Clinical corner

Revisiting respiratory failure

by Richard D. Pinson, MD, FACP, CCS

The diagnosis and documentation of respiratory failure continues to be challenging for coders, documentation specialists, and physicians. Many physicians, including pulmonologists, are unaware of the current clinical standards for diagnosing acute respiratory failure and commonly overlook the presence of chronic respiratory failure. Yet they typically identify multiple clinical criteria and provide appropriate management for respiratory failure, which creates query opportunities.

In this article, we will discuss a variety of clinical indicators for respiratory failure and identify a number of common documentation improvement opportunities.

Definition of acute respiratory failure

Acute respiratory failure is classified as hypoxemic (low arterial oxygen levels), hypercapneic (elevated levels of carbon dioxide gas), or a combination of the two. In most cases one or the other predominates. For ICD-9, these terms, being "nonessential modifiers," are irrelevant for code assignment. ICD-10, however, has codes that permit a distinction (see Table 1), but the distinction is not a requirement and queries for it will not alter its MCC classification. The clinical criteria for diagnosing acute respiratory failure are:

- **Hypoxemic**: Partial pressure of oxygen (pO2) level less than (<) 60 millimeter(s) of mercury (mmHg) (oxygen saturation [SpO2] < 91%) on room air, **or** pO2/fraction of inspired oxygen (FIO2) (P/F) ratio < 300, **or** 10 mmHg decrease in baseline pO2 (if known)
- **Hypercapnic**: Partial pressure of carbon dioxide (pCO2) >50 mmHg with pH < 7.35, **or** 10 mmHg increase in baseline pCO2 (if known)

With the exception of the P/F ratio, these criteria have also been offered as assistance to coders and documentation specialists for recognizing possible acute respiratory failure (see AHA's *Coding Clinic for ICD-9-CM,* Third Quarter 1988, p. 7; and Second Quarter 1990, p. 20).

Management that requires endotracheal intubation and mechanical ventilation or initiation of biphasic positive airway pressure (BiPAP) nearly always means the patient has acute respiratory failure, but these measures are not required for the diagnosis. Similarly, providing 40% or more supplemental oxygen implies that the physician is treating acute respiratory failure since only a patient with acute respiratory failure would need that much oxygen.

Acute hypoxemic respiratory failure

The gold standard for the diagnosis of hypoxemic respiratory failure is an arterial pO2 on room air less than 60 mmHg measured by arterial blood gases (ABG). In the absence of an ABG, SpO2 measured by pulse oximetry on room air can serve as a substitute for the pO2: SpO2 of 91% equals pO2 of 60 mmHg. These criteria may not apply to patients with chronic respiratory failure (e.g., severe chronic obstructive pulmonary disease [COPD]), because their room air pO2 is often less than 60 mmHg (SpO2 < 91%).

Chronic respiratory failure patients are treated with supplemental oxygen on a continuous outpatient basis to keep arterial oxygen above these levels. However, if the baseline pO2 is known, a decrease by 10 mmHg or more indicates acute hypoxemic respiratory failure in such a patient.

The P/F ratio

The P/F ratio is a powerful objective tool to identify acute hypoxemic respiratory failure at any time while the patient is receiving supplemental oxygen, a frequent problem faced by documentation specialists where no room air ABG is available, or pulse oximetry readings seem equivocal.

The P/F ratio equals the arterial pO2 ("P") from the ABG divided by the FIO2 ("F")—the fraction (percent) of inspired oxygen that the patient receives expressed as a decimal (40% oxygen = FIO2 of 0.40). A P/F ratio less than 300 indicates acute respiratory failure.

Most physicians have never heard of the P/F ratio, but it was validated and has been used in the context of acute respiratory distress syndrome (ARDS) for many years, where acute respiratory failure is called "acute lung injury." A P/F ratio < 300 indicates mild ARDS, < 200 is consistent with moderate ARDS, and < 100 is severe ARDS. The P/F ratio indicates what the pO2 would be on room air:

- P/F ratio < 300 = a pO2 < 60 mm Hg on room air

» P/F ratio < 250 = a pO2 < 50 mm Hg on room air
» P/F ratio < 200 = a pO2 < 40 mm Hg on room air

As an example, suppose the pO2 is 90 mmHg on 40% oxygen (FIO2 = .40). The P/F ratio = 90 divided by .40 = 225 (rather severe acute respiratory failure). The pO2 on room air in this case would have been about 45 mmHg (well below the "cutoff" of 60 mmHg).

The validity of the P/F ratio is not limited to ARDS. It simply expresses a consistent physiologic relationship between inspired oxygen and arterial pO2 regardless of cause. Authoritative applications of the P/F ratio in settings other than ARDS include pneumonia and sepsis. The Infectious Disease Society of America and the American Thoracic Society recognize a P/F ratio less than 250 as one of the 10 criteria for "severe" community-acquired pneumonia that may require admission to intensive care. The International Sepsis Definition criteria (2001) and the Surviving Sepsis - Severe Sepsis Guidelines (2008 and 2012) use a P/F ratio < 300 as an indicator of acute organ (respiratory) failure.

SpO2 may be translated to pO2

The arterial pO2 measured by ABG is the definitive method for calculating the P/F ratio. However, when the pO2 is unknown because an ABG is not available, the SpO2 measured by pulse oximetry can be used to approximate the pO2, as shown in Table 2. It is important to note that estimating the pO2 from the SpO2 becomes unreliable when the SpO2 is greater than 97%.

For example, suppose a patient on 40% oxygen has a pulse oximetry SpO2 of 95%. Referring to Table 2, SpO2 of 95% is equal to a pO2 of 80 mmHg. The P/F ratio = 80 divided by 0.40 = 200 (quite severe acute respiratory failure). The patient may be stable receiving 40% oxygen, but still has acute respiratory failure. If oxygen were withdrawn, leaving her on room air, the pO2 would only be 42 mmHg (much less than 60 mmHg on room air).

Translating supplemental oxygen

Supplemental oxygen may be administered by mask or nasal cannula. A Venturi mask (Venti-mask) delivers a controlled flow of oxygen at a specific fixed concentration (FIO2): 24%, 28%, 31%, 35%, 40%, and 50%. The non-rebreather (NRB) mask is designed to deliver approximately 100% oxygen. Providing 40% or more supplemental oxygen implies that the physician is treating acute respiratory failure since only such a patient would need that much oxygen.

A nasal cannula provides oxygen at adjustable flow rates in liters of oxygen per minute (L/min or LPM). The actual FIO2 (percent oxygen) delivered by nasal cannula is somewhat variable and less reliable than with a mask, but can be estimated as shown in Table 3. The FIO2 derived from nasal cannula flow rates can then be used to calculate the P/F ratio. For example, a patient has a pO2 of 85 mmHg on ABG while receiving 5 L/min of oxygen. Since 5 L/min is equal to 40% oxygen (an FIO2 of 0.40), the P/F ratio = 85 divided by 0.40 = 212.5 (clearly severe acute respiratory failure).

Acute hypercapneic respiratory failure

The hallmark of acute hypercapneic respiratory failure is

Table 1: ICD-10-CM codes for respiratory failure

The following codes are applicable for respiratory failure under ICD-10-CM:

- » J96.0: Acute respiratory failure (MCCs)
  - – J96.00: unspecified whether with hypoxia or hypercapnia
  - – J96.01: with hypoxia
  - – J96.02: with hypercapnia
- » J96.1: Chronic respiratory failure (CCs)
  - – J96.10: unspecified whether with hypoxia or hypercapnia
  - – J96.11: with hypoxia
  - – J96.12: with hypercapnia
- » J96.2: Acute and/on chronic respiratory failure (MCCs)
  - – J96.20: unspecified whether with hypoxia or hypercapnia
  - – J96.21: with hypoxia
  - – J96.22: with hypercapnia
- » J96.9: Respiratory failure, unspecified
  - – J96.90: Respiratory failure, unspecified, (unspecified whether with hypoxia or hypercapnia)
  - – J96.91: Respiratory failure, unspecified with hypoxia
  - – J96.92: Respiratory failure, unspecified with hypercapnia (excludes newborn, postprocedural, ARDS, respiratory arrest, and cardiorespiratory failure)

elevated pCO2 due to retention/accumulation of carbon dioxide gas resulting in an acidic pH less than 7.35. There are many causes, but severe COPD is the most common. Physicians can establish a diagnosis by viewing a pCO2 greater than 50 mmHg with a pH less than 7.35. If the pH is greater than 7.35, the patient has chronic (not acute) respiratory failure.

Physicians often identify this clinical condition as "respiratory acidosis," which is the same thing as acute hypercapneic respiratory failure. Unfortunately, the code for "respiratory acidosis" is 276.2, which is a CC, in contrast to the MCC status of acute respiratory failure—hence the need for clarification.

Also, if the baseline pCO2 is known, an increase of 10 mmHg or more indicates acute hypercapneic respiratory failure. Finally, an exacerbation of symptoms requiring an increase in chronic supplemental oxygen indicates an "acute exacerbation" of chronic respiratory failure, which would be classified as acute-on-chronic respiratory failure if properly documented.

Table 2: Conversion of SpO2 to pO2

The following chart illustrates the conversion of SpO2 to pO2:

SpO2 (percent)	pO2 (mmHg)
85	50
86	51
87	52
88	54
89	56
90	58
91	60
92	64
93	68
94	73
95	80
96	90
97	110

Note: Estimating the pO2 from the SpO2 becomes unreliable when the SpO2 is greater than 97%.

Chronic respiratory failure

Chronic respiratory failure is very common in patients with severe COPD and other chronic lung diseases such as cystic fibrosis and pulmonary fibrosis. It is characterized by a combination of hypoxemia, elevated pCO2, elevated bicarbonate level, and normal pH (7.35–7.45). The most important tip-off to chronic respiratory failure is chronic dependence on supplemental oxygen ("home O2").

Patients who qualify for home O2 almost always have chronic respiratory failure. Another clue is an elevated bicarbonate level on the basic metabolic panel (BMP) in a COPD patient, especially helpful when no ABG was obtained.

For example, consider a patient admitted with CHF exacerbation and a history of severe COPD. ABG on room air shows pH 7.40, pCO2 52 mmHg, and pO2 70 mmHg; bicarbonate level on BMP is elevated at 42. This is classic chronic respiratory failure: normal pH, elevated pCO2 and bicarbonate, with hypoxemia—but no acute criteria.

Acute-on-chronic respiratory failure

When a patient experiences an acute exacerbation or decompensation of chronic respiratory failure, he has "acute-on-chronic" respiratory failure. It is recognized by any of the following:

- Worsening symptoms
- Greater hypoxemia (hypoxemic)
- Elevated pCO2 with pH < 7.35 (hypercapneic)

During an acute exacerbation, acidic carbon dioxide (pCO2) may accumulate rapidly ("CO2 retention"), causing acidosis with a pH < 7.35 (acute hypercapneic respiratory failure). This would be acute-on-chronic respiratory failure. Worsening of symptoms requiring an increase in supplemental oxygen also indicates an "acute exacerbation" of chronic respiratory failure.

Use hypoxemic criteria (pO2, SpO2, and P/F ratio) in patients with chronic respiratory failure with caution. Many of these patients always have a pO2 < 60 mmHg on room air, which is the reason they use supplemental oxygen. For such patients, the pO2/SpO2 criterion can be applied, not on room air, but while receiving their usual supplemental oxygen flow. Why? Because home O2 is adjusted to maintain a pO2 > 60 mmHg (SpO2 > 91%). Therefore, if the pO2 is < 60 mmHg on the usual supplemental oxygen flow rate,

acutely decompensated respiratory failure has occurred.

Do not use the P/F ratio to diagnose acute-on-chronic respiratory failure since it is typically < 300 in these patients at baseline. It may be used to monitor the patient's clinical progress over time; if it keeps dropping, the patient is getting worse and needs more aggressive treatment.

Post-procedural respiratory failure

The diagnosis of respiratory failure following surgery has profound regulatory and quality of care implications. If identified as "postop," "due to," or "complicating" a procedure, respiratory failure is classified as one of the most severe, life-threatening, reportable surgical complications a patient can have.

This diagnosis adversely affects quality scores for both the hospital and the surgeon. On the other hand, the diagnosis and coding of post-procedural respiratory failure (an MCC) often results in large payment increases for hospitals. If improperly diagnosed without firm clinical grounds, it may become the basis for regulatory or contractual audits, penalties, sanctions, and even legal action affecting the hospital and the physician.

Post-procedural respiratory failure is a lucrative Recovery Auditor target. Facilities should have a policy that governs the coding of any condition (including respiratory failure) not supported by clinical criteria in the medical record.

To validate the diagnosis, the patient must have acute pulmonary dysfunction requiring nonroutine aggressive measures. A patient who requires a short period of ventilator support during surgical recovery does not have acute respiratory failure; do not assign a code in this instance. The same is true for any duration of mechanical ventilation that is usual or expected following the type of surgery performed, unless there truly is underlying acute pulmonary dysfunction.

A further difficulty arises because coding rules inexplicably call for coding of postop respiratory failure as a complication of care even when terms that seem clinically innocuous to physicians are used in the postop setting, such as pulmonary insufficiency (acute or not) and acute respiratory insufficiency. To avoid confusion and improper code assignment, instruct your physicians not to use such terms in the postoperative setting unless the patient actually has acute respiratory failure.

If the patient has acute respiratory failure following surgery, but it is truly due to, primarily the result of, or related to a preexisting medical condition (such as COPD, CHF, a neuromuscular disorder, etc.), ask the physician to clearly document this connection to avoid the incorrect assignment of a code for post-procedural respiratory failure. For example, something like: "acute respiratory failure in the postop setting primarily due to preexisting CHF."

Summary

Understanding the pathophysiology and authoritative clinical criteria for the several types of respiratory failure empowers coders and documentation specialists to confidently recognize, query, validate, and compliantly code these conditions. The two basic types of respiratory failure are hypoxemic and hypercapneic, sometimes occurring in combination. The distinction is clinically important but not required for correct coding using either ICD-9 or ICD-10.

The P/F ratio is a powerful diagnostic, prognostic, and clinical management tool: P/F ratio < 300 indicates acute respiratory failure. However, the acute hypoxemic criteria (pO2/SpO2 and P/F ratio) must be applied with caution to the diagnosis of acute-on-chronic respiratory failure since they are frequently abnormal in the patient's stable, chronic, baseline state.

Carefully consider the implications of diagnosing and coding post-procedural respiratory failure; clarify any potential relationship to preexisting conditions when present.

EDITOR'S NOTE
Pinson is a certified coding specialist and a principal partner at HCQ Consulting *(www.hcqconsulting.com)*. He is coauthor of *The CDI Pocket Guide* and the CDI+ and CDI+MD mobile apps.

Table 3: Conversion of nasal cannula oxygen flow rate to FIO2

The following figures illustrated the conversion of nasal cannula oxygen flow rate to FIO2:

Flow Rate	FIO2
1 L/min	24%
2 L/min	28%
3 L/min	32%
4 L/min	36%
5 L/min	40%
6 L/min	44%

December ACDIS ICD-10-CM/PCS query preparation survey results

1. To date, have your CDI staff received information to raise their awareness of ICD-10 implementation and documentation improvement needs?

Answer options	Response percent	Response count
Yes	87.7%	100
No	12.3%	14
Other (please specify)		0
	answered question	114
	skipped question	0

2. To date, have your CDI staff received ICD-10 training on the code set?

Answer options	Response percent	Response count
Yes	67.5%	77
No	32.5%	37
Other (please specify)		0
	answered question	114
	skipped question	0

3. To date, have your CDI staff assisted with the ICD-10 education of physicians?

Answer options	Response percent	Response count
Yes	31.5%	35
No	68.5%	76
Other (please specify)		3
	answered question	111
	skipped question	3

4. Have you to date, or do you plan to, train CDI staff on the actual ICD-10 code set?

Answer options	Response percent	Response count
Yes	90.8%	99
No	9.2%	10
Other (please specify)		7
	answered question	109
	skipped question	5

5. Which of the following query templates do you use in your organization today?		
Answer options	**Response percent**	**Response count**
Anemia	89.5%	85
Angina	36.8%	35
CAD	32.6%	31
Cause and effect	54.7%	52
Coma	21.1%	20
Complication	47.4%	45
Diabetes	50.5%	48
Diabetes, controlled or uncontrolled	41.1%	39
Fracture	31.6%	30
Heart failure	95.8%	91
Liver failure	14.7%	14
Malnutrition	88.4%	84
Renal failure	84.2%	80
Respiratory failure	82.1%	78
Sepsis	90.5%	86
Other (please specify)		26
	answered question	95
	skipped question	19

6. Have you conducted an inventory of your physician queries by type and frequency?		
Answer options	**Response percent**	**Response count**
Yes	37.5%	42
Yes, by type	11.6%	13
Yes, by frequency	8.9%	10
No	34.8%	39
Don't know	7.1%	8
Other (please specify)		1
	answered question	112
	skipped question	2

December ACDIS ICD-10-CM/PCS query preparation survey results *(cont.)*

7. Have you started to audit (review) and update queries for ICD-10 language changes?

Answer options	Response percent	Response count
Yes	18.2%	20
Yes, we have audited our queries	8.2%	9
Yes, we have audited our queries and updated them for ICD-10	10.9%	12
No	30.9%	34
No, but we plan do this in the first quarter of 2014	29.1%	32
Don't know	2.7%	3
Other (please specify)		7
	answered question	110
	skipped question	4

8. Does your compliance department review new/updated physician queries to ensure they are compliant?

Answer options	Response percent	Response count
Yes	29.5%	33
No	53.6%	60
Don't know	17%	19
Other (please specify)		5
	answered question	112
	skipped question	2

9. Do your physicians review new/updated queries?

Answer options	Response percent	Response count
Yes	5.5%	6
Yes, our physician advisor reviews all new/updated queries	20%	22
Yes, our physicians review any new/updated queries by specialty	5.5%	6
No	61.8%	68
Don't know	7.3%	8
Other (please specify)		7
	answered question	110
	skipped question	4

10. Does your CDI program staff meet regularly with your HIM/coding staff?		
Answer options	**Response percent**	**Response count**
Yes	19.1%	21
Yes, weekly	10%	11
Yes, monthly	30%	33
Yes, quarterly	15.5%	17
No	24.5%	27
Don't know	0.9%	1
Other (please specify)		5
	answered question	110
	skipped question	4