Analysis of Blood Transfusions Utilizing a Restricted Hemoglobin Threshold and the Use of a Transfusion Review Process

Nathan Weber, DO PGY-3
Authors: Dr. Nathan Weber, Dr. Hanna Crow, Oklahoma State University Medical Center, Department of Internal Medicine

The utilization of blood transfusions has been an area of significant study that has resulted in significant changes regarding the proper use of blood transfusions. Once believed to be a benign intervention, newer data has demonstrated blood transfusions can lead to increased morbidity and mortality. Numerous studies have demonstrated a conservative approach to transfusions by not recommending blood product to stable patients unless hemoglobin levels are less than 7 g/dl. These updated guidelines are not always utilized in the hospital setting. Our project has implemented a monthly review process that evaluates blood transfusions given at Oklahoma State University Medical Center. Blood transfusions that were deemed as inappropriate, based on current guidelines by the American Association of Blood Banks, would be flagged and the provider that ordered the blood product would be notified and updated on the current transfusion guidelines. The goal of the project was to decrease the amount of inappropriate transfusions, and as a result, reduce the overall morbidity and mortality of patients receiving blood transfusions. Transfusions were analyzed based on the pre-transfusion hemoglobin level and the number of total transfusions administered was calculated annually starting in 2015. Our hypothesis states there would be an overall reduction in the amount of blood transfusions performed to hospitalized patients by utilizing a peer review process and subsequent education given to providers who ordered inappropriate transfusions. The review process has resulted in 39% decrease in blood transfusions from 2016-2017 with a hemoglobin level between 7g/dl-8g/dl.

Analysis of Blood Transfusions Utilizing a Restricted Hemoglobin Threshold and the use of a Transfusion Review Process

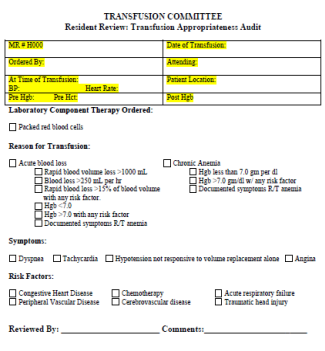
Authors: Nathan Weber DO, Hanna Crow DO, Justin Chronister DO
Oklahoma State University College of Health Sciences

INTRODUCTION

In the United States, nearly 4.5 million patients per year receive blood products. In 2012, the American Association of Blood Banks (AABB) released the Clinical Practice Guideline on Red Blood Cell Transfusion. The guideline was designed to optimize clinical outcomes and to avoid transfusions that are not clinically indicated while combating the rising cost of healthcare in the United States.[1] As recommended by the latest guidelines, using a more restrictive hemoglobin threshold of 7g/dL in hemodynamically stable patients instead of 9g/dL to 10g/dL, has shown to reduce the number of adverse outcomes related to packed red blood cell (PRBC) transfusion.[2] In this study, we incorporated a review process to see if it would reduce the number of inappropriate packed red blood cell transfusions and enforce a more restrictive transfusion threshold of 7 g/dl.

METHODS

- Extensive literature review to examine current guidelines for appropriate blood transfusions was performed.
- A plan-do-study-act model was performed that involved the Transfusion Committee made up of attending physicians, residents, and nursing from various specialties in the hospital.
- Monthly chart reviews were performed by residents to examine the appropriateness of inpatient transfusions based on current guidelines and practice. The review form can be seen below.
- Current transfusion guidelines were distributed to ordering physicians of transfusions that were deemed inappropriate.
- Transfusion data was analyzed to examine how effective the transfusion review process is and the impact on the number of transfusions performed.



TRANSFUSION COMMITTEE
Resident Review: Transfusion Appropriateness Audit

MR # 10000	Date of Transfusion:
Ordered By:	Attending:
At Time of Transfusion:	Patient Location:
BP: Heart Rate:	
Pre Hgb: Pre Hct:	Post Hgb

Laboratory Component Therapy Ordered:

☐ Packed red blood cells

Reason for Transfusion:

☐ Acute blood loss
- ☐ Rapid blood volume loss >1000 mL
- ☐ Blood loss >250 mL per hr
- ☐ Rapid blood loss >15% of blood volume with any risk factor.
- ☐ Hgb <7.0
- ☐ Hgb <7.0 with any risk factor
- ☐ Documented symptoms R/T anemia

☐ Chronic Anemia
- ☐ Hgb less than 7.0 gm per dl
- ☐ Hgb >7.0 gm/dl w/ any risk factor
- ☐ Documented symptoms R/T anemia

Symptoms:

☐ Dyspnea ☐ Tachycardia ☐ Hypotension not responsive to volume replacement alone ☐ Angina

Risk Factors:

☐ Congestive Heart Disease ☐ Peripheral Vascular Disease ☐ Chemotherapy ☐ Cerebrovascular disease ☐ Acute respiratory failure ☐ Traumatic head injury

Reviewed By: _____ **Comments:** _____

Figure 1. Transfusion Review Sheet utilized to evaluate the appropriateness of blood transfusions.

HYPOTHESIS

We predict that the transfusion review process and providing education about current guidelines will reduce the number of packed red blood cells transfused by 20% for patients with hemoglobin levels greater than 7 g/dl.

RESULTS

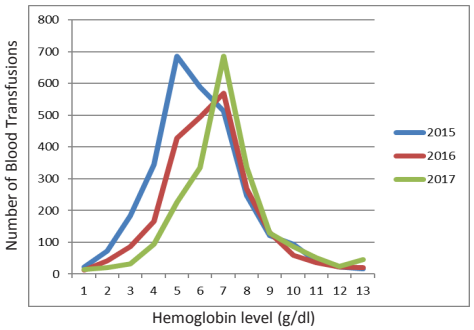


Figure 2. Total Number of PRBC transfusions per year by Hemoglobin level

Hemoglobin level (g/dl)	2015	2016	2017
9.5-9.9	23	12	15
9.0-9.4	73	42	20
8.5-8.9	184	86	32
8.0-8.4	345	166	93
7.5-7.9	685	427	226
7.0-7.4	589	493	335
6.5-6.9	514	569	686
6.0-6.4	247	269	336
5.5-5.9	122	131	128
5.0-5.4	94	59	87
4.5-4.9	39	35	51
4.0-4.4	23	23	25
<4.0	16	21	46

Number of Blood Transfusions

Table 1. Total Number of PRBC transfusions per year by Hemoglobin level

DISCUSSION

Since implementation of the Transfusion Review Committee at OSUMC in 2015, total PRBC transfusions have decreased. In 2016, transfusions decreased by 35% and by 61% in 2017 for pre-transfusion hemoglobin concentration 7-11.9g/dL . The aim to decrease blood transfusions by 20% was met. There was a 39% decrease in blood transfusions form 2016 to 2017 with a hemoglobin level between 7g/dL – 7.9g/dL.

A t-test analysis was performed for the number of transfusions from 2016-2017 with a hemoglobin level of 7 g/dl-7.9 g/dl. The p value was 1.063 and not statistically significant. However, there continues to a be downward trend of total blood transfusions by year since the institution of the transfusion committee.

CONCLUSION

- Implementing A review process utilizing AABB practice guidelines for transfusions decreased the number of total PRBCs transfused.
- Future research includes analyzing the impact of the Transfusion Review Committee on dollars saved and adverse reactions related to PRBC transfusions. .
- Future goals also include evaluation of fresh frozen plasma, cryoprecipitate, and platelets..

REFERENCES

1. Carson JL, Grossman BJ, Kleinman S, Tinmouth AT, Marques MB, Fung MK, et al; Clinical Transfusion Medicine Committee of the AABB. Red blood cell transfusion: a clinical practice guideline from the AABB. Ann Intern Med. 2012;157:49-58.
2. Carson, J. L., Guyatt, G., & Heddle, N. M. (2016). Clinical Practice Guidelines From the AABB Red Blood Cell Transfusion Thresholds and Storage. *JAMA, 316*(19), 2025-2035. doi:10.1001/jama.2016.918

Acknowledgments

- Dr Kathy Cook, Oklahoma State University Medical Center, Internal Medicine
- Jamie Flower, MSN, RN, Oklahoma State University Medical Center