Blood conservation in the intensive care unit

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PURPOSE

This analysis investigates a variety of initiatives to improve blood utilization and to reduce transfusion requirements. These strategies include the administration of adequate nutritional support, avoidance of bone marrow toxins, erythropoietin stimulation of red blood cell production, consideration of therapy with blood substitutes, and minimized blood loss because of diagnostic phlebotomy and bleeding. The combination of several of these strategies is likely to contribute to best practice in blood management in the ICU.

MATERIALS AND METHODS

This study used a predefined strategy to search the electronic databases of Medline, EMBASE, CINAHL, the Cochrane database of systematic reviews, the Cochrane central register of controlled trials, ACP Journal Club, database of abstracts of reviews and effects, and HealthSTAR for descriptions and evaluations of strategies of blood conservation among critically ill patients.

> Truly closed no-waste sampling systems that minimize the usage of access ports may also lessen the risk of bacterial colonization of catheter hubs and the subsequent risk of catheter-related bloodstream infections.

RESULTS

A number of blood conservation strategies have been used to prevent or treat anemia among critically ill patients. These include:

› Restrictive diagnostic phlebotomy using small-volume or pediatric phlebotomy tubes

› Point-of-care and inline bedside microanalysis

› Minimization of diagnostic sample waste

› Minimization of routine multiple daily phlebotomies

› Red blood cell salvage and antifibrinolytic agents for bleeding patients

› Consideration of removal of central venous and arterial catheters when no longer needed for physiologic monitoring or medication administration

› Threshold-based transfusion policy

› Healthcare professional education

Blood draws taken via catheter cause a variable amount of the initial phlebotomy to be discarded to clear the catheter of infusate that may affect the accuracy of laboratory results. Using a closed method of blood sampling and returning the initial sample component back to the patient's blood can eliminate this type of blood waste when performing diagnostic phlebotomy. This technique was evaluated in a small, randomized, controlled clinical trial of critically ill surgical patients and found that the use of a closed arterial system decreased the mean phlebotomy amount by 50%.[1] A subsequent study revealed similar reductions in wasted blood and hemoglobin decline in patients treated with a closed system.[2]

Truly closed no-waste sampling systems that minimize the opening and closing of access ports may also lessen the risk of bacterial colonization of catheter hubs and the subsequent risk of catheter-related bloodstream infections.

Concurrent to this analysis, the authors were performing a multi-faceted intervention of blood conservation and restrictive diagnostic phlebotomy, comparing usual practice with strategies identified above. In an observational study of 89

consecutively critically ill patients at Stanford University, the authors found that diagnostic sample waste accounted for the most frequent and largest volume of blood loss.

In a subsequent prospective controlled pilot clinical trial, introduction of a multi-faceted blood conservation strategy resulted in an 87.5% reduction of initial sample discard compared with a group treated with the usual practice. Also, patients treated with the restrictive diagnostic phlebotomy and blood conservation strategy were significantly less likely to receive packed red blood cell transfusions during their ICU length of stay.

CONCLUSION
Many strategies for blood conservation for critically ill patients may be identified, although few randomized, controlled clinical trials have been conducted to evaluate effectiveness. Intensivists might adopt particular interventions, such as the use of smaller volume phlebotomy tubes as intuitive or obvious improvements to current practice. Research of less obvious strategies should evaluate both effectiveness and economic impact of the new therapies and diagnostic procedures in comparison to current standards of care.

References

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2. Preusser B, Lash J, Stone K, et al. Quantifying the minimum discard sample required for accurate arterial blood gases. Nurs Res 1989; 38:276-279.