Selected Best Practices and Suggestions for Improvement

PDI 09: Postoperative Respiratory Failure

Why focus on postoperative respiratory failure in children?

- Even though there is debate regarding the definition of true postoperative respiratory failure, it still remains an important patient adverse event. Generally, postoperative respiratory failure is the failure to wean from mechanical ventilation within 48 hours of surgery or unplanned intubation/reintubation postoperatively.[1]
- Postoperative respiratory failure occurs in about 2 to 3 per 1,000 pediatric discharges.[2, 3]
- Using Healthcare Cost and Utilization Project data, Miller and Zhan found 33 of 10,000 discharges had postoperative respiratory failure in pediatric patients ages 0-18. This complication resulted in an average of 24.4 additional days in the hospital and $140,507 in increased charges.[3]
- Kronman and colleagues found that postoperative respiratory failure resulted in an average excess length of stay of 4.8 days and an average of $77,739 in additional charges.[4]

Recommended Practice	Details of Recommended Practice
Assess risk factors.	Develop a set of risk factors for postoperative respiratory failure and screen all patients undergoing elective surgery.[5]
Initiate various treatments during the perioperative and postoperative period to reduce a patient's risk of developing respiratory failure.	To prevent or lessen the risk of developing postoperative respiratory failure, perform lung expansion exercises and selective use of nasogastric tubes, and use short-acting neuromuscular blockade.[6,7]

Best Processes/Systems of Care

Introduction: Essential First Steps

- Engage key nurses, physicians and other providers, hospitalists, respiratory therapists, dietitians, and pharmacists from infection control, intensive care, and inpatient units including operating room; and representatives from quality improvement, radiology, and information services to develop time-sequenced guidelines, care paths, or protocols for the full continuum of care.

Recommended Practice: Assess risk factors

- Determine which pediatric patients are at increased risk for postoperative respiratory failure to better prepare clinicians to anticipate adverse events postoperatively, as well as improve allocation of resources after surgery.[5]
- Some risk factors for pediatric respiratory failure are[5,6,8,9]:

  o Age (infants and young children).
  o Acute lung disease (status asthmaticus, bronchiolitis, pneumonia, pulmonary edema, depressed neural ventilatory drive, acute respiratory syndrome, pulmonary contusion, cystic fibrosis, acute or chronic upper airway obstruction).

- o Rib cage abnormalities.
- o Decreased central nervous system input (head injury, ingestion of central nervous system depressant, adverse effect of procedural sedation, intracranial bleeding, apnea of prematurity).
- o Peripheral nerve/neuromuscular junction (spinal cord injury, organophosphate/carbamate poisoning, Guillain-Barré syndrome, myasthenia gravis, infant botulism).

- Additional adult risk factors that are applicable to children are:

  - o Smoking.
  - o Obesity.
  - o Functional dependence and/or neuromuscular weakness.
  - o Higher American Society of Anesthesiologists (ASA) score/class.
  - o Emergency surgery.
  - o High-risk surgery (e.g., emergent and prolonged procedures, open vs. laparoscopic).
  - o Serum albumin <3.0 g/dL.
  - o BUN >30 mg/dL.

Recommended Practice: Initiate various treatments during the perioperative and postoperative period to reduce a patient's risk of developing respiratory failure

- Implement strategies to minimize the following conditions that can contribute to respiratory failure[9]:

  - o Appropriate antibiotic use for respiratory infections (if indicated)
  - o Deep breathing exercises and smoking cessation (if applicable) to prevent atelectasis
  - o Lifestyle changes to reduce obesity

- Ensure that caregivers recognize the importance of using lung expansion exercises with children, such as incentive spirometry, deep breathing, intermittent positive-pressure breathing, and continuous positive airway pressure. These exercises have been shown to reduce the likelihood of postoperative respiratory failure.
- Use nasogastric tubes selectively since they can increase the risk of aspiration.
- Use short-acting neuromuscular blockade. Long-acting neuromuscular blockade has a higher incidence of residual block, and patients with higher residual block were more than 3 times as likely to develop postoperative pulmonary complications than those without residual block.[10]

Educational Recommendation

- Plan and provide education on protocols and standing orders to physicians and other providers, nurses, and all other staff involved in postoperative respiratory failure prevention and care (emergency department, intensive care unit, etc). Education should occur upon hire, annually, and when this protocol is added to job responsibilities.

Effectiveness of Action Items

- Track compliance with elements of established protocol steps.
- Evaluate effectiveness of new processes, determine gaps, modify processes as needed, and reimplement.
- Mandate that all personnel follow the postoperative respiratory failure protocol and develop a plan of action for staff in noncompliance.
- Provide feedback to all stakeholders (physicians and other providers, nursing, and ancillary staff; senior medical staff; and executive leadership) on level of compliance with process.
- Monitor and evaluate performance regularly to sustain improvements achieved.

Additional Resources

Systems/Processes

- WHO Postoperative Care
  http://www.who.int/surgery/publications/Postoperativecare.pdf

Policies/Protocols

- AARC Clinical Practice Guideline: Incentive Spirometry: 2011
  http://www.rcjournal.com/cpgs/pdf/10.11.1600.pdf

Staff Required

- Surgeons
- Intensivists
- Nursing
- Respiratory therapy

Equipment

- Incentive spirometer

Communication

- Systemwide education on policy/protocol of monitoring postoperative patients

Authority/Accountability

- Senior leadership mandating protocol for all providers

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