

# Transfuse or Not to Transfuse: For Post-op Anemia

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## Abstract

An estimated five million patients receive blood transfusion per year, and blood transfusion is the most commonly employed procedure code used among inpatient stay. About 60-70% of blood transfusions take place in surgical settings.<sup>1</sup>

Although these statistics are impressive, the presence of post-anemia presents a challenge for both medical and surgical specialties. In my practice, I have always tried to follow what is considered the best practice with our current understanding of the most recent research. It would be beneficial for both specialties to discuss their different points of views and expectations on this subject to achieve better patient outcome.

In order to arrive at a consensus between medical and surgical specialties, I would like to review a few key publications, including the old practice guideline published by the American Society of Anesthesiologists in 2006 and the Canadian TRICC study published in 1999 in the NEJM, and compare these with the results from the much anticipated FOCUS study, which started in 2006, for hip fracture patients with cardiovascular disease or cardiovascular risk factors. These reviews compare different approaches in treating post-op surgical patients, such as a liberal red blood cell (RBC) transfusion strategy and aggressively treat moderate anemia, and their clinical outcomes.

## Introduction

I first became interested in this subject because of orthopedics admissions to skilled nursing facilities. I always seek to strike a balance between offering the best care and producing the best clinical outcomes in a nursing setting. However, not all admissions come with all of the most desirable criteria and potential to reach good clinical outcomes. In one recent call, I was asked

to accept a patient with hemoglobin 8.1, who just had a knee replacement done. There was no report on the discharge condition; I requested that the orthopedic surgeon ask for a medical consult for medical clearance before sending the patient out of hospital. The call back response was: The patient's hemoglobin improved to 8.6 and he would be on his way to the nursing home by supper time.

## The Lowest Safe Level of Hemoglobin

In a retrospective cohort study published by Carson et al. in 2002, they looked at about 2,000 female, post-op patients, with an average age of 57 years old. Only 300 people out of 2,083 had hemoglobin lower than 8.0 who qualified for the study. When hemoglobin level decreased to 7.1-8.0 g/dL, there was no report of death, but 9.4% of cases of morbidity were reported. On the other hand, when hemoglobin level decreased to 4.1-5 g/dL, more serious consequences were encountered: 34.4% of the 300 patients died and a much higher percentage (57.5%) of patients experienced morbidity. The risk of death was low in patients with postoperative hemoglobin levels of 7.1 to 8.0 g/dL, although morbidity occurred in 9.4%. As postoperative blood counts fall, the risk of mortality and/or morbidity rises and becomes extremely high below 4 to 5 g/dL.<sup>2</sup>

## Benefits of Higher Hemoglobin in Post-op Patients

Would post-op patients receive any benefit from higher hemoglobin levels? A study published by Lawrence et al. in 2003 said, "They do." Two major benefits were observed in post-op orthopedic patients. One is better functional status: they seem to walk better! It was felt that a patient's ability to walk without

assistance 60 days post op correlated with success of surgery and survival. Secondly, patients seemed to have higher efficacy of rehabilitation. For example, they have shorter length of stay.<sup>3</sup>

### Practice Guideline 2006 American Society of Anesthesiologists

Recommendations made by the practice guideline published by the American Society of Anesthesiology in 2006 include these points. Both anesthesiologists and surgeons can have inputs on this. It describes doing a visual check in order to quickly assess blood loss. It was also felt that hemoglobin less than 6.0 g/dL is a strong indication for transfusion. There should be no blood transfusion if hemoglobin is higher than 10.0. For between 6.0 to 10.0 g/dL, it is based upon the best clinical judgments, such as evidence of organ ischemia, bleeding, intravascular volume, and patients' own risk factors, which can predispose patients to have low cardiopulmonary reserve and high O<sub>2</sub> consumption.<sup>4</sup>

In order to arrive at a decision on blood transfusion, you may also consider the use of the *safe allowable blood loss*. That is, the average blood volume that a patient may lose and still maintain hemoglobin at a safe level is about 25% of hemoglobin drop from baseline.<sup>5</sup> This recommended 25% threshold can actually result in numbers that are higher than most physicians expect. For example, a 25% loss of a start hemoglobin 13.0 g/dL would be as high as 9.75; a 25% loss of hemoglobin 12.0 g/dL would be as high as 9.0. My patient's initial hemoglobin was 11.5 and with a drop down to 8.1 g/dL, which is actually equivalent to a 30% hemoglobin loss. Even though his hemoglobin level was well above 6.0, it was still more than a 25% drop. He could have been a good candidate for blood transfusion; however, he did not receive it in the hospital.

### Serious Infections May and May Not Be Identified with Transfusion Screening

There are serious infections associated with blood transfusion. Currently, major viral infections, such as HIV, hepatitis B, Hepatitis C, and West Niles virus, can be identified with transfusion screening.

However, there are other types of infections that are not identified with transfusion screening. These include CMV, EBV, B19 parovirus, dengue fever, Chikungunya, human herpes virus-8, and malaria, etc.<sup>6</sup> In some cases, patients have consciously refused transfusions, either for moral, religious, or other personal reasons.

### Strategy for Transfusion

The Transfusion Requirement in Critical Care (TRICC) trial was the largest blood transfusion study in the past 11 years. The TRICC trial conclusions were that most ICU patients benefit from blood transfusion only if hemoglobin is less than 7.0 g/dL. A restrictive approach is more superior to a liberal transfusion approach.<sup>7</sup>

This trial studied two different strategies for blood transfusion: a restrictive approach and a liberal approach. In the restrictive group, patients only received blood transfusions when hemoglobin dropped below 7.0 g/dL and was maintained between 7.0 to 9.0 g/dL. On the other hand, in the liberal group, patients would always get blood when hemoglobin dropped below 10.0 g/dL and was maintained at much higher level 10.0 to 12.0 g/dL. About 838 post-op patients were initially included, which is relevant to our discussion. The results of the study described later were based upon the entire population. In the restrictive group, 164 patients out of 418 post-op patients were qualified to enroll in the study, whereas 141 out of 420 post-op patients were selected for the liberal group. The average hemoglobin level was between 7.5 to 8.9 g/dL, which is commonly seen in post-op settings. However, because many of the population studied have multiple medical conditions, the APACHE II score was used to categorize them. APACHE is the acronym for Acute Physiology and Chronic Health Evaluation. Patients were assessed on the day of admission to ICU. The range of scores for this test is 0 to 71. The higher score indicates more severe illness.

Figure 1: 30 Days Mortality in Pts with APACHE II <20.

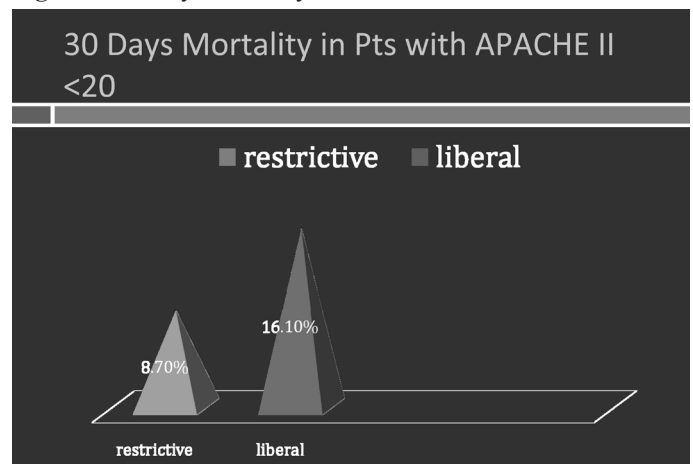
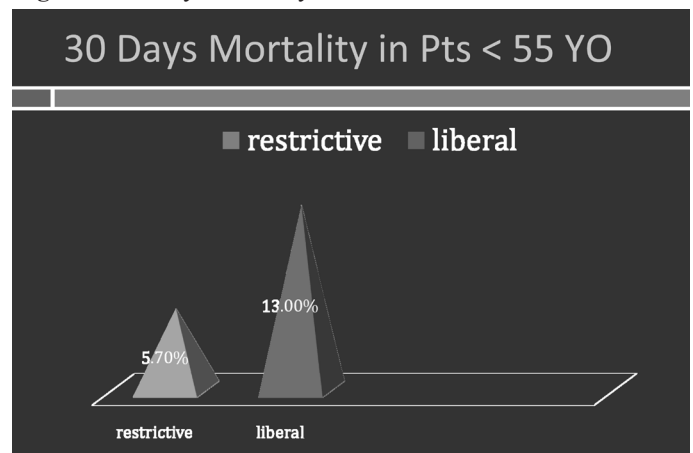


Figure 2: 30 Days Mortality in Pts < 55 YO.



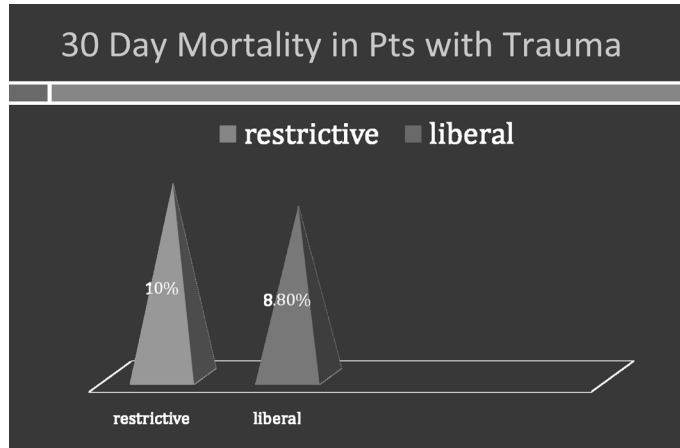
For patients with APACHE II score less than 20, the 30-day mortality rate was much lower in the restrictive group at 8.70% compared with 16.10% in liberal group.

The same trend was seen in the group of patients who were younger than 55 years old; less mortality was seen in the restrictive group. Namely, only to give blood transfusion when hemoglobin drops below 7.0 g/dL and maintained between 7.0 to 9.0 g/dL.

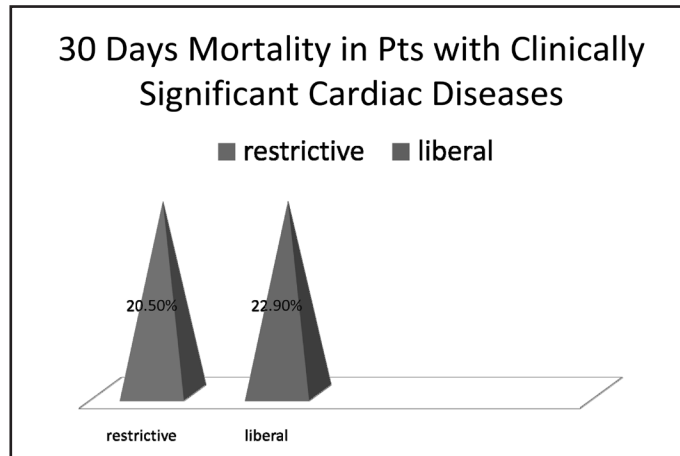
In trauma patients, the result was the opposite. A higher mortality rate was observed in the restrictive group.

A very important finding emerged: patients with clinically significant cardiac diseases showed no clear distinction between the restrictive versus the liberal approach.

**Figure 3:** 30 Day Mortality in Pts with Trauma.



**Figure 4:** 30 Days Mortality in Pts with Clinically Significant Cardiac Diseases.



In the TRICC trial, more episodes of MI, pulmonary edema, and slightly longer hospital stay were observed in the liberal transfusion group. The conclusion of the TRICC is that blood transfusion is indicated in hemoglobin < 7.0 g/dL for ICU patients. Perhaps it can be said that a restrictive approach is superior to keeping hemoglobin >10.0 g/dL (liberal approach) except for patients with significant cardiac disease.

In addition to the 2006 practice guideline from ASA and since the TRICC trial, there have been other published studies with conflicting results. One study published in the NEJM in 2001 suggested patients with MIs should receive blood transfusion if hematocrit level falls below 33%.<sup>8</sup>

Rao et al. reported that in patients with acute coronary syndrome who received transfusion there was an increase in mortality risk.<sup>9</sup>

## Blood Transfusion Strategy on Patients With Cardiovascular Diseases or Risks Factors

Transfusion trigger trial for Functional Outcomes in Cardiovascular patients Undergoing Surgical (FOCUS) hip fracture repair is to determine clinical outcomes in patients with cardiovascular diseases or cardiovascular risk factors using more aggressive transfusion strategy.<sup>10</sup> The results of the study, which began in 2006 and is still ongoing, have not been finalized. The study followed 2,016 patients, age ranging from 51 to 103, with average age 81.6 years old, who underwent hip fracture repair surgery. It took place at 47 medical centers in the United States and Canada between August 2004 and February 2009. The elderly patients either had cardiovascular disease or were at high risk for it. It is a randomized, un-blinded, parallel, two groups, and multicenter trial.

The exclusion criteria are the following:

- Unable to walk without human assistance post-op hip fracture repair
- No blood transfusion
- Multiple trauma
- H/o malignancy and pathological fracture
- Previous trial participant
- Active chest pain (cardiac)
- Active bleeding
- Fractures of greater and lesser trochanters

The definitions for cardiovascular disease included in this study are:

1. H/o MI
2. EKG changes c/w old MI
3. CHF
4. PAD
5. CVA
6. TIA

The definitions for cardiovascular risk factors included in this study are:

- HTN
- DM
- Dyslipidemia (LDL >130, total cholesterol >200)
- Tobacco use
- Creatinin > 2.0

All the patients had hemoglobin levels <10.0 g/dL three days after post-op hip fracture treatment.<sup>10</sup>

In the group of symptomatic transfusion, if patients complained of symptoms such as chest pain that is cardiac in nature, CHF, tachycardia, hypotension, volume depletion not responding to fluid, they would receive blood transfusion if hemoglobin <8.0 g/dL. In the liberal group, patients would receive one unit of PRBC and more transfusions to keep above 10.0 g/dL.

The primary goal was the improved ability to walk 10 feet across the room without human assistance 60 days after surgery. The secondary goal was to investigate the risk of post-op MI or death, the risk of 30 days post-op mortality, improvement at 30 days, 60 days LE function of IADL, and patients remaining in SNF > 60 days post-op. The last goal was to investigate risks post-op in-patient non-infectious morbidity, such as delirium, stroke, thrombo-embolism, risks post-op pneumonia, 30 days composite outcomes (MI, pneumonia, stroke and thrombo-embolism), medical errors, and characteristics for successful rehabilitation.

For the results with secondary aim, the stand-alone rate of in-hospital mortality, 2% for the liberal group versus 1.4% symptomatic group, were observed, which failed to reach statistical significance.

According to Dr. Carson, who reported at the American Heart Association Scientific Sessions in November 2009, "Many clinicians base their decisions only on the hemoglobin levels. This trial seems to say that you need to look at every patient individually, to evaluate their symptoms. The overall interpretation of the trial will depend on consideration of functional outcomes, infection outcomes, and longer-term mortality. Only after consideration of all these outcomes can the clinician fully weigh the pros and cons of the different transfusion methods."<sup>11</sup>

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