Needs Assessment: Quality of Care for Perioperative Blood Management

Overall Objectives	Learning objectives	Expected Results
Surgeons fail to identify the presence of anemia and do not implement appropriate treatment before surgery.	a) Prescribe appropriate treatment for hemoglobin levels below accepted target levels in advance of a surgical procedure. b) Determine the etiology of anemia in advance of a surgical procedure.	a) Increased preoperative treatment of low hemoglobin levels. b) Increased preoperative testing to determine the etiology of anemia.
Surgeons are not routinely using viscoelastic testing in combination with a restrictive transfusion algorithm to limit the frequency and volume of blood transfused.	Explain how viscoelastic testing is used along with restrictive transfusion algorithms to limit intraoperative blood transfusions.	Improved ability to explain viscoelastic testing, and its role in limiting perioperative blood transfusions.
Surgeons lack knowledge of transfusion risks and benefits.	Recall the principles of red blood cell transfusions along with the risks and benefits.	Improved ability to recall the principles, risks, and benefits of blood transfusions.

This medical education activity is intended for physicians and nurses involved in the decision to transfuse patients in the perioperative period.

Gap 1: Surgeons fail to identify the presence of anemia and do not implement appropriate treatment before surgery.

Guidelines for Best Practice

In practice, blood transfusions are relatively common in the perioperative setting. Statistically, transfusions are administered to one in ten patients undergoing an invasive procedure.[1] Patients transfused perioperatively have longer hospitalizations along with increased morbidity and mortality.[2] As a result, efforts to encourage more judicious use of blood products perioperatively have been underway since guidelines were published by the American Society of Anesthesiologists (ASA) and the American Thoracic Society (ATS) in 2006.

In 2016, transfusion guidelines were expanded when an international group of clinicians and researchers published a consensus statement on the preoperative management of anemia.[2] In contrast to the 2006 guidelines by the ASA and the ATS—which limited the *preoperative* management of anemia to patients with coagulopathy, renal insufficiency, and anemia of chronic disease—these updated guidelines proposed **an anemia protocol beginning 6 to 8 weeks before surgery for** *any* patient with anemia (hemoglobin < 13 g/dl) undergoing an elective surgery with anticipated blood loss greater than 500 ml.[2]

Specifically, they defined iron deficiency anemia—ferritin less than 30 ug/l—and directed providers to treat patients meeting these criteria with iron, preferably intravenous, at least 6 weeks prior to surgery—even if their hemoglobin level is normal. Moreover, to determine the etiology of iron deficiency anemia, they suggested a gastroenterology evaluation and, if warranted, testing for B12 and folate deficiency.[2] For patients diagnosed with anemia of chronic disease or renal insufficiency, they recommended intravenous iron along with subcutaneous erythropoietin .[2]

> *"Therefore, unless the proven benefit of blood transfusions outweighs the known risks, it is better to treat patients before, during, and after surgery in ways that decrease the risks of needing blood as much as possible".*
>
> *Pierre R. Tibi M.D., past President, Society for Advancement of Blood Management*

More recently, in 2021, practical guidelines for perioperative blood management were published as a joint effort of the Society of Thoracic Surgeons (STS), the Society of Cardiovascular Anesthesiologists (SCA), American Society of Extracorporeal Technology, and the Society for the Advancement of blood management.[4] These guidelines mirrored the recommendations of the 2016 consensus statement. Other similar protocols have been outlined by the Society of Cardiovascular Anesthesiologists Clinical Practice Improvement Advisory for Management of Perioperative Bleeding and Hemostasis in Cardiac Surgery.[5] Given this extensive list of professional organizations that embrace the early management of preoperative anemia—it should be the standard of care at all surgical centers.

Current Practice Gap

Studies show that despite the wide distribution of guidelines in 2006, 2016, and 2021, clinical implementation of these protocols has been inadequate.[6] Respondents to a survey conducted by the SCA reported that 40% (range 20% to 60%) of patients scheduled for surgery were anemic.[6] Despite this high number, few surgeons reported preoperatively performing a diagnostic evaluation for anemia (35.7% at academic centers $P < .008$; 25% at private hospitals $P < .008$).[7]

Moreover, most patients who were treated for anemia preoperatively received oral iron as opposed to the preferred intravenous route, which more rapidly increases hemoglobin levels.[7] Specifically, only 60% of patients with anemia received intravenous iron at academic centers, 42.3% at affiliated hospitals, and 35.3% at private hospitals.[7] Furthermore, several studies show that most surgeons either don't treat preoperative anemia or use an approach that defies evidence-based practice. Examples of these suboptimal treatment methods include oral iron prescribed too late to significantly increase hemoglobin levels (less than 7 days before surgery) or erythropoietin administered with no clinical indication, such as renal insufficiency, to justify its use.[7,8,9,10,11]

Interestingly, the frequency of preoperative anemia evaluations varies between medical centers. A 2021 survey at Ohio State Wexner Medical Center found that only 8.2% of surgeons regularly perform

preoperative anemia evaluations,[11] whereas a recent SCA survey found that 35.7% to 25% of surgeons routinely complete a preoperative anemia evaluation.[7] This variability between centers implies a considerable gap in clinical practice among surgeons, suggesting that surgeons in the perioperative setting do not routinely employ evidence-based guidelines to assess and treat anemia.

Gap 2: Surgeons are not routinely using viscoelastic testing in combination with a restrictive transfusion algorithm to limit the frequency and volume of blood transfused perioperatively.

Guidelines for Best Practice

Viscoelastic testing measures the level of fibrinogen, fibrin, platelets, and other coagulation factors. Unlike traditional lab tests, it is performed rapidly in the surgical suite in real-time. Viscoelastic testing provides prompt guidance for potential coagulopathies and expedites hemostatic treatment in the perioperative period. Moreover, viscoelastic testing in combination with a restrictive transfusion algorithm reduces the number of red blood cells, platelets, fresh frozen plasma, and cryoprecipitate units administered in the surgical setting.[12] Recent reviews show that **transfusion therapy guided by viscoelastic testing improves patient outcomes by reducing red blood cell transfusions (*P* = .14), platelet transfusions (*P* = .004), plasma transfusions (*P* < .001), length of hospital stay (*P* = .005), intensive care unit length of stay (*P* = .04), uncontrolled bleeding (*P* = .002), and mortality (*P* = .049).[12,13]**

In 2019, The Society of Cardiovascular Anesthesiologists Clinical Practice Improvement Work Group on Blood Conservation updated its guidelines for perioperative blood management, emphasizing the use of viscoelastic testing in conjunction with restrictive transfusion algorithms.[14] Moreover, several professional organizations have endorsed intraoperative viscoelastic testing: STS and SCA in 2011,[14] ASA in 2015,[15] and the European Society of Anesthesiology in 2016.[16]

Current Practice Gap

As recently as 2021, a survey found that 57% to 71% of academic and private hospitals have point-of-care viscoelastic technology available, but only 5.5% % to 22.0% of surgeons at these hospitals use this technology in conjunction with a restrictive transfusion protocol.[7] Overall, viscoelastic testing is used more often at academic practices and centers with high case volumes (more than 500 per year). The odds of surgeons utilizing perioperative viscoelastic testing increase when institutions have formal discussions of STS/SCA guidelines (*P* < .001), a regular division level review of blood utilization (*P* < .001), and a multidisciplinary group to monitor blood management (*P* < .001).[7] Thus, institutional oversight and direct educational resources improve adherence to viscoelastic testing protocols.

Of note, a survey done in 2021 looked at viscoelastic testing in 61 liver transplant centers.[17] Viscoelastic testing was first recommended for

liver transplant surgery in 1985, so adherence to these protocols is high. This survey found that 54 of these transplant centers used viscoelastic testing routinely, and 42 centers reported using intraoperative viscoelastic testing for every liver transplant patient. Despite the high number of surgeons that report using this technology, only 21.1% were formally trained to interpret viscoelastic assay results .[17]

Gap 3: Surgeons lack knowledge of transfusion risks and benefits.

Guidelines for Best Practices

Blood transfusions are associated with anaphylaxis, increased mortality, higher infection rates and prolonged hospital stays.[16] For most surgical patients, a hemoglobin threshold of 7 g/dl to 8 g/dl is safe and effective.[16,18,19] Exceptions include patients with recent stroke, myocardial infarction or hematologic malignancies. Multiple professional organizations advocate for more conservative hemoglobin thresholds (7 g/dl to 8 g/dl) to help promote evidence-based practice and improve outcomes in patients undergoing surgical procedures. These organizations include the STS and the SCA in 2011,[14] ASA in 2015,[15] and the European Society of Anesthesiology in 2016.[16]

In addition to a restrictive transfusion protocol, The Society for the Advancement of Blood Management recommends monitoring physiological signs and symptoms. They also advise checking the hemoglobin level after administering each red blood cell unit to help better predict the need for subsequent transfusions.

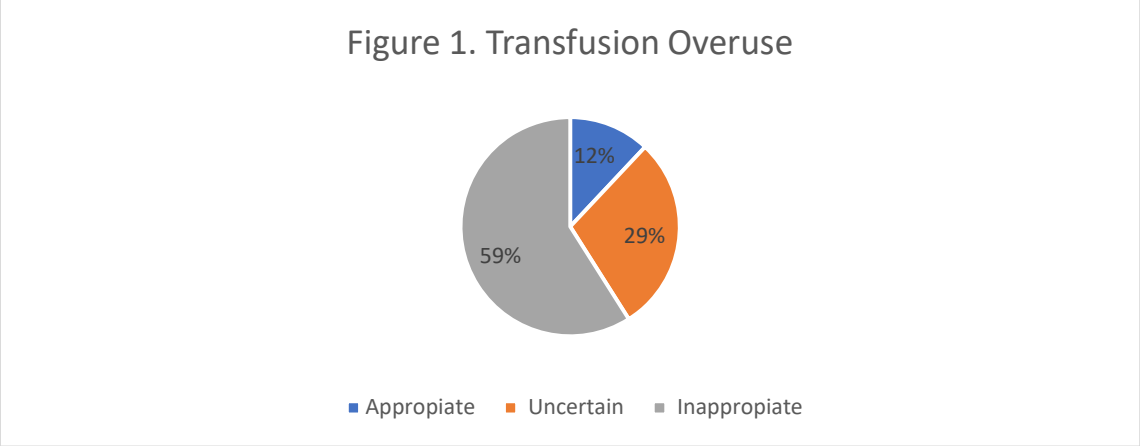
Current Practice Gap

The use of safe and effective transfusion protocols correlates with a surgeon's knowledge and perception of transfusion risks and benefits. The evidence for this dilemma, a challenge for efforts to improve patient care, is manifold. First, surgeons and other clinicians overestimate the quality of care provided by more traditional approaches.[20] This bias implies that surgeons remain hesitant to adopt new guidelines that contradict conventional protocols—a behavior that reflects a knowledge gap.

Second, provider specialty and age demographics determine the likelihood of transfusion. For example, Bourque et al found that anesthesiologists transfuse more often than surgeons, and younger providers (age < 35) transfuse more often than older providers.[21] Thus, transfusion algorithms learned previously in clinical training programs and subjective experiences from past patient encounters may override data-based protocols in the perioperative setting. These trends suggest a need for focused educational resources at the institutional level.

Third, indirect evidence exists of transfusion overuse by providers.[21] Data obtained from 3000 surgical patients revealed that up to **one-third of patients receive a blood transfusion despite having no laboratory hemoglobin level**.[22] In addition, a recent study demonstrated that 40% to 60% of transfusions are unnecessary resulting in either no benefit or possible harm.[22] Moreover, one expert panel seeking to assess transfusion appropriateness—defined as transfusions that improve health outcomes—conducted a systematic study that found only 12% of transfusions in 494 published studies met these criteria; the rest resulted in either harm or uncertain benefit (figure 1).[23] The overuse of blood products suggests some providers are not only unaware of the risks associated with blood transfusions

but also uninformed about the reduced risk with using lower hemoglobin thresholds in the perioperative setting.



Fourth, surgeons and anesthesiologists use higher hemoglobin thresholds for postoperative patients in the intensive care unit compared to patients in the operating room. A recent survey shows that 40% of surgeons report using a hemoglobin threshold of > 8 g/dl for patients in intensive care, whereas only 4% reported using this same threshold intraoperatively.[11] These percentages were consistent across academic and private institutions. The widely discrepant hemoglobin thresholds used across clinical settings implies that transfusion decisions are often based on perceived risks rather than evidence-based practice.

Finally, hospitals and surgical centers have been slow to introduce institution-wide restrictive transfusion protocols. In practice, restrictive algorithms have been implemented in only 28% to 37% of private and academic institutions,[7] making it easy for providers to circumvent their use. Despite these obstacles, provider habits and institutional strategies for blood management can improve with educational intervention.[24,25]

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