

# Anemia and the Perioperative Patient

## WHITE PAPER

### Importance of Anemia

The World Health Organization defines anemia as a hemoglobin less than 13 g/dL in men and less than 12 g/dL in women. The causes of anemia are diverse, and are commonly related to blood loss, decreased red blood cell (RBC) production or increased RBC destruction. The most common causes of blood loss are menstruation, gastrointestinal bleeding, trauma and operative bleeding. Decreased RBC production is most frequently due to dietary insufficiency or chronic disease (e.g. malignancy, renal failure, HIV). Increased RBC destruction is associated with sickle cell disease, prosthetic heart valves with perivalvular leak, and autoimmune diseases (e.g. ITP).

Anemia is a remarkably prevalent condition. Forty per cent of patients presenting with hip fracture and 38% of acutely admitted geriatric patients have anemia (5). Studies of critically ill patients found that 77% experience anemia in the ICU. Sixty three per cent of these patients had hemoglobin values less than 12 g/dL and 29% less than 10g/dL.

### Clinical Outcomes of Anemia

Patients admitted with anemia have higher incidences of hospital acquired infection, increased transfusion rates, and longer lengths of stay (1). These patients demonstrate higher in-hospital mortality and an increased rate of readmission within 90 days. A meta-analysis including 30 studies of patients having cardiac surgery and 16 studies of orthopedic patients found that the key variables associated with perioperative allogeneic transfusion were **preoperative anemia**, advanced age, female gender and small body size (3). In one report involving 842,738 patients, anemia on admission increased by 3.7 fold the likelihood of transfusion (6).

### Anemia Management

The key principles in managing patients with anemia are

- maximize red cell mass
- minimize blood loss
- cell salvage
- tolerate normovolemic anemia

# Anemia and the Perioperative Patient

Pre-admission planning should include identifying patients with anemia, determining its cause, and treating as indicated. Iron therapy (and possibly erythropoietin) may be used to treat anemia in these patients. In-hospital care encompasses intraoperative and postoperative cell salvage, minimizing blood loss, and meticulous control of anticoagulation and anti-platelet therapy.

## Iron Deficiency Anemia

If the cause of anemia is found to be iron deficiency, oral or intravenous iron therapy is consistently successful in correcting the problem. The concomitant use of erythropoietin (EPO) will increase red cell mass more rapidly.

## Minimizing Red Cell Loss - The Role of Phlebotomy

Studies within the ICU have found that the mean daily phlebotomy loss is 41 ml. Van Iperan et al. document 3 week ICU blood loss of 813 ml and a mean hemoglobin/hematocrit change of 0.79 g/dL and 2.1% (7). Therefore, in-hospital phlebotomy exacerbates the problem of anemia.

## Tolerating Normovolemic Anemia

Blood transfusion designed to reach a hemoglobin/hematocrit “trigger” is no longer considered appropriate. The patient’s clinical status, rather than their hemoglobin level should determine RBC transfusion therapy (4). In most clinically stable patients a hemoglobin of 7.0-8.0 g/dL will be sufficient (2). Patients with untreated coronary artery disease may benefit from higher levels but transfusion to above 8 g/dL is rarely warranted. Asymptomatic, non-bleeding patients should not need blood to correct a hemoglobin/hematocrit value.

M. Popovsky, M.D.

R. Thurer, M.D.

P. Parce, RN

# Anemia and the Perioperative Patient

## References

1. Halm EA, Wang JJ, Boockvar K, Penrod J, Silberzweig SB, Magaziner J, Koval KJ, Siu AL. The effect of perioperative anemia on clinical and functional outcomes inpatients with hip fracture. *J Orthop Trauma*. 2004 Jul;18(6):369-74.
2. Hébert PC, Wells G, Blajchman MA, Marshall J, Martin C, Pagliarello G, Tweeddale M, Schweitzer I, Yetisir E. A multicenter, randomized, controlled clinical trial of transfusion requirements in critical care. Transfusion Requirements in Critical Care Investigators, Canadian Critical Care Trials Group. *N Engl J Med*. 1999 Feb 11;340(6):409-17. Erratum in: *N Engl J Med* 1999 Apr 1;340(13):1056
3. Khanna MP, Hébert PC, Fergusson DA. Review of the clinical practice literature on patient characteristics associated with perioperative allogeneic red blood cell transfusion. *Transfus Med Rev*. 2003 Apr;17(2):110-9.
4. Klein HG, Spahn DR, Carson JL. Red blood cell transfusion in clinical practice. *Lancet*. 2007 Aug 4;370:415-26.
5. Pedersen AJ, Skjelbo E. Anemia--prevalence and etiology among acutely admitted geriatric patients. *Ugeskr Laeger*. 2008 Apr 21;170(17):1453-7. Danish.
6. Spence R, Parce P, Rose L, Popovsky MA. Who gets transfused? An analysis of 842,738 inpatients. *Transfusion* 2008; 48(S); 85A.
7. van Iperen CE, Gaillard CA, Kraaijenhagen RJ, Braam BG, Marx JJ, van de Wiel A. Response of erythropoiesis and iron metabolism to recombinant human erythropoietin in intensive care unit patients. *Crit Care Med*. 2000 Aug;28(8):2773-8.