

*Blood is crucial for life. The “holy” equation of oxygen delivery (DO<sub>2</sub>) explains us that blood (in this term: hemoglobin) is one of the three main components of “vitality”. So why should I stop myself of increasing the Hb, and maximise the DO<sub>2</sub> in this way? ..... a lot of things.*

*There are numerous “guidelines” and “recommendations” about the rules of blood transfusion. Almost none of them work well: The blood transfusion is still a matter of “instinct”, even in developed countries. Now we have the “Patient Blood Management”: What is its difference to other “guidelines”?*

*Maybe the clinician should make a calculation/estimation before “each and every” transfusion whether this would lead to an increase in oxygenation, instead of following the guidelines. But is this feasible?*

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## The Yin and Yang of Blood Transfusion

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Few physicians will argue against the statement that blood transfusions carry certain risks. There is also little debate over the fact that they can benefit those with hemorrhage or non-functioning bone marrow. Most of the salient debate in the literature centers on the benefits/risk ratio of blood component therapy. Besieged with repeated studies on restrictive vs. liberal transfusion, the clinician is left with only one treatment modality for the patient. By centering on transfusion, other more effective or less risk-associated therapies are ignored. This is problematic, as transfusions may prove to be associated with risks higher than that posed by the anemia, especially if there is no clinical or physiological concern (1). The quest for safe and effective blood transfusions is the opposing debate, and that side of the argument has no place in the treatment of anemia in majority of hospitalized and non-hospitalized patients with anemia.

Perhaps, the problem is that the debate over transfusions is presented in such a dichotomous manner. In truth, both blood transfusions and anemia carry significant risks, and they are both associated with increased morbidity and mortality (2). Instead of quibbling over which risk is greater, physicians need to move toward finding the best solution for individual patients, as the symptoms of anemia (low red cell mass) are exceedingly individual. As such, this means shying away from asking the question: to transfuse or not to transfuse? And instead asking: what is the underlying cause of the anemia, and what can be done to treat it effectively and at the lowest possible risk?

The pernicious nature of anemia has been documented in numerous studies over the years, with more evidence continuing to emerge. A recent meta-analysis summarized the effects of anemia on the surgical population and concluded that it was associated with an increase in mortality, acute kidney injuries, strokes, and myocardial infarctions (3). These issues may be the result of the anemia as an independent risk that can be compounded by the underlying cause of the anemia (4).

While anemia should be taken with the utmost seriousness, blood transfusions carry their own risks, such as viruses, bacterial infections, hemolytic transfusion reactions, and transfusion-related acute lung injuries, among others. Although tremendous strides have been made in the field of blood safety, concerns will forever exist. These ongoing concerns include the unquantifiable risk of having an undetected pathogen with a long incubation period enter the blood supply and infect many people in the meantime (5, 6). Although highly visible, the infectious risks pale in comparison to the non-infectious risks embedded in the immune response of the recipient, such as the transfusion-related immune modulation, and immediate immune-related pathologies, such as fatal hemolytic reactions (7). Physicians should carefully consider these before making blood transfusions their first line of therapy, thus adding further risk to an already vulnerable patient.

## Blood: Fiend or/and Foe? | INCE vs. SHANDER

The intended benefit of transfused red cells is to increase oxygen delivery with the hope of improving tissue oxygenation, leading to improved patient outcome. However, the preferred level of hemoglobin at which red cell transfusions offer benefit over risk is still unknown and hotly debated. Although the opposing view makes the argument that transfused red cells can deliver this promise, ample data suggest the reverse, including worse outcomes in transfused cohorts (8). Manipulating stored red cells suggests that one can improve their performance, but needless to say, added resources are required to do so (9).

Transfusions can be helpful in cases where patients' hemoglobin levels are dangerously low and need to be rapidly increased, but in general, the treatment provided for anemia should be dependent on its source. The use of available modalities is recommended. One approach is to use erythropoiesis-stimulating agents or intravenous iron for pre-existing anemia (10).

Measures should also be taken in the perioperative period, including efforts toward blood conservation. One method, cell recovery, involves salvaging blood lost during patient's surgery and re-infusing it back into the patient, if s/he has a high risk of surgical bleeding (11); these patients have a much greater risk of postoperative anemia (12). Physicians should also be mindful of minimizing diagnostic testing via phlebotomy or using smaller tubes, as diagnostic phlebotomy can contribute to anemia (13).

In sum, debating over the merits of blood transfusions remains an empty pursuit. As long as one ignores other treatment modalities, it is akin to debating over the merits of one insulin preparation over another, ignoring all other aspects of the underlying disease. By promoting transfusion as the only therapy, one not only ignores the vast amount of negative data but also contributes to now a major concern of transfusion overuse (14). Overuse has been well defined by the Institute of Medicine as a potential harm to patients as well as costly to healthcare and society.

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