A CNS-Led Initiative to Reduce Red Blood Cell Transfusions in Adult Critical Care Patients

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Purpose:

The purpose of this quality improvement (QI) initiative was to develop, implement, and evaluate the effectiveness of an evidence-based algorithm designed to reduce the number of packed red blood cell (PRBC) transfusions in adult critical care patients while maintaining a stable hematological status and maintain current length of stay outcomes.

Description:

Priorities in the management of the adult critical care client are to ensure adequate ventilation and oxygenation and restore or maintain tissue perfusion at the cellular level. To meet this physiological requirement the hematological status of the client must be adequate to support cellular respiration needs. Transfusion is rarely indicated when the hemoglobin (hgb) is greater than 10 gm/dl and is typically indicated when it is less than 6 gm/dl. For intermediate hgb concentrations between 6-10 gm/dl evaluation of PRBC transfusion should include a relative risk assessment based on the client’s needs. Generally, hematocrit (hct) levels between 25-30% are adequate for optimal tissue oxygenation.

Design:

This QI project utilized a pre-post design. It included an educational component to assess physician/nurse knowledge of current transfusion protocols that currently existed at the initiation of this project. A transfusion algorithm was then developed and implemented that focused exclusively on the client with an intermediate hgb level between 6-10 gm/dl. The transfusion algorithm was developed and implemented to redefine the standard of care for PRBC transfusion for adult clients in the ICU setting.

Development of the Algorithm:

Prior to the implementation of this QI project, current practice in our facility was based on the “10/30 rule,” where transfusion was considered routine when hgb levels were below 10 gm/dl and hct was less than 30%. The medical director of the critical care units, working with a CNS-led team of interprofessional clinicians, were recruited to review and revise the current transfusion algorithm using a systematic approach that provided evidence for the development and implementation of a PRBC transfusion protocol with guidelines utilizing various professional society guidelines published since 2012. A 90-day retrospective systematic review of 214 charts in persons with an intermediate hgb level finding and who had received at least one PRBC transfusion was conducted to examine pre-transfusion blood pressure, heart rate, respiratory rate, O2 saturation, level of orientation (if warranted), and diagnosis or procedure-related condition. A risk-based, stratified, decision outcome algorithm was designed in which both objective and subjective findings were included, as was the reason for hospitalization and procedural interventions related to potential hematological factors.

Implementation:
Use of the revised transfusion algorithm began the first day of the month following an educational intervention aimed at improving clinician knowledge related to the changes in PRBC transfusion in the revised transfusion protocol. The CNS Project Lead collected data beginning one month following implementation of the revised algorithm and documented the total PRBC transfused units based on the aforementioned parameters.

**Data Analysis and Results:**

The statistical software package SPSS (V25.0) was used for data analysis, with a statistical significance established at .05. Continuous variables were reported using mean and SD. The mean difference between pre-intervention and post-intervention transfusions was compared using a 2-sample independent t-test. Categorical variables were reported using frequency distribution and percentages. The sample was primarily male (78%), with a mean age of 68, admitted for either a surgical procedure, or who has undergone a surgical procedure and was admitted to the critical care units. Changes related to pre/post data revealed that clients with hgb levels between 6-7 g/dl were likely to receive a transfusion (p<.04), whereas persons with hgb levels between 7-9 g/dl were less likely to receive a transfusion (p<.02). Procedural variances were noted related to orthopedic and cardiac surgical procedures with those populations more likely to receive a transfusion (p<.02). When the decision to transfuse was compared to pre-post objective clinical findings, i.e., heart and respiratory rate and level of orientation, persons with an intermediate hgb were less likely to receive a transfusion, but not significantly (p<.09). When clients were categorized by DRG differences in length of stay (LOS) no significant change was found (p<.04), and the total number of pre-intervention transfusion units (n=253) compared to post-intervention (n=197) was significantly less (p<.04).

**Limitations:**

Two limitations were identified in this project. Nursing staff turnover between the pre and post-project period was 17.6%. A second limitation was noted with regards to the attending physician background, with critical care hospitalist being less likely than surgeons to order a PRBC transfusion. A further issue was identified when anesthesia orders related to a specific procedure were compared with the revised algorithm and were grounded on hgb/hct measures versus physiological findings related to patient status.

**Implications and Conclusions:**

The evidence from this project demonstrates that a risk-based, stratified, decision outcome algorithm may reduce the number of transfusion events in the critical care setting, while not impacting patient status or LOS. By reducing the number of transfusion events the likelihood of a transfusion complication is decreased. The implications of this evidence for patient care guidelines and the education of healthcare providers demonstrates similar outcomes with fewer transfusion events than in the pre-intervention phase. Additionally, this project demonstrates the need to conduct additional translational research projects to reduce risk and achieve similar or improved outcomes related to transfusion practices in the critically ill adult population.

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**Keywords:**
Adult Critical Care, Hematological outcome and Red Blood Cell Transfusion
References:


Abstract Summary:
The purpose of this clinical quality improvement project was to minimize the number of red blood cell transfusion units in adult critical care patients while maintaining optimal physiological hematologic outcomes. Comparison of pre-intervention with post intervention data reveals fewer transfusions can maintain hematologic integrity without complications.

Content Outline:

Introduction
This presentation will present a CNS-led, interprofessional (IP), quality improvement initiative whose aim was to improve clinical outcomes through the translation of evidence by developing and implementing a risk-based, stratified, decision outcome algorithm for transfusion in the adult critical care setting.

Body

1. Utilizing a systematic search of literature evidence was collected, evaluated for relevance, and compared to current critical care practice. Levels of Evidence were used to determine the degree of scientific rigor in the selected resources. After screening by the IP team, several iterations of the proposed draft were reviewed by clinical providers across disciplines.
Supporting point: A medical librarian was included in the team to assist and verify the search terms and dates of publications, Boolean operators, and to assist with determining the levels of evidence of the selected sources.

2. An IP team was formed which consisted of physicians, advanced practice providers, clinical staff, and ancillary staff. The purpose of this team was to advise on multiple aspects of the development of the algorithm, particularly as it related to the use of evidence to drive decision making on whether to transfuse the client in the critical care setting.
Supporting point #1: The primary aim was to develop an algorithm that was clinically useful and would decrease the number of transfusions while maintaining hematologic status, and also maintain or reduce the departmental metric of length of stay.

Supporting point #2: A key stakeholder was not identified during the initial development of the
algorithm. An oversight from the IP team was anesthesia services which had negative implications during the Medical Staff approval process.

3. The newly developed algorithm, after approval, required extensive education from the Clinical Education Department across units, across disciplines, and across multiple shifts.

   Supporting point: Nursing turnover, coupled with a high census period proved more difficult than originally planned, necessitating an additional month of education sessions prior to the planned initiation date.

4. After implementation a 30-day trial period was established, data was collected from pre-intervention and post intervention patient records to evaluate the usefulness of the toll and to measure its impact against the stated aims.

5. Data analysis demonstrated that statistical improvements were made in reducing the number of transfusion events when comparing pre/post data.

   Supporting point #1: There were no clinical adverse outcomes reported nor discovered when evaluating and measuring post intervention clinical data

   Supporting point #2: The average LOS in the critical setting of the hospital remain stable throughout the trial period

Conclusions

1. The utilization of an IP team to develop an evidence-based, risk-stratified algorithm proved effective for adult clients in the critical care setting at decreasing the number of transfusion events while maintaining the average LOS in the adult critical care units.

2. The use of a systematic search of the evidence, coupled with an IP team review and inclusion on the design and implementation demonstrated efficacy and efficiency at improving knowledge related to adult transfusion in the critical care units.

First Primary Presenting Author

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Author Summary: Dr. Sutton has been a practicing nurse since 1983, and a clinical researcher and professor since 2004. His primary research focus has been on the quality of life and psychophysiological impacts of obesity on the adult community dweller. In addition Dr. Sutton, who is board certified as a Nurse Executive-Advanced serves as a Governing Council Member for Northern Arizona Healthcare in Flagstaff, AZ.

Second Author
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Author Summary: Dr. Stetina is a PhD graduate of Texas Women's University and has over 30 years of clinical experience working with multiple patient populations. Her expertise for this presentation focused
on the translation of published evidence and the translation of evidence related to a risk-based, stratified, decision based algorithm for transfusions in the adult critical care setting.