

Pediatric Respiratory Failure: The Need for Specific Definitions

WHITE PAPER

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Summary: The lack of specific clinical criteria for the diagnosis of acute respiratory failure in the pediatric population, without intubation or arterial blood gas measurements, have led to the development of numerous institution-specific criteria for this disease.

During the 2015 Association for Clinical Documentation Improvement Specialists (ACDIS) Conference, a national work group of experienced pediatric CDI specialists including pediatricians, pediatric hospitalists, pediatric critical care physicians, nurses, and coding specialists was formed to examine concerns related to conflicting clinical definitions of acute respiratory failure (ARF) within the pediatric population—a problem deemed common to both children’s hospitals and acute care centers treating children.

Numerous meetings of the work group were held, which resulted in the generation of this white paper. The following document outlines the prevailing CDI-related concerns, provides clinical scenarios, and offers some suggested actions. It also seeks additional insight and clarity as we move toward a more specific definition of ARF in the pediatric patient, one which will accurately reflect the severity of patients’ illness, the complexity of caring for these patients, and the appropriate reimbursement for services provided.

The lack of a specific and comprehensive definition of ARF in the pediatric patient and the ambiguities that currently exist should compel the related medical societies (The Society of Critical Care Medicine, The Society of Pediatric Critical Care Medicine and the Hospital Medicine section of the American Academy of Pediatrics) to work toward developing a more specific clinical definition for respiratory failure and especially ARF in pediatric medicine.

Meg Frizzola, DO, chief of critical care medicine at Nemours/Ai duPont Hospital for Children served as clinical reviewer. Members of the work group include:

- Valerie Bica, BSN, RN, CPN
- Karen Bridgeman, MSN, RN, CCDS
- Megan Buyn, BSN, RN
- J. Douglas Campbell, MD, FAAP, MHA
- Daniel E. Catalano, MD, FACOG
- Larry Faust, MD, FAAP
- Stephanie D. Hill-Sandoval
- Adeel Jeffrey, MBBS, MBA, CCS, CCDS, CDIP
- Robert H. Moore, MD
- Sharon Ray, RN, CCM
- Lauren Shivers, RN, BSN, CPN
- Sheilah Snyder
- MacDara Tynan, MD, MBA
- Amy J. Yung, RN, CCDS

Acute respiratory failure

ARF is a condition not uncommon in pediatric medicine. It can evolve from diseases affecting the lungs, respiratory muscle strength, chest wall, or control of breathing, neurologic alteration. Acute hypoxic or hypercapnic respiratory failure can be diagnosed with an arterial blood gas (ABG) or venous blood gas; however, without this measurement, the diagnosis of ARF becomes less objective. In pediatric medicine, the diagnosis and treatment of respiratory distress and failure are usually made by clinical symptoms, pulse oximetry, and end tidal carbon dioxide monitoring (ETCO₂); an ABG is often not required or performed. Many times, the intervention is done prior to measuring any of the above—the child may arrive in the ED not breathing, for example, and thus be intubated/ventilated first with objective measurements taken later. In those cases, the attending physician may be unwilling to add hypoxia/hypercapnia to the diagnosis.

This work group's opinion is that a pediatric ARF diagnosis should not be limited to patients who require intubation and mechanical ventilation and/or have an ABG performed. Patients requiring the use of modalities such as high-flow nasal cannula, positive pressure (BiPaP and CPAP), or significant concentrations of supplemental oxygen, especially considering their age and size, should be considered to have ARF and require specialized care to prevent progression to respiratory arrest. These patients should also be appropriately diagnosed as having ARF.

As of October 2015, with the adoption of ICD-10-CM/PCS, the diagnosis of “acute respiratory distress” now codes to acute respiratory distress syndrome (ARDS), which may occur as end-stage ARF but is not the appropriate diagnosis in most cases. ARDS has its own set of specific criteria, which are not appropriate for accurately describing the vast majority of pediatric patients with ARF. Many pediatric critical care providers regard the diagnosis of ARDS as a progression of illness in the disease of ARF, and treatment requires even more intervention. In addition, a major change was made in assigning severity of illness to the diagnosis of ARDS which was downgraded to a CC (complication/comorbidity) as opposed to an MCC (major complication/comorbidity) with the intention of lessening the severity of illness (SOI) implied. Under the APR-DRG system, which looks at SOI and risk of mortality (ROM) to determine clinical severity, ARDS has an SOI of 2. ARF, however, has an SOI of 4. Given that the majority of patients have ARF initially, does this make sense clinically? Although this is a separate discussion point, it reflects the need for more precise clinical definitions that can be applied appropriately in ICD-10.

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The lack of a specific universally accepted definition of ARF for pediatric patients who are not intubated, and do not require an ABG measurement, has led to the development of numerous individual institutional criteria for ARF in an effort to accurately document and reflect the patient's SOI/ROM. The proliferation of individual guidelines has compelled this work group to advocate for the development of a more universally accepted consensus criteria for pediatric patients who have ARF. In addition, there is concern regarding institutional reimbursement: It should be appropriate for the care and services provided to pediatric patients with ARF, and it should accurately reflect institutional and individual provider metrics.

The problem

At a Pennsylvania children's hospital, the facility's CDI physician, continues to work with physicians to obtain the most accurate documentation depicting the current condition of patients suffering with respiratory problems.

"I work with an amazing team that is often able to provide an incredibly high level of support on the medical unit which would potentially be ICU-level care at another institution," she says. "But we take this level of care for granted and assume that if we are providing high-flow oxygen, CPAP, BIPAP, and continuous respiratory treatments on the medical floor, the patient must not be in respiratory failure, because respiratory failure is what happens in the PICU."

Scope of practice may also contribute to the problem of the appropriate diagnosis of ARF. General pediatricians may be reticent to "diagnose" ARF despite providing the patient with significant respiratory support, because ARF patients may be perceived as someone who requires care from an intensivist or a pulmonologist.

While CDI specialists may get two physicians to clinically agree when a patient is in ARF, as in "I know it when I see it," it can be difficult to get those physicians to agree on overarching parameters for what would qualify a patient for ARF. Anytime a physician identifies an exception to a rule, the impulse is to redefine that rule. But in medicine, no rule is 100% inclusive or exclusive all of the time.

It's a problem many CDI professionals face, regardless of facility or patient population type. Some CDI programs gather experts from each department—coding, CDI, medical staff—to review the coding conventions, medical literature, and documentation requirements, then bring forward some consensus information for the facility medical staff to approve. It allows physicians an opportunity to provide input into CDI processes as well as education regarding documentation and coding requirements related to tricky diagnoses.

“This has led to the development of numerous institutional guidelines, not a nation-wide consensus,” says Douglas Campbell, MD, FAAP, MHA, CDI physician advisor at Wolfson Children’s Hospital in Jacksonville, Florida. “This makes coding, data gathering, and accurate reimbursement exceedingly problematic.”

At Women & Children’s Hospital of Buffalo (New York), the CDI team attempted to compose facility-specific criteria, but differences of opinion amongst providers kept the team from settling on any standards. Instead, CDI staff rely on several articles as references for when to place a query, according to Amy J. Yung, RN, CCDS, director of revenue cycle clinical support at Kaleida Health.

Furthermore, neonatal clinical conventions for respiratory conditions differ from that of other pediatric populations. Neonatal codes for respiratory distress syndrome add complexity to the diagnoses that can be captured in a very sick neonate.

“Many of the codes available are designed for adult medicine, and the definitions used to describe these diagnoses are also based on adult medicine, so you can imagine that there are major differences in the definitions when applied to infants and children,” says Valerie Bica, BSN, RN, CDI specialist at Nemours/A.I. DuPont Hospital for Children in Wilmington, Delaware.

The symptoms shown by an infant or child are often quite different from those shown by an adult, and the practitioner will often describe the symptoms (tachypnea, retractions, head bobbing, belly breathing) instead of naming the diagnosis. Early symptoms may include inability to feed, irritability, lethargy, and increased sleeping.

At Bica’s facility, in the PICU, the diagnosis of ARF is usually made by the critical care attending at the time of the code blue or PICU admission. But for children on the med/surg floor who require escalating levels of pulmonary care (such as vapo-therm or high-flow oxygen), or patients with symptoms not related to pulmonary disease, identifying and documenting the diagnosis of ARF is challenging.

It is uncommon for pediatric hospitalists to diagnose ARF despite the level of intervention required (high-flow nasal cannula, high levels of inspired oxygen or mask CPAP), Bica says.

The condition will commonly be described as “respiratory distress,” “acute respiratory distress,” or even “severe respiratory distress.” In that the condition is not ARDS, the clinical description and interventions for “respiratory distress” will get coded as dyspnea. This does not accurately reflect the severity of the patient’s condition nor identify the resources used in taking care of the patient.

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Several clinical scenarios demonstrating the need for a clear and concise definition of respiratory failure were submitted by the work group.

1. A 4-year-old child admitted with asthma is admitted with status asthmaticus and associated hypoxia. Noted are a respiratory rate of 68, heart rate of 140, and increased work of breathing with nasal flaring and retractions. The patient requires 10l/min of oxygen by face mask, plus intravenous fluids, steroids, cardiopulmonary monitoring, and multiple treatments with bronchodilators.
2. A 10-year-old child is admitted with Guillain-Barré syndrome that progresses to the point of requiring BIPAP to maintain adequate oxygenation.
3. A 3-month-old infant is admitted with bronchiolitis requiring continuous monitoring secondary to decreased oxygen saturations of 86%. The patient is put on 5l high-flow nasal cannula at FiO₂ of 21% for 12 hours and requires weaning off the flow over the next 12 hours.
4. A 1-year-old Down syndrome patient, with complete atrioventricular canal defect repaired, is admitted with respiratory distress and hypoxia. The patient is placed on four liters of high-flow nasal cannula. Attempts to wean the patient off oxygen fail, and the patient requires high-flow vapotherm to maintain adequate saturation.
5. A 3-year-old with hypoplastic left heart syndrome is admitted for a scheduled Fontan procedure. Immediately postop, the patient arrives at the cardiovascular ICU intubated with the unit's vent-weaning protocol in place. In the postop critical care note, the cardiovascular intensivist documents acute post-procedural respiratory failure. The patient is extubated the night of surgery and placed on a nasal cannula for a few hours. The next day, the patient is stable and breathing on room air and doesn't require additional oxygen again. The intensivists insist this is respiratory failure because if the patient had been extubated immediately postop, then the patient would have decompensated.

These and numerous other clinical scenarios occur daily, giving rise to the question, “Does this child have respiratory failure?” It is a dilemma confronted by all professionals involved with documenting and coding a patient’s clinical condition. Appropriately capturing the diagnosis of respiratory failure and having it accurately reflected in the patient’s medical record is important for clinical data collection and for appropriate reimbursement for the medical services provided. These dilemmas should mandate the development of clear concise guidelines for all types of respiratory failure: acute, chronic, acute on chronic, and postoperative.

Sample facility clinical definitions

Although numerous institutions have developed criteria for respiratory failure, the most specific institutional definition comes from Texas Children’s Hospital in Houston developed by Robert H. Moore, MD, pediatric pulmonologist (see below for references). This work group embraces broadened criteria as put forth by Dr. Moore.

Acute Respiratory Failure is a common medical emergency in children. It is defined as the inability to provide O₂ and remove CO₂ at a rate that meets metabolic demands. ARF can evolve from diseases affecting the lungs (e.g., pneumonia, bronchiolitis), airway (e.g., croup), respiratory muscle strength (e.g., Guillain-Barré, Duchenne’s muscular dystrophy), chest wall (e.g., flail chest), or control of breathing (e.g., apnea of infancy, encephalopathy).

Physiologically, it is defined by a PaO₂ of < 60 mm or a SaO₂ < 88% on room air (ICD-10, ARF with hypoxia) and/or by an acute increase in pCO₂ of 10-15 mm Hg, particularly if associated with a decrease in pH to 7.32 or less (ICD-10, ARF with hypercapnia).

Not all patients with ARF require intubation and mechanical ventilation. Nor is the diagnosis of acute hypoxemic respiratory failure limited to ARDS or acute lung injury, which typically are associated with severe hypoxemia and defined by PaO₂:FiO₂ ratios of < 200 or < 300, respectively. Children with an acute respiratory process and the need for any of the following interventions likely meet the criteria for ARF.

Supplemental oxygen with FiO₂ ≥ 0.30-0.35 to maintain SpO₂ ≥ 90%. Such levels of supplemental O₂ likely correlate to a PaO₂:FiO₂ ratio of < 300 in children with normal hemoglobin.

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NOTE: Although it is impossible to precisely measure FiO_2 when using a nasal cannula or simple face mask, this level of O_2 delivery might be achieved with nasal cannula at 2-4 LPM in children and adolescents or $\frac{1}{2}$ -2 LPM in infants and toddlers or with simple face mask at 5-7 LPM.

- Any level of high-flow nasal cannula; or
- Any level of nasal CPAP or BiPAP, except for isolated obstructive sleep apnea.

Chronic Respiratory Failure describes chronic respiratory processes requiring home oxygen or ventilator support (mechanical ventilator or nasal BiPAP), or having baseline $SaO_2 < 88\%$ on room air or $pCO_2 > 50$ with a normal pH.

Acute on Chronic Respiratory Failure is indicated by a patient who meets the criteria for chronic respiratory failure along with worsening in their baseline respiratory symptoms and SaO_2 (or PaO_2) and/or pCO_2 . As an example, an 18 month old with BPD on $\frac{1}{4}$ LPM at home chronically who presents with acute bronchiolitis and an increased O_2 requirement to 2 LPM fits this definition.

Work group recommendations

In this age of increased specificity, from the diagnosis of specific diseases and the etiologies of disease processes to the accurate coding of these conditions for institutional, research, and reimbursement purposes, the need for more specific definitions for acute, chronic, acute on chronic, and postoperative respiratory failure is clear and overdue.

At present, in lieu of a universally accepted definition of these conditions, individual institutions are called upon to develop definitions of respiratory failure. This is exceedingly problematic for both the accurate collection of clinical data and the appropriate institutional reimbursement for the medical care provided and needs to be addressed. We, the members of this work group, call upon the appropriate learned societies—The Society of Critical Care Medicine, The Society of Pediatric Critical Care Medicine and the Hospital Medicine section of the American Academy of Pediatrics—to work toward developing more inclusive, specific, clear, and concise clinical definitions for respiratory failure in pediatric medicine.

References

American Hospital Association (2006). Mechanical ventilation longer than expected postop. *Coding Clinic for ICD-9-CM*, Second Quarter 2006, 8–9.

Davidson, S., Ratnavel, N., Mohinuddin, S., Hird, M. F., & Sinha, A. (2011). Hypoxic respiratory failure in term and near term newborns: Perspective from the neonatal transfer service. *Pediatric Research*.

www.nature.com/pr/journal/v70/n5s/full/pr2011730a.html.

Flori, H., Dahmer, M. K., Sapru, A., & Quasney, M. W. (2015, June 16). Comorbidities and assessment of severity of pediatric acute respiratory distress syndrome: Proceedings from the Pediatric Acute Lung Injury Consensus Conference. *Journal of Pediatric Critical Care Medicine*.

www.ncbi.nlm.nih.gov/pubmed/26035363.

Frey, B. (2002, July). Oxygen administration in children. *ADC Fetal & Neonatal Journal*. <http://fn.bmj.com/content/88/2/F84.full>.

Springer, S. C. (2014, April 27). Pediatric respiratory failure. *Medscape*.

<http://emedicine.medscape.com/article/908172-overview>.

Tang, C. (2014, October 13). Respiratory failure following surgery.

www.hcqconsulting.com/knowledge-base/entry/respiratory-failure-following-surgery.html.

Texas Children's Hospital pulled from the following references to compose their definitions:

1. Hammer, J. (2013). Acute respiratory failure in children. *Paediatric Respiratory Reviews*, 14(2), 64–69.
2. Roca, O., Riera, J., Torres, F., & Masclans, J. R. (2010). High-flow oxygen therapy in acute respiratory failure. *Respir Care*, 55(4), 408–413.
3. Sztrymf, B., Messika, J., Mayot, T., Lenglet, H., Dreyfuss, D., & Ricard, J. D. (2012). Impact of high-flow nasal cannula oxygen therapy on intensive care unit patients with acute respiratory failure: A prospective observational study. *J Critical Care*, 27(324): e9–e13.
4. Dani, C., Pratesi, S., Migliori, C., & Bertini, G. (2009). High flow nasal cannula therapy as respiratory support in the preterm infant. *Pediatric Pulmonology*, 44(7), 629–634.
5. British Thoracic Society Standards of Care Committee (2002). Noninvasive ventilation in acute respiratory failure. *Thorax*, 57(3), 192–211.
6. Hess, D. R. (2013). Noninvasive ventilation for acute respiratory failure. *Respiratory Care*, 58(6), 950–972.
7. Najaf-Zadeh, A., & Leclerc, F. (2011). Noninvasive positive pressure for acute respiratory failure in children: A concise review. *Annals of Intensive Care*, 1(1), 15.
8. Teague, W. G. (2005). Non-invasive positive pressure ventilation: Current status in paediatric patients. *Paediatric Respiratory Reviews*, 6(1), 52–60.
9. Frat, J. P., Thille, A. W., Mercat, A., Girault, C., Ragot, S., Perbet, S., ... Robert, R. (2015). High-flow oxygen through nasal cannula in acute hypoxemic respiratory failure. *N Engl J Med*, 372, 2185–2196.

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