomized controlled trial: large sample
- B: Randomized controlled trial: small sample
- C: Prospective trial or large case series
- D: Retrospective analysis
- E: Expert opinion or consensus
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- S: Review article
- M: Meta-analysis
- Q: Decision analysis
- L: Legal requirement
- O: Other evidence
- X: No evidence

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

- Blunting of physiologic stress response to cardiac surgery

- Pain control
- Sedation that provides comfort and safety
- Decreased risk for adverse hemodynamic events

POTENTIAL HARMS

Long-term infusion of fentanyl may result in prolonged side effects such as apnea due to the redistribution of fentanyl into lipid tissue

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- In developing this guideline, the working group recognizes the paucity of large-scale studies with direct bearing on this particular focus population. The specific recommendations in this guideline are drawn from directly applicable studies where possible, but are largely extrapolated from smaller studies and from studies more indirectly related to the present issues.
- These recommendations result from review of literature and practices current at the time of their formulations. This protocol does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the guidelines to meet the specific and unique requirements of individual patients. Adherence to this pathway is voluntary. The physician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

The implementation process for each Cincinnati Children's Hospital Medical Center (CCHMC) guideline is a phase in a larger process of Guideline Development. This process is utilized for every guideline but is not addressed in the content of every guideline.

At the start of each guideline, a projected implementation date is determined. Reservations for education are then made (Grand Rounds, Patient Services Inservices). When the guideline is complete and enters into the Approval Process, education planning begins. Changes created by the guideline are outlined as well as anticipated outcomes. The implementation date is confirmed. Education is provided. The guideline is implemented and pilot information collection started. The Guideline Coordinator makes daily rounds and eligible children are followed to document the use of the guideline. The implementation phase aids in finding areas for improvement or question. When issues identified are improved, the guideline progresses to the monitoring phase.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

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ADAPTATION

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

DATE RELEASED

2001 Jan 22

GUIDELINE DEVELOPER(S)

Cincinnati Children's Hospital Medical Center - Hospital/Medical Center

SOURCE(S) OF FUNDING

Cincinnati Children's Hospital Medical Center

GUIDELINE COMMITTEE

Clinical Effectiveness Team for Arterial Switch Operation (ASO)

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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) from the [Cincinnati Children's Hospital Medical Center Web site](#).

For information regarding the full-text guideline, print copies, or evidence based practice support services contact the Children's Hospital Medical Center Health Policy and Clinical Effectiveness Department at HPCEInfo@chmcc.org.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on March 11, 2004.

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