

Maximum  
Surgical Blood  
Order Schedule:  
Improved Inventory  
Management



**Maximum Surgical Blood Order Schedule (MSBOS)** was originally developed to match orders for red blood cell (RBC) units to actual transfusion needs for surgical patients and assure availability of needed RBCs. Use of these documents fell out of favor partly due to the difficulty in obtaining blood usage data for maintaining an effective tool. Current focus on patient blood management has stimulated redevelopment of the MSBOS. MSBOS provides an evidence based, standardized approach for ordering blood for elective surgical patients. Use of MSBOS minimizes over-ordering of blood products, reduces surplus inventory and lowers costs.

Collaboration between transfusion service, surgeons and nursing is key to a successful MSBOS. The overarching goal is to ensure compatible RBCs are available for scheduled procedures that may require transfusion while reducing unnecessary testing and cost to patients and institutions. Understanding an institution's current state, including RBC utilization and surgical procedures performed, is essential for creation of a MSBOS. The following steps outline a process to create an institution-specific MSBOS.

### Step 1: Establish a team

- Identify the team to collect and analyze data
  - Include Transfusion Service staff, surgeons, anesthesiologists, nurses from surgical services and Information Technology
- Who will develop the MSBOS from the data obtained?
- Who will approve the MSBOS?
- Who will communicate it to the surgeons and their assistants?

### Step 2: Determine current state

- What elective surgical procedures are performed at your hospital?
  - Select only inpatient procedures
- Which surgical procedures are associated with intraoperative transfusions and/or transfusions within the first 24 hours after surgery?
  - What is your institution's Crossmatch to Transfusion (C:T) ratio?
    - Calculate C:T ratio by surgical service lines i.e. Orthopedic surgery, Cardiovascular, Obstetrics, General Surgery, etc.
  - What is your issue to transfuse (I:T) ratio, if available?
    - The I:T ratio is calculated by dividing the number of RBC units transfused by the number issued. This ratio is particularly useful for blood requested by surgery. It can highlight those procedures where products are issued at the start of the case and returned at the end of the case (i.e. issue 25 RBCs with 15 units returned; I:T ratio=2.5)
- Which surgeons perform these procedures?
- How many Type & Screen (T&S) tests are done at your institution for elective surgical procedures?
  - Ideally, T&S testing should be completed prior to patient arrival (e.g. from 3-30 days), not on the day of surgery
  - Determine the time between collection of T&S and day of surgery (average and range)
  - What is your policy for T&S prior to surgery?
- Is there access to a report that includes surgical procedures/ICD-10 codes, pretransfusion tests, total RBCs transfused to patient undergoing the procedure, and location of transfusions (in OR suite or postoperative)?
  - If yes, pull data for at least 6 months (procedures, pretransfusion tests, RBCs transfused)
  - If no, collect prospective data using surgery schedule for 3-6 months
    - Track pretransfusion tests, number of units ordered and transfused
    - Example spreadsheet available on Hospital Portal for Versiti Blood Center of Wisconsin.



### Step 3: Collect and analyze the data

Review data collected on all elective inpatient surgical cases:

- Sort by procedure name or ICD-10 code
- For each procedure with same name/ICD-10 code, calculate the total cases and total cases transfused
  - Identify the most common procedures where patients were transfused
- Does the procedure need a sample collected for pretransfusion testing?
  - Calculate percent of cases transfused (total cases transfused/total cases performed) for each procedure type
  - Suggested criteria for pretransfusion testing<sup>1</sup>:
    - If percent transfused is less than 5%, no testing needed
    - If percent transfused is greater than 5%, order pretransfusion testing (T&S)
- Calculate total and average number of RBCs transfused for each procedure
- Does the procedure need RBCs set up?
  - Calculate average number of RBC units per cases transfused (Total number of RBCs/Total cases transfused) for each procedure type
    - The result will be entered in draft MSBOS as number of RBC units to order
  - Calculate the Transfusion Index or TI [total number RBC units transfused/total number cases (transfused & non-transfused)]
  - If possible, collect Estimated Blood Loss (EBL) for each procedure. If data not available, surgeons can assist with deciding risk of bleeding for particular procedures. Risk of bleeding examples:
    - Vascular and cardiac bypass: high risk of bleeding
    - Ophthalmology, otolaryngology procedures: very low risk of bleeding
    - Biopsies: usually low risk of bleeding

If % of cases transfused <5%; EBL ≤50ml, TI<0.3\* AND no risk of major bleed

• No pretransfusion testing required

If % of cases transfused ≥5%; EBL >50ml, and TI≥0.3 OR risk of major bleeding=YES

• Order pretransfusion testing (T&S)

If % of cases transfused >10%

• Order T&S AND  
• If average RBCs transfused <4, order 2 RBC units  
• If average RBCs transfused >4, order 4 RBC units

\* TI = Transfusion Index.

Adapted from Frank SM et al. Anesthesiology 2013;118:1286-1297.

### Step 4: Create a draft MSBOS

- Create a table by surgical specialty with these headings: (1) procedure name, (2) recommended pretransfusion testing and (3) number of RBCs to order
  - Number of RBCs to order is average RBC units transfused per case calculated in Step 3
  - The list will not be all inclusive but should contain all major procedures where the data analysis indicates need for pretransfusion testing and/or RBC units to be ordered
- Discuss and adjust in collaboration with surgeons:
  - Bring blood usage data
  - Discuss and verify risk of bleeding and proposed RBCs to set up for identified procedures is appropriate
  - Align current practice with newly created MSBOS

**Step 5: Distribute and communicate MSBOS final version** to all departments that interact with elective surgical patients

## Step 6: Implement MSBOS

- As technology and procedures change, MSBOS will require periodic review

### Example

#### Dairyland Hospital Maximum Surgical Blood Order Schedule (MSBOS)

Dairyland Hospital MSBOS can assist providers to determine pretransfusion testing and RBCs to order for selected procedures where a patient may need blood transfusion. The table is not an all-inclusive list. If procedure being performed is not on this table, select the procedure that most closely represents the case.

- Order pretransfusion testing and RBCs based on the procedure, patient's clinical condition, risk of bleeding and procedural EBL.
- A "Hold" sample may be collected for add-on testing in the event any unexpected bleeding occurs to provide compatible RBCs for patients.
- Emergency release blood is always available for ALL cases.

Procedure	Testing	# RBCs	Comments
<b>Orthopedic</b>			
Total knee replacement	None	None	
Total hip replacement	None	None	
Fractured pelvis	T&S	2 units	
Amputation-above/below knee	T&S	1-2 units	Is pt at risk for bleeding?
Fractured femur	T&S	1 unit	
<b>General Surgery</b>			
Appendectomy	None	None	
Cholecystectomy (open or laparoscopic)	None	None	
Organ procurement	T&S	2 units	
Exploratory Lap (open)	T&S	2 units	
<b>OB/Gynecology</b>			
Cesarean section	T&S	None	Based on patient risk
Vaginal delivery	T&S	None	

### References:

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