

Optimizing current blood utilization practices in perioperative patients using the lean team approach

Many organizations have identified miscommunication in healthcare as a frequent cause of preventable patient harm.^[1] Multiple initiatives to improve team communication are underway in diverse sectors of the medical system. With regard to patient blood transfusions, the incidence of patient harm is high;^[2] the transfusion practices and thresholds are, in general, heterogeneous within the United States of America (USA);^[3] and it is estimated that approximately 40% of the blood and blood products transfused in the USA may not be necessary.^[4] Quality assurance and accrediting agencies (e.g., the Joint Commission) have also identified blood transfusion as one of the top over-utilized procedures in the USA.^[5]

There are multiple guidelines available in the literature to direct transfusion practices;^[6,7] unfortunately, those have had significant difficulty in being adopted in most clinical practices. The reasons for this are numerous and include a reluctance to modify existing practices by healthcare professionals due to the limited number of randomized controlled trials. In addition, multiple local and national guidelines exist with significant variation in transfusion triggers that are influenced by physician bias; there is great difficulty in changing the culture. Publications have shown that the hospital culture itself is the greatest predictor of whether the patient will receive a transfusion,^[3,8,9] despite the obvious necessity that transfusion decisions be based on clinical grounds, the patient's co-morbidities, symptoms of anemia, active bleeding, etc.

Most of the blood transfusion guidelines and randomized controlled trials focus on the pretransfusion hemoglobin level to determine if the transfusion is liberal (i.e., a hemoglobin

transfusion trigger [HTT] of 10 or 9 g/dL) or restrictive (i.e. a trigger of 8 or 7 g/dL).^[6,10,11] One of the major limitations of this approach is that frequently it is not possible to evaluate the hemoglobin level before each unit of blood is transfused; in many cases, multiple blood units are transfused and it is not practical (nor accurate) to measure the hemoglobin level prior to every unit of blood. In other cases, there is simply the insufficient time between transfusions to delay and obtain a baseline hemoglobin level.

The available transfusion guidelines recommend having a restrictive transfusion practice unless significant active bleeding is ongoing,^[6] and as expected, not every patient will benefit from a restrictive transfusion approach. In a recent landmark study, Murphy *et al.* randomized 2,007 patients after cardiac surgery from multiple centers to compare a restrictive (7.5 g/dL) vs. liberal (9.0 g/dL) strategy. Their conclusion was that the outcomes were similar, but as a secondary outcome, there was higher mortality in the restrictive group.^[12] Similarly, a recent randomized controlled trial comparing restrictive vs. liberal transfusion strategy in an oncologic surgical population demonstrated worse outcomes in the restrictive group.^[13] On the other hand, in patients with severe gastrointestinal bleeding, the mortality was improved when a restrictive transfusion strategy was applied,^[14] while in the general intensive care unit population, outcomes are similar to either transfusion strategy.^[11] Thus, the literature is composed of several high-quality publications with highly varied viewpoints and conclusions; this obviously

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increases the confusion and frequent frustration among providers and different specialties in regard to transfusion practices. Clear communication and expectations regarding the transfusion plan for the perioperative patient has never been so paramount. In 2013, our institution (Mayo Clinic in Florida) engaged in a project focused on improving our transfusion practice. A multidisciplinary “Lean Team” was formed, with a cardiac anesthesiologist and a cardiothoracic surgeon as the team leaders. The concerns regarding the lack of adequate communication, the frequent disagreements among providers, the lack of similar expectations between teams, and the limitations of the use of pretransfusion hemoglobin values as a guide to the transfusion strategy were the pillars of our initiatives to improve our transfusion practices.

We decided to apply the “Lean” approach (that has been used in industry and high-reliability organizations) to enhance the efficacy of our effort. This is an integrated philosophy of principles, practices, tools and techniques that focus on the continuous elimination of all waste through small and incremental improvements, all with the common goal of enhancing quality and efficiency through teamwork. After the application of multiple quality improvement tools including value-stream mapping, surveys, process mapping, fishbone diagrams, asking the 5 “whys” (a core aspect of the process to determine a cause-effect relationship, where every question forms the basis for the next), and stakeholder analysis, we implemented the use of first postoperative hemoglobin levels as a marker of the transfusion practice for postoperative patients and modified our surgical “timeout” procedure to include the HTT to be stated for patients in the operating room (OR). The initial HTT was decided to take into consideration the patient’s co-morbidities, the surgery to be performed, and the surgical team’s clinical judgment. The first postoperative hemoglobin information was the first tool to be used. Very low postoperative hemoglobin levels or, alternatively, very high levels were considered indicators that the care might have been different. This data point was used to provide feedback for the clinical providers for future improvement. Following the implementation of these process modifications, we noticed an approximately 40% reduction in overall blood utilization during the surgical procedure and 28% overall blood utilization (perioperative period). The frequency of episodes of severe anemia was decreased, and now there is also less disagreement between providers related to the use of blood products. Overall, improving the communication process and tracking

a stable metric improved our transfusion practice. The project illustrates the value of having a dedicated team skilled in quality improvement to improve efficiency, safety and reduce waste in a complex and highly variable paradigm that is transfusion medicine. This process can be replicated in any institution worldwide. The Institute for Healthcare Improvement, Cambridge, Massachusetts, USA has long been the leader in health care quality improvement and Lean systems management (www.ihp.org) and is a good source of information regarding implementation of Lean approaches to quality improvements in health care.^[15-17]

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