

# Preoperative Anemia

## Evaluation and Treatment



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### KEYWORDS

- Preoperative period • Transfusion • Surgery • Optimization
- Patient blood management

### KEY POINTS

- Preoperative anemia is the most frequent hematological condition identified before surgery.
- Preoperative anemia is associated with an increased likelihood of red blood cell (RBC) transfusion, which in turn has been associated with increased morbidity, mortality, and length of stay.
- Preoperative optimization of patients undergoing elective surgical procedures associated with significant blood loss, along with strategies to minimize intraoperative blood loss, shows promise for reducing postoperative transfusions and improving outcomes.
- Patients should be evaluated as early as possible in the preoperative pathway to coordinate optimization of patient hemoglobin and iron stores.
- Further research should evaluate if correcting preoperative anemia improves postoperative outcomes.

## INTRODUCTION

### *Definition*

Anemia is defined as a condition in which the body has a decreased amount of circulating erythrocytes, or RBCs, (and consequently their oxygen carrying capacity) compared with age-matched controls.<sup>1</sup> The World Health Organization (WHO) defines anemia as hemoglobin less than 13 g/dL in adult men (15 years of age and above) and less than 12 g/dL in adult nonpregnant women (15 years of age and above).<sup>2,3</sup> The WHO acknowledges, however, that these values were chosen somewhat arbitrarily; most laboratories define anemia as the lowest 2.5% of the distribution of hemoglobin values from a normal, healthy population.<sup>2</sup>

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## ***Epidemiology***

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### ***Prevalence in general population***

In the United States, prevalence estimates of anemia are approximately 5% in the general population, with preschool, pregnant, and elderly populations affected most significantly. In those older than 65, the prevalence of anemia climbs to 11%<sup>4</sup> and increases to more than 30% in those older than 85 years.<sup>5</sup>

### ***Prevalence in surgical population***

The reported prevalence of anemia in surgical patients varies largely due to the criteria for definition of anemia, population studied, and type of surgery. In studies published after 2000, preoperative anemia was found in 34% of all veterans undergoing noncardiac surgeries, in 46% of colorectal surgeries, in 25% to 45% of hip and knee surgeries, in 46% of elderly patients undergoing hip fracture surgery, and in 75% of patients with advanced colon cancer undergoing colectomy.<sup>5,6</sup>

Bleeding and blood loss are expected in major surgical procedures (especially cardiac, orthopedic, gynecologic, and cancer) despite the use of techniques to reduce blood loss; for example, a patient undergoing a major orthopedic surgery can lose as much as 1 litre of blood perioperatively.

Elderly patients and those with comorbidities, such as renal disease, cancer, heart failure, and diabetes mellitus, have an increased risk of being anemic.<sup>5</sup> Female patients are also at an increased risk of being anemic compared with men, likely because female patients have lower circulating blood volume and if the amount of blood loss is the same it may result in a higher probability of postoperative anemia.<sup>7</sup>

In 2011, the availability of allogenic whole blood/RBCs in the United States was approximately 14.5 million units, and 13.7 million units were transfused.<sup>8</sup> It is estimated that yearly 60% to 70% of all RBC units are transfused to surgical patients.<sup>9,10</sup> In the United States, the whole blood/RBC transfusion rate in 2011 was 44.0 allogenic units per 1000 overall population; although this rate is lower than in 2008, it is still substantially higher than the rates reported in Canada and in European countries.<sup>11</sup> It is postulated that the decline in transfusion is an indicator of better blood management practices, including a reduction in transfusion rates in surgical patients.

## **PREOPERATIVE OPTIMIZATION OF PATIENTS AND ANEMIA EVALUATION**

### ***Should Evaluation for Anemia Be Part of the Preoperative Risk Assessment and Optimization?***

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The preoperative evaluation can be considered to serve 2 broad purposes: (1) to risk stratify patients in order that providers and patients and their families are well informed on the risks in undergoing the surgical procedure and (2) to proactively identify and optimize preoperatively modifiable factors and thus improve a patient's chance for a successful outcome.

Although several studies suggest that anemia is associated with an increase in postoperative transfusions, morbidity, and mortality, patients with anemia frequent proceed with surgery without optimization and often the hemoglobin is measured only a few days before surgery when there is little to be done for work-up and treatment.<sup>12,13</sup> One of the reasons may be the belief that anemia is readily correctable by means of transfusion, giving clinicians a sense that it is not a problem that necessarily needs to be addressed before surgery. Preoperative assessment

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