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Prioritising Communication and Specific Role Allocation in a Protocolised Approach to Massive Blood Transfusion

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Abstract

Massive blood transfusion serves to prevent fatal outcomes from critical cellular hypoperfusion in a patient with uncontrolled haemorrhage. By developing and implementing massive transfusion protocols, overall usage of blood products and mortality related to complications have been reduced. There should be inter-professional healthcare collaboration for managing patients requiring massive blood transfusion. Significant pre-planning and coordination among involved departments, especially the blood bank, is of utmost necessity. However, even in presence of established protocols in prior published literature, practical scenarios convey a different message. Lack of prioritisation of actions and absence of specific roles for team members leads to confusion and delay in management of crisis, resulting in worse outcomes. We hereby have documented a practical approach to bring into effect massive blood transfusion protocol with specific roles and responsibilities for avoiding hurdles and streamlining the processes involved in such scenarios.

We have assigned specific tasks for the primary anaesthesiologist and those involved in procuring blood and managing the patient including nursing staff, technicians, housekeeping staff. Also, we have prepared a massive blood transfusion protocol kit to ensure ready availability of equipment. Resuscitation goals and targets to meet post massive transfusion have also been defined.

Each institute or hospital is varied in its infrastructure and availability of resources. Following a prescribed protocol for such an event as emergency massive blood transfusion may not be feasible unless there is a structured approach to the problem at hand. We suggest a personnel management protocol in an attempt to solve this issue. Specific tasks done by different team members lead to overall timely management and better patient outcomes.

Keywords: Massive Blood Transfusion Protocol; Non Technical Skills; Multidisciplinary; Role Allocation; Blood Bank

Abbreviations: MBT: Massive Blood Transfusion; MTP: Massive Transfusion Protocol; PRBC: Packed Red Blood Cell; LRBC: Leuko-Reduced Red Blood Cell; FFP: Fresh Frozen Plasma; RDP: Random Donor Platelet; SDP: Single Donor Platelet; POC: Point of Care; BB: Blood Bank; ABG: Arterial Blood Gas; Lab: Laboratory; ABC: Assessment of Blood Consumption; ICU: Intensive Care Unit; TRALI: Transfusion Related Acute Lung Injury; TACO: Transfusion Associated Circulatory Overload; FVIIa: Activated Factor Seven; BG: Blood Group; PACU: Post Anaesthesia Care Unit; OT: Operation Theatre; CBP: Complete Blood Picture; PT: Prothrombin Time; INR: International Normalised Ratio;

APTT: Activated Partial Thromboplastin Time; µl: Microlitre; g/L: Gram/ Litre; mm Hg: Millimetre of Mercury; EDTA: Ethylene Diamine Tetraacetic Acid

Introduction

MBT is encountered in trauma resuscitation, perioperative period, even in critical care settings [1]. One of the first literatures mentioning about a formalised MTP was in 1985, where "Code Red" protocol described an initial massive crystalloid infusion, followed by rapid access to, and transfusion of blood [2]. Anaesthesiologists being perioperative physicians play a pivotal role in managing such situations. Though restrictive transfusion strategy is most preferred, in an exsanguinating patient MBT aims to restore oxygen delivery to tissues and maintains euvolaemia.

Crystalloid and colloid infusions can compensate for mild to moderate loss, however with increasing loss and intravenous fluid infusion, dilutional anaemia and coagulopathy sets in, which worsens the situation further [3].

In trauma related deaths, 40% result from uncontrolled bleeding. Massive haemorrhage is the most common cause of maternal mortality worldwide [4]. These situations get complicated due to early trauma induced coagulopathy and hyperfibrinolysis which may lead to increased morbidity and mortality, if timely institution of blood transfusion is not done.

MBT itself has high morbidity rates and chance of cancer recurrence [5]. Thus, implementing a protocolised approach prevents transfusion related complications, ensures effective communication and team work, reduces any delay in initiating transfusion and improves patient outcome as a whole.

Criteria to activate MBT focuses on presence of persistent haemodynamic instability, >2 litre acute blood loss, ongoing active bleeding requiring surgery or angioembolisation, shock index criteria >1 and ABC score ≥2. It not only aims to replace intravascular volume, but also to correct coagulopathy in order to halt further blood loss [6].

Background

While handling patients with MBT needs, we have come across several hurdles in our institute due to which we felt the need to develop a specific approach which is simplified as well as effective in bringing about a change in the system. We did a literature search and were unable to find any articles on in depth management of MBT situations relating to personnel management. Hence, we embarked upon the idea to develop an MTP template and role cards. Goal was to achieve highest standard of patient care.

Protocols should be locally agreed upon and centre oriented specific guidelines to be formulated including clinical, lab, BB and logistic responses [3]. MTPs should be designed by a multidisciplinary team with representatives from anaesthesia, emergency department, surgical team, BB, lab services, OT staff, housekeeping staff (designated runners) and hospital management for easy mobilisation of resources. It should address the triggers for initiating transfusion as discussed; outline a plan for carrying resuscitation in a seamless fashion. A format of blood product preparation, availability, delivery and transfusion should be clearly delineated. It should also mention about transfusion targets, judicious use of adjuncts, criteria to terminate MTP and how to monitor and improve performance of involved personnel [7]. BB, lab and others should be notified about beginning and termination of MBT. A fixed lab test algorithm should be followed and POC tests like thromboelastography can be incorporated in MTP wherever available.

Though algorithms can vary among institutions, most MTPs use predetermined transfusion packages including PRBC, FFP, RDP and also cryoprecipitate when situation warrants. Use of fresh whole blood has its mention in military field set up and where ready availability of components may be an issue [4].

Complications following MBT may be life threatening. Specific ones which need mention are TRALI, TACO, hypothermia, metabolic acidosis, dyselectrolytemia, air embolism and haemolytic reactions. Vigilant monitoring and early anticipation while managing cases requiring MBT are helpful in preventing and treating the complications. Though most complications are reversible, it can delay patient recovery in postoperative period requiring ventilation and prolonged ICU stay, thus increasing morbidity and mortality. Acute transfusion reactions should be identified, reported, evaluated and followed up [8]. Even when situation demands prompt action, our response should include cross checking blood and blood products with patient details and documenting the number of units transfused. Any desaturation, increase in airway pressure during mechanical ventilation, new onset haemodynamic instability, bleeding manifestations, arrythmias should be correlated with patient's clinical signs, symptoms and investigation results like ABG, chest x ray, echocardiogram in postoperative period. Daily discussion with surgeons and critical care physicians about patient status enables us in deciding upon a patient specific treatment plan if such complications arise.

Methodology

Even though protocols are formulated to enhance patient safety, it is observed that implementing them at ground

level is jeopardised by multiple obstacles like absence of accountability of assigned tasks, lack of ready availability of necessary equipment, delay in communicating to other departments. Thus, to overcome this situation we have come up with the idea of specific role allocation. Non-technical skills are an important component of any system for successful completion of work and proper management of critical situations. Appointing a responsible person helps in smooth execution of blood procurement and following up of lab and ABG results. Also, by preparing MBT kits all necessary equipment is readily available. Turnaround time can be minimised by identifying designated runners, directly informing BB about the critical situation and regarding urgent need of blood. Also, appointing a dedicated lift to ply between required areas where necessary and incorporating lab tests of immediate clinical significance in the protocol are imperative.

The technique of MBT follows an almost similar approach in most centres and needs no specific mention here. We need to include strategies to reduce intraoperative blood loss [1], administer adjuvants in correct dosages, practice transfusions which are goal directed, guided by POC and lab tests. Predetermined transfusion packages in ratios of 1:1:1 with early initiation of fibrinogen should be made available from BB in sequential batches on activation of MTP request [9].

We have formulated an MTP template which covers multiple aspects of MBT and is followed in our institute. Each hospital or institute can modify it as per availability of resources and manpower and create an organised approach to massive blood loss. Also, when observed, we find that all components of non-technical skills play a vital role in successful management of an exsanguinating patient. Specific role cards of contributing members of the team involved in MTP are elaborated subsequently.

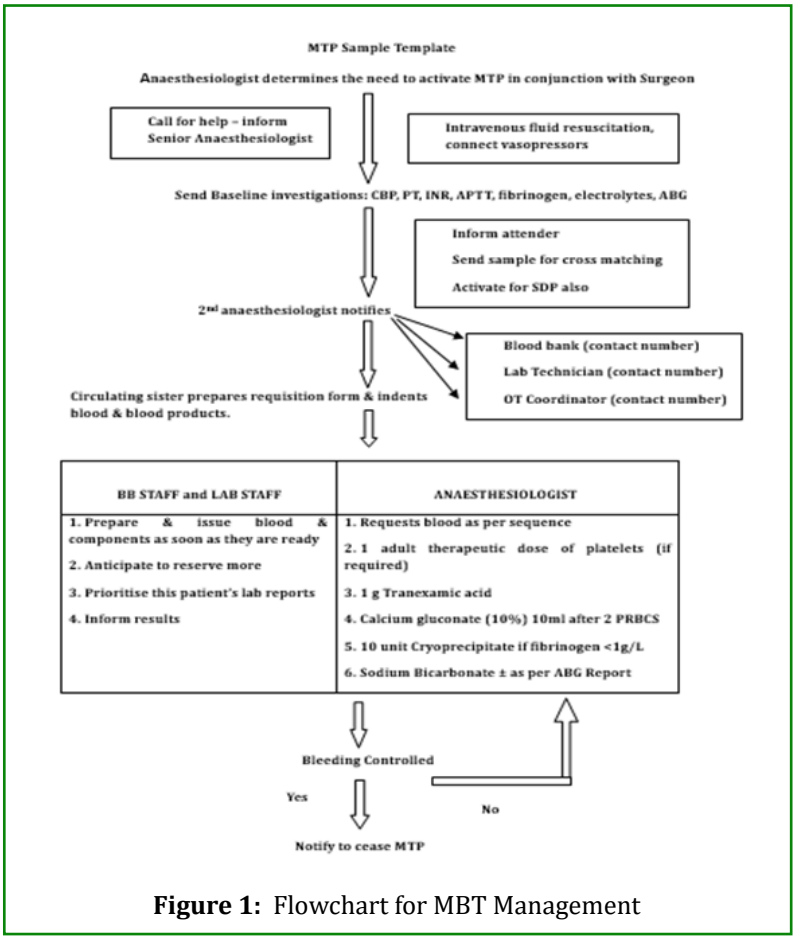

Figure 1: Flowchart for MBT Management

MTP kit: It will be with OT Coordinator (To be Checked and Replaced Every 6 Months)

➢ **Vacutainers for cross matching & investigations**

- Crossing matching (EDTA): 2ml
- CBP (EDTA): 3ml
- Coagulation profile (3.2% sodium citrate): 3 ml
- Total 8 ml needed

➢ **Intravenous fluid**

- Normal Saline (500ml): 1

- Normal Saline (1000 ml): 1
- Gelatin solutions (500ml): 2
- Plasmalyte (1000ml): 1

➢ **Syringes**
- 5 ml: 3
- 50 ml: 2

➢ Pressure bags: 2
➢ ABG syringes: 2
➢ Blood transfusion set: 2
➢ Pressure monitoring lines : 2
➢ MTP labels
➢ Role cards
➢ MTP Center specific protocol copy

Specific Role Cards that are Created are Distributed Immediately (Present in MTP Kit)

Role of Main anaesthesiologist

➢ Activate MTP (Call for help): 2nd anaesthesiologist
➢ Patient stabilisation by fluid bolus, vasopressors
➢ Securing extra intravenous line → drawing blood samples & ABG
➢ Assessment of blood loss
➢ Check proper connection of vasopressor & inotropic infusion (separate lines for these)
➢ Invasive lines, other adjuvant drugs.
➢ Monitoring: American society of Anaesthesiologists monitoring, pulse pressure variation.
➢ Documentation

Role of 2nd anaesthesiologist

➢ Notifies OT-Coordinator, blood bank in charge, lab technician and follows up with them.
➢ Inform attenders about blood transfusion and take consent
➢ Helping in invasive lines, extra intravenous line
➢ Starting infusions, transfusions (cross checking blood bag details)
➢ Check for adverse reactions, monitor urine output

Role of OT-Coordinator: (Nurse in charge)

➢ Arrange MTP kit immediately
➢ Call 2nd sister for helping & allocate tasks to her
➢ Call ward boy & give necessary instructions
➢ Instruct PACU sister to raise issue order for 1st batch of blood and blood products and repeat the same for subsequent batches.
➢ Call lift person & inform need of MBT-Lift to ply between OT and blood bank floor only; inform lift person to continue routine work post calling off MTP need.

Role of Circulating nurse

➢ Indenting blood & blood products, preparing requisition forms→ (Re doing it multiple times as needed)
➢ Follow up of lab investigations

Role of 2nd Circulating nurse

➢ Sending samples
1st to blood bank for crossmatching
2nd to lab for blood tests
3rd for ABG
➢ Inform lab → urgent samples of deteriorating patient } Via pneumatic chute
➢ Get ABG report back

Role of Ward Boy

1st Round: Take requisition form & submit to blood bank.
2nd Round: Bring blood & blood products (once 2nd anaesthesiologist confirms with blood bank) } In ice box
3rd Round: Redo task.

Role of Anaesthesia Technician

➢ Helping with intravenous cannulation
➢ Attaching pressure bag
➢ Helping in collecting samples
➢ Starting intravenous infusions
➢ Syringe pump to attach & keep ready (functioning)
➢ Fluid warmer to connect
➢ Warm air blower to arrange

Monitoring & Optimisation

Depending on Patient Status we will Monitor

➢ CBP
➢ PT-INR, APTT, Fibrinogen
➢ Ionised Calcium
➢ ABG
➢ POC test: Thromboelastography (where provision is there)

We Will Optimize

➢ Oxygenation: monitoring patient saturation, arterial partial pressure of oxygen in ABG
➢ Cardiac output: standard haemodynamic monitoring, Cardiac Output monitor to use where available
➢ Tissue perfusion: monitoring end organ functions (urine output, electrocardiogram changes, capillary refill time, lactate)
➢ Metabolic state: Rechecking ABG

Goals

➢ Temperature >35°Celsius
➢ pH>7.2
➢ Base excess<- 6
➢ Lactate <4
➢ Platelets > 50000/ µl

- PT/APTT<1.5* normal
- INR <1.5
- Fibrinogen >1g/L

Dosages

- Platelet count <50000/µl- 1 SDP or 4 RDPs
- INR >1.5 - FFP @ 15ml/kilogram
- Fibrinogen < 1g/L - Cryoprecipitate 10 units
- Tranexamic acid - 1g intravenously over 10 minutes followed by 1g infusion over 8 hours

Resuscitation

- Avoid lethal triad of hypothermia, acidosis and coagulopathy
- Avoid excessive crystalloid/colloid
- Tolerate permissive hypotension
- Haemoglobin alone should not be trigger for transfusion
- Target Heart rate < 100/minute
- Target Systolic blood pressure = 90 mmHg
- Target Mean arterial pressure: 60-65 mmHg

Special Situations

Patient on Warfarin: FFPs followed by Vitamin K followed by Prothrombin complex concentrate
Obstetric haemorrhage: chance of early Disseminated Intravascular Coagulation -- Cryoprecipitate
Head injury: target platelet count > 100000/µl, permissive hypotension is contraindicated

Consider Use of Cell Salvage Where Feasible & Provision Available

Recombinant FVIIa consideration

- Uncontrolled haemorrhage in salvageable patient
- Failed surgical or radiological measures to control bleeding
- Adequate blood component replacement over
- pH>7.2, Temperature >34°Celsius

Blood Bank

- 1st Batch issued
- →ER --- Group specific 2 PRBCs (once BG known in 5 mins)
- →ER --- 2 PRBCs O negative (BG not known)
- → OT --- 2 PRBCS (BG known)
- ABG report to arrive by this time
- 1st 2ml sample for crossmatching received in blood bank
- 2nd Batch
- → 2 LRBCs
- → 2 FFPs
- 3rd Batch
- → 2 LRBCs
- → 2 FFPs
- → 4/6 RDPs (same or most compatible group)
- To resend 2ml sample for crossmatching this time
- Lab reports will come by this time
- 4th Batch
- → 2 LRBCs
- → 2 FFPs
- →10 Cryoprecipitate

Performance Indicators

- Time to transfuse 1st PRBC and 1st FFP post MTP activation.
- Adherence to predetermined ratio in 1-2 hours post MTP initiation followed or not.
- Time between decision to terminate MTP and notifying blood bank, lab and others involved in the process.
- Wastage rates of blood products.

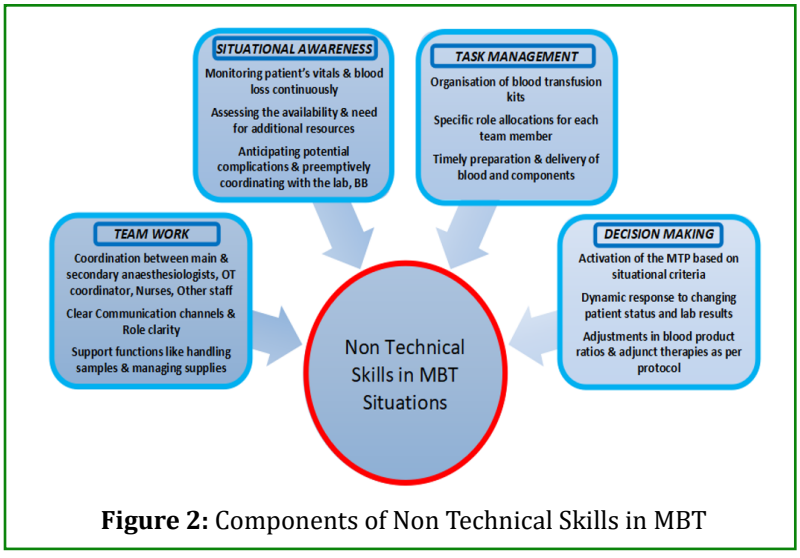

Figure 2: Components of Non Technical Skills in MBT

Conclusion

Managing massive blood loss is possible by concerted team effort comprising of medical, paramedical and other members of the system. Current protocols guide us to a rational transfusion practice with individualised clinical approach. Majority of transfusion related complications are preventable and we should emphasise on reducing the contributing human errors to nil, thus comes the importance of assigning roles and allocating tasks during MBT. Also, we have focused here on enhancing health care team outcomes by interprofessional pre-planning, conducting scheduled drills, involving all related departments and by ensuring availability of O negative blood and universal thawed plasma (AB plasma) in BB. Performance indicators used help us to avoid wastage of blood products and refine our tasks within specific time limits. The ideal ratio of blood products and patient specific modifications vary in each institution. Thus, time has come not only to practise MBT when indicated but to follow this defined approach with clearly mentioned triggers, endpoints, technique, outcomes, adjunct drugs and most importantly to adhere to the tasks mentioned in specific role cards in order to streamline and smoothly execute the process without any hindrances and delay. The importance of non-technical skills as we discuss here can be the focus of future articles.

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