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Viscoelastic Monitoring in Major Hepatic Surgery: An Evidence-Based Practice Project

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Abstract

- Patients undergoing major hepatic surgery are at high risk for intraoperative transfusion of allogenic blood products.
- Current literature states that viscoelastic monitoring is superior to traditional laboratory values when guiding transfusion during major hepatic surgery.
- For the purpose of this project, ROTEM will be referred to as viscoelastic monitoring and will be the focus of the proposed guidelines.
- The lack of an evidence-based approach to standardize transfusion utilization may lead to misinterpretation of viscoelastic monitoring, which may result in over- or under-resuscitation.
- This doctor of nursing practice (DNP) project aims to develop an evidence-based practice guideline, utilizing the Rosswurm and Larrabee conceptual model, to assess a need for change, identify gaps in practice, implement the guideline, and evaluate the outcome.

Introduction

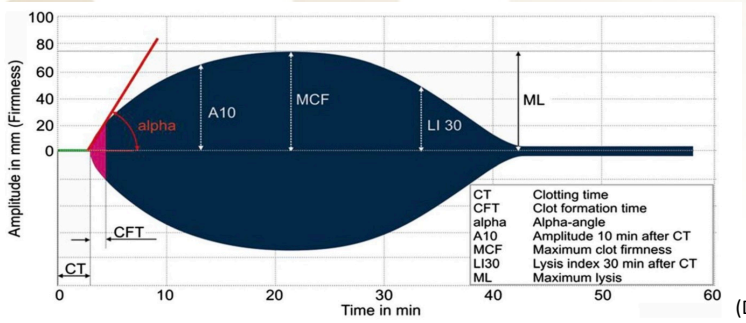
- Major hepatic surgery is associated with large blood loss and complicated coagulopathy.
- Allogenic blood transfusions, while necessary at times, are associated with complications such as transfusion-related lung injury (TRALI), transfusion-associated circulatory overload (TACO), hepatic artery thrombosis, right ventricular failure, and immune hemolytic reactions.

Significance of the Problem

- Allogenic blood transfusions are associated with many risk factors that are costly to the patient and facility.
- Anesthetists should have evidence-based guidelines on the use of viscoelastic monitoring during major hepatic surgery.

Problem Statement

In patients undergoing major hepatic surgery (P) would the development and implementation of intraoperative evidence-based practice coagulation guidelines specific to viscoelastic monitoring (I) versus traditional coagulation testing (C) affect blood product utilization management (O) intraoperatively (T)?



(Deaton, 2013)

Project Description & Design

1. **Assess the need for change by gathering both internal and external data.** Communication with key stakeholders such as leaders of the anesthesia department, leaders of the general surgery department, transfusion services, and information and technology department (IT) with be vital for data collection.
2. **Identify the problem.** The clinical problem is coagulopathy associated with patients undergoing major hepatic surgery.
3. **Synthesizing the evidence.** A literature review and synthesis will be performed to apply the best evidence to the facility. The literature supports the use of viscoelastic monitoring to reduce allogenic blood transfusions during major hepatic surgery.
4. **Design the practice change.** Working with stakeholder to develop the guidelines and determine the education needed for staff members.
5. **Implementation.** After obtaining approval, steps 1-4 will likely occur over the span of 2-3 months. Implementation of the guidelines will occur over a year and outcomes will be evaluated at the end of the year.
6. **Integrate the practice change into the current standards of practice.** Training and education of staff will be coordinated by the department of anesthesia, department of general surgery, and transfusion services.

Guidelines

I. Indication
   a. Request by surgical team
   b. Patient suspected to be in hemorrhagic shock
   c. Initiation of massive transfusion protocol (MTP)

II. Resuscitation/Transfusion
   a. Repeat ROTEM every 30 minutes once drawn or until clinically necessary
   b. Transfusions based on recommendation from ROTEM
   c. The following interpretation is a *guideline* and not a substitute for clinical judgement

III. Component Transfusion Based on ROTEM Results:

Lab Value	Product
CT_{EXTEM} >85	Plasma
$A10_{EXTEM}$ <45 and $A10_{FIBTEM}$ ≥ 10	Platelets
$A10_{EXTEM}$ <45 and $A10_{FIBTEM}$ <10	Cryoprecipitate
ML ≥10	Tranexamic Acid

Clotting Time (CT): Time from start of the measurement until initiation of clotting
Clot Formation Time (CFT): Time from initiation of clotting until a clot firmness of 20 mm is detected
Maximum Clot Firmness (MCF): Firmness of the clot
Lysis Index at 30 Minutes (LI30): Ratio between the the clot firmness and the amplitude at 30 minutes
Maximum Lysis (ML): Reduction of clot firmness after MCF in relation to MCF
Amplitude at 10 Minutes (A10): Amplitude of deflection at 10 minutes
EXTEM: Coagulation is activated by a small amount of tissue factor that typically leads to clot formation within 70 seconds
FIBTEM: Coagulation is activated as in EXTEM, but with the addition of cytochalasin D, the thrombocytes are blocked and the resulting clot is only depending on fibrin formation and polymerization
*Of note, EXTEM and FIBTEM are reagents added to whole blood to manipulate coagulation

Outcome Analysis

Pre-Intervention Data: A retrospective chart review of 50 randomized charts of patients that underwent major hepatic surgery. Data will be recorded for baseline comparison, post-intervention.
Post-Intervention Data: A retrospective chart review of 50 randomized charts of patients that under went major hepatic surgery after implementation of the guidelines.
Comparison: Post-intervention data will be compared to pre-intervention data to compare volume and frequency of allogenic blood product transfusion.

Conclusion

- The use of viscoelastic monitoring during major hepatic surgery reduces the frequency and amount of allogenic blood product transfusion.
- Allogenic blood transfusions are associated with severe adverse effects.
- Reduction in frequency and volume transfusion decreases the risk of adverse events which improves patient safety.

References

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