

# Anemia and Critical Illness

## What is anemia?

Anemia is a below-normal level of **hemoglobin\*** or **hematocrit\***. Hemoglobin is the substance in red blood cells that carries oxygen to all parts of your body. Anemia can be temporary or it can be a long-term disease/illness. People with mild anemia may not have any symptoms or may have only mild symptoms. People with severe anemia can feel tired, get short of breath with activity, and have problems doing the things they usually do.

## How common is anemia in critically ill people?

As many as 77% of critically ill people are anemic.<sup>2,3</sup>

## What causes anemia in critically ill people?

Many factors can contribute to anemia in critically ill people, including blood loss, infection, **inflammation**, and **nutritional deficiencies**.<sup>2-6</sup> Anemia may have a serious affect on a patient who is critically ill, because of underlying illness or sudden blood loss from an injury or surgery.

## What are the effects of untreated anemia?

Critically ill people with anemia are also more likely to develop a severe type of confusion called delirium. Research also suggests critically ill people with heart disease and anemia may have a lower survival rate than people without anemia.<sup>7-10</sup> This does not mean that correcting anemia improves survival in people with anemia, but suggests that it is important to pay attention to anemia.

## How do I know if I am anemic?

Anemia is detected when a blood test shows a low hemoglobin or hematocrit. Symptoms and signs usually develop when anemia is moderate to severe, and can include fatigue, weakness, pale skin, chest pain, dizziness, irritability, numbness or coldness in your hands and feet, trouble breathing, a fast heartbeat, and headache. In any critical illness, it is important to talk with your doctor about changes in your health and understand which problems can be treated and how they can be treated.

## What treatments are available to help?

Your doctor must determine which treatment is safe and effective, because each critically ill patient is very

different. People with anemia who are critically ill may need a blood transfusion. The most common risk of blood transfusion is an allergic reaction. Infection is a rare risk of blood transfusion.<sup>11</sup> In critically ill people, a transfusion has been associated with poor organ function and an increased risk of death.<sup>3</sup> Study results have shown some critically ill people can tolerate a certain level of anemia.<sup>12</sup> Drug therapy that stimulates red blood cell production has been shown to reduce the need for transfusion in critically ill people with anemia over the long term.<sup>13</sup>

\*Normal Lab Values: Normal hemoglobin >12 g/dL for women, >14 g/dL for men; normal hematocrit >36% for women, >42% for men

## Glossary

**Hemoglobin:** Substance carried by red blood cells; delivers oxygen throughout your body

**Hematocrit:** Percentage of red blood cells in a blood sample

**Inflammation:** Your body's response to injury or irritation; often associated with pain, redness, heat, and/or swelling

**Nutritional deficiency:** Not enough of a necessary vitamin, mineral, or element

**Delirium:** Confusion, reduced awareness; sometimes hallucinations

**Blood transfusion:** Transfer of blood or any of its parts to a person

## References

1. National Anemia Action Council. *Anemia: A Hidden Epidemic*. Los Angeles, CA:HealthVizion Communications, Inc; 2002.
2. von Ahnen N, et al. *Crit Care Med*. 1999;27:2630-2639.
3. Vincent J. *JAMA*. 2002;288:1499-1507.
4. Rodriguez R, et al. *J Crit Care*. 2001;16:36-41.
5. Darveau M, et al. *Ann Pharmacother*. 2002;36:1068-1074.
6. van Iperen C, et al. *Crit Care Med*. 2000;28:2773-2778.
7. Hébert P, et al. *Am J Respir Crit Care Med*. 1997;155:1618-1623.
8. Wu WC, et al. *N Engl J Med*. 2001;345:1230-1236.
9. Goodnough LT, Bach R. Anemia, transfusion, and mortality. *N Engl J Med* 2001;345:1272-1273.
10. Krombach, et al. *Anesth Anal*. 2002;94:154-156.
11. Aldemir M, et al. *Crit Care*. 2001;5:265-270.
12. Hébert P, et al. *N Engl J Med*. 1999; 340:409-417.
13. Corwin H, et al. *JAMA*. 2002;288:2827-2835.

# Do I Have Anemia?

This questionnaire is an important first step toward improving your health. Your answers to these questions can help your doctor determine if you have symptoms of anemia. Please answer every question to the best of your ability and discuss them with your doctor.\*

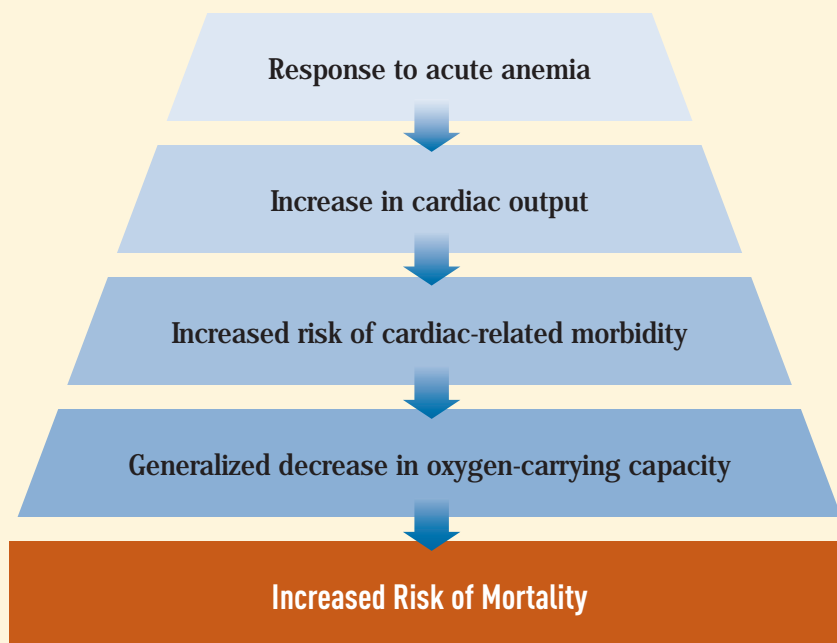
\*This quiz will not provide you with an answer. Only a healthcare professional can determine if you have anemia or not.

## What's Your AQ?™

Since you were diagnosed with your serious medical condition:

	Yes	No
<b>1. Have you felt unusually tired or fatigued?</b>		
<b>2. Have you experienced unusual weakness?</b>		
<b>3. Have you experienced shortness of breath?</b>		
<b>4. Have you felt easily confused or lost your concentration?</b>		
<b>5. Have you felt dizzy or have you fainted?</b>		
<b>6. Has your skin become unusually pale, including decreased pinkness in your lips, gums, lining of your eyelids, nail beds, and palms?</b>		
<b>7. Have you experienced a rapid heart beat?</b>		
<b>8. Have you been feeling unusually cold?</b>		
<b>9. Have you been feeling sad or depressed?</b>		
<b>10. Do you know if your hemoglobin count is between 12 and 18 g/dL (grams per deciliter) of blood?</b>		

# Impact of Uncorrected Anemia



Haller M, Forst H. Red cell transfusion therapy in the critical care setting. *Transfus Sci.* 1997;18:459-477.

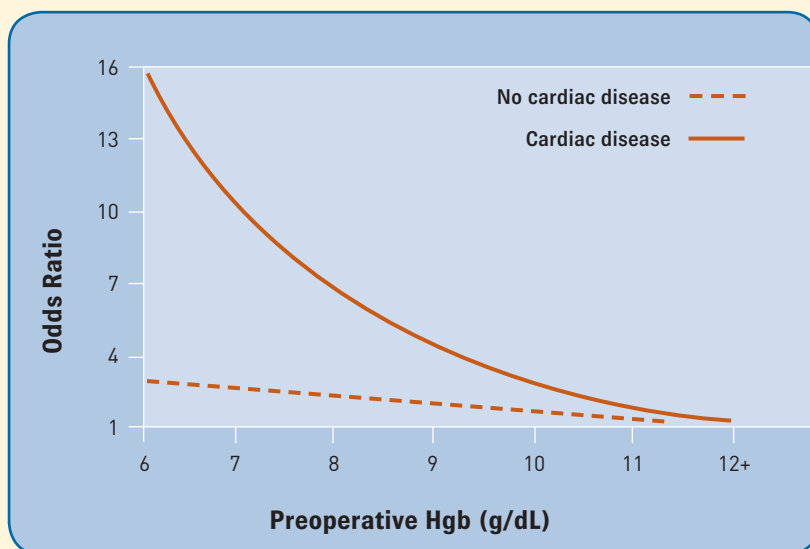
Vincent JL, Baron JF, Reinhart K, et al. Anemia and blood transfusion in critically ill patients. *JAMA.* 2002;288:1499-1507.

## Anemia in the ICU: Who Is at Risk?

### Anemia is tolerated less well in:

- ◆ Elderly patients
- ◆ Severely ill patients
- ◆ Patients with coronary, cerebrovascular, or respiratory disease

**However, the clinical evidence confirming that these factors are independently associated with an increased risk of adverse outcome is lacking.**



# Estimated Risks of Blood Transfusion

	Frequency of Occurrence per Million Units (per Actual Unit)
<b>INFECTIOUS</b>	
<b>VIRUS</b>	
Hepatitis B	4 (1/220 000)
Hepatitis C	1 (1/800 000-1/1.6 x 10 <sup>6</sup> )
HIV	1 (1/1.4-2.4 x 10 <sup>6</sup> )
<b>BACTERIA</b>	
Red cells	2 (1/500 000)
Platelets	500 (1/2 000)
<b>ACUTE HEMOLYTIC TRANSFUSION REACTIONS</b>	1 to 4 (1/250 000-1 000 000)
<b>DELAYED HEMOLYTIC TRANSFUSION REACTIONS</b>	1000 (1/1 000)
<b>TRANSFUSION-RELATED ACUTE LUNG INJURY</b>	125 (1/8 000)

Goodnough LT. Risks of blood transfusion. *Crit Care Med.* 2003;31(Suppl 12):S678-S686.

Goodnough LT, Brecher ME, Kanter MH, et al. Transfusion medicine. Part I: Blood transfusion. *N Engl J Med.* 1999;340:438-447.

## Minimizing Phlebotomy

- ◆ Assess frequency and type of routine tests needed with attending physicians on a regular basis:
  - Question repetitive testing and suggest noninvasive monitoring techniques (pulse oximetry and capnography) when appropriate
- ◆ Schedule diagnostic blood tests simultaneously so the same blood sample can be used for all the tests
- ◆ Document blood lost during phlebotomy on intake and output records to identify patients with excessive blood loss from testing
- ◆ Consult with laboratory staff about the use of small-sized collection tubes
- ◆ Investigate the use of point-of-care testing with microanalyzers, which require 1 to 2 drops of blood rather than the 9 mL collected in standard laboratory tubes
- ◆ Minimize blood loss (waste) during sampling of arterial and central venous lines:
  - Reintroduction of “waste” blood

### Criteria For the Use of Erythropoietin

- 1 APACHE III estimated ICU length of stay  $\geq 7$  days
- 2 Hemoglobin level  $< 9$  g/dL (hematocrit level  $< 27\%$ ) on day 3 or prior to blood transfusion
- 3 Exclusion criteria:
  - ◆ Uncontrolled hypertension (systolic blood pressure  $> 200$  or diastolic blood pressure  $> 110$ )
  - ◆ Pregnancy
  - ◆ Chronic renal failure on dialysis\*
  - ◆ Patients who refuse blood products due to religious beliefs\*

\*Erythropoietin may be used but these indications are not included in the protocol.

### Dosing Recommendations for Erythropoietin

- 1 Initiate therapy on ICU day 3
- 2 Dose erythropoietin at 40 000 units subcutaneously, weekly on days 3, 10, 17, and 24 while in the ICU
- 3 The dose should be held when hemoglobin level of  $> 9$  g/dL (hematocrit  $> 27\%$ ) on the day of scheduled dose (unless red blood cells have been given within 3 days)
- 4 Erythropoietin will be discontinued upon transfer from the ICU
- 5 CBC should be monitored every 1 to 2 days

### Weekly Erythropoietin to Reduce Transfusions: ICU Protocol

- |                 |  |
|-----------------|--|
| <b>Protocol</b> | <p>A patient is a candidate for high-dose, weekly erythropoietin plus iron if he/she meets both of the following criteria:</p> <ol style="list-style-type: none"> <li>1. Anticipated or actual ICU length of stay greater than 7 days</li> <li>2. Hematocrit of 28% or less</li> </ol>   |
| <b>Dosing</b>   | <ol style="list-style-type: none"> <li>1. The erythropoietin dose is 300 U/kg (based on ideal body weight) given subcutaneously once each week (round dose to nearest 2000 units).</li> <li>2. Serum transfer and iron studies should be ordered on all patients to assess whether iron replacement is necessary; if necessary, begin at 325 mg of ferrous sulfate TID orally. Consider intravenous iron therapy only if oral route can not be utilized.</li> <li>3. Discontinue erythropoietin dose when the hematocrit reaches 33% (hemoglobin of 11) for 2 consecutive days, or when the patient leaves the ICU.</li> </ol> |

Data adapted from: Hecht K. Adult ICU Anemia Management Protocol Approved. *Current Topics from the Drug Information Center*, University of Kentucky. 2001;31(7):1-2.

