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Implementation of a simple electronic transfusion alert system decreases inappropriate ordering of packed red blood cells and plasma in a multi-hospital health care system

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ABSTRACT

Background and objectives: Prescriber adherence to institutional blood component ordering guidelines can be low. The goal of this study was to decrease red blood cell (RBC) and plasma orders that did not meet institutional transfusion guidelines by using data within the laboratory information system to trigger alerts in the computerized order entry (CPOE) system at the time of order entry.
Methods: At 10 hospitals within a regional health care system, discernment rules were created for RBC and plasma orders utilizing transfusion triggers of hemoglobin <8 gm/dl and INR >1.6, respectively, with subsequent alert generation that appears within the CPOE system when a prescriber attempts to order RBCs or plasma on a patient whose antecedent laboratory values do not suggest that a transfusion is indicated. Orders and subsequent alerts were tracked for RBCs and plasma over evaluation periods of 15 and 10 months, respectively, along with the hospital credentials of the ordering health care providers (physician or nurse).
Results: Alerts triggered which were heeded remained steady and averaged 11.3% for RBCs and 19.6% for plasma over the evaluation periods. Overall, nurses and physicians canceled statistically identical percentages of alerted RBC (10.9% vs. 11.5%; $p = 0.78$) and plasma (21.3% vs. 18.7%; $p = 0.22$) orders.
Conclusions: Implementing a simple evidence-based transfusion alert system at the time of order entry decreased non-evidence based transfusion orders by both nurse and physician providers.

1. Introduction

Management of a hospital system's blood supply is a vital task, and part of this process involves monitoring blood component orders. Many clinicians, house staff, and nursing staff may not understand or not be aware of guidelines for issuing blood products, and thus order these products based on criteria that are not evidence-based. Implementing a system that integrates data in the electronic medical record (EMR) with computerized physician order entry (CPOE) is one

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efficient method for attempting to guide blood component orders that adhere to institutional transfusion criteria [1–3].

It has been previously demonstrated that implementation of actionable technology at the time of order entry can lead to cost savings, decreased use of laboratory resources, and reveal deviations from institutional evidence-based transfusion guidelines [4–7]. In light of this, an electronic alert system was implemented using CPOE in conjunction with our laboratory information system for ordering of packed red blood cells (RBCs) and plasma in 10 hospitals in a regional healthcare system. Among the hospitals, the largest facility transfuses approximately 28,000 units of RBCs and 24,000 units of plasma annually. The goal was to decrease RBC and plasma orders that did not meet institutional transfusion guidelines.

2. Materials and methods

Institutional transfusion guidelines were developed by the hospital transfusion committees and were based on the current literature of transfusion thresholds and clinical outcomes. The same criteria for ordering RBCs and plasma and alert settings were used at all 10 hospitals within this healthcare system. The phrasing of the alerts was approved by each of the hospital's transfusion committee. For RBCs, the alert was triggered if an order was placed and the patient's most recent hemoglobin within the past 14 days was ≥8 gm/dl. For plasma orders, an alert was triggered if the INR was <1.6 in the 24 hours preceding the order. A transfusion order on a patient without a recent hemoglobin or INR laboratory measurement would also trigger the alert, and offer to order a hemoglobin or INR before proceeding with the transfusion order. The information technology staff incorporated these decision guidelines into the CPOE application of the EMR by applying the transfusion threshold criteria to create discernment rules (Fig. 1); these guidelines were used to create alert screens triggered by RBC or plasma orders in patients whose laboratory data did not meet the institutional criteria (Fig. 2a and 2b). Monthly reports were created which collected data on the following parameters: the number of orders that triggered an alert, the number of alerts that were heeded and not heeded, and the hospital credentials of the person ordering the blood component (nurse or physician). For all hospitals, the alert system was implemented in both the outpatient and inpatient settings but was not applied to the operating rooms or the emergency departments. Data were acquired over a 15 month period for RBCs and a 10 month period for plasma. The raw data were exported to Microsoft Excel (Microsoft, Inc., Redmond,

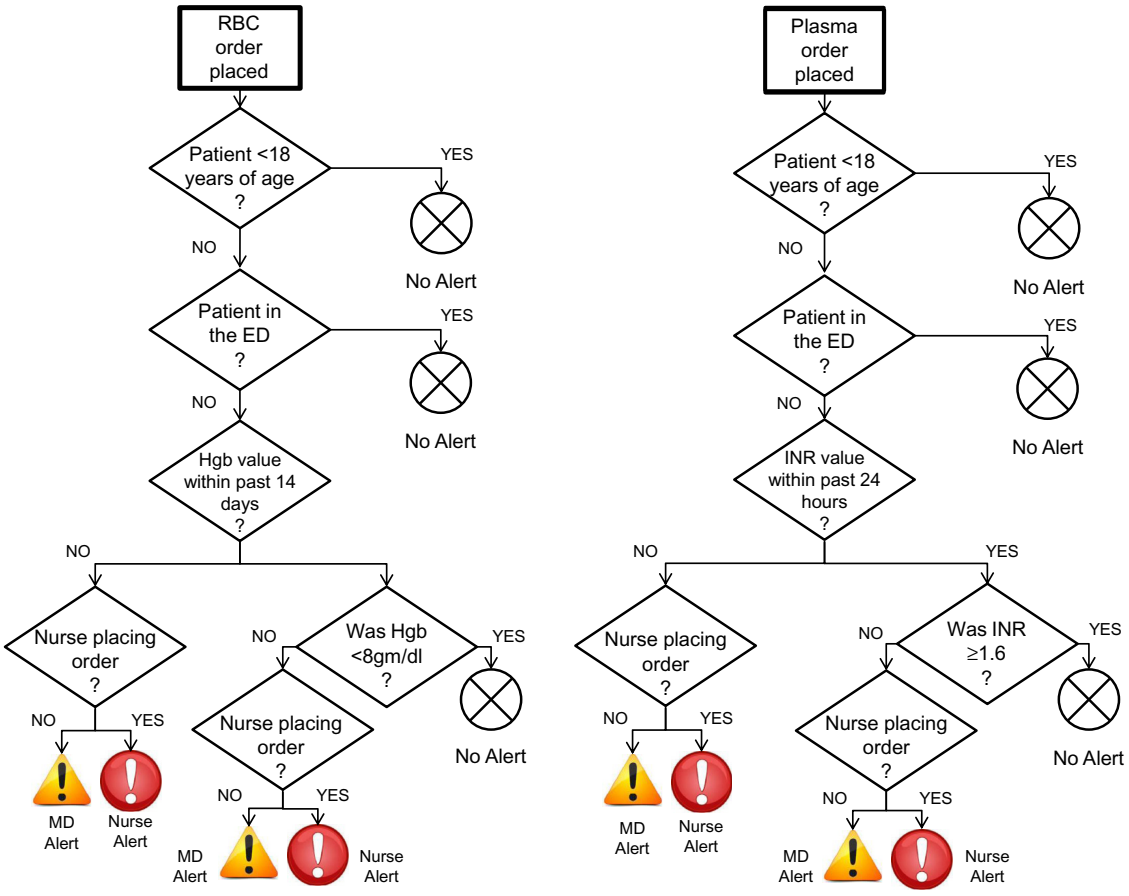

Fig. 1. Flow chart logic for activation of RBC and plasma alerts. RBC = red blood cell; ED = emergency department; Hgb = hemoglobin.