

Clinical practice guideline on anaesthesia and perioperative blood transfusion management.

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Abstract

Hemorrhage may account for a third of in-hospital deaths, particularly in the first 24 h after admission. In massive hemorrhage, mortality exceeds 50%, such figures emphasize that the importance of early recognition of major blood loss and the need for effective action to prevent shock and its consequences. Surgical control to arrest the cause of the hemorrhage is the main intervention, but even when surgery is performed aggressively, hemorrhage portends low survival, more over; Currently, the ideal transfusion ratios or models for transfusion and coagulation management of patients with hemorrhage are unclear or controversial. Additionally, the overall rate of appropriate use of blood was 40.7%; it was inappropriate in 19.2% of cases (hemoglobin > 11 g dl⁻¹). Therefore this review will address new information regarding trauma-induced coagulopathy, priorities for intervention, Anesthetics considerations and not to take extra risk comments for management of operative massive bleeding and traumatic patients. To obtain a systematically developed guideline statements that assists in decision-making about appropriate health care and safe use of intra-operative blood transfusion, depending on local circumstances and accessibility at the point of clinical activity. To examine sound and update scientific evidences, which are intended to supplement current resuscitation guidelines and are specifically directed at improving Anaesthetic management of pre-operative anemia, pre-operative hemorrhagic shock and peri-operative acute massive blood loss events. To adapt with discussions and recommendations on why to take extra risk and priorities for treatment, from those revised literatures and professional consensus. To take part in the Hospital Transfusion Committee members and facilitate the development of protocols for the management of safe transfusion and coagulopathies. To take in to account simple template guidelines for acute blood loss which may be modified with local circumstances and displayed in clinical areas.

Keywords: Anesthesia, Blood transfusion.

Introduction

Massive operative blood loss still represents a major challenge for the operating team members / Hemorrhagic shock accounts for 80% of deaths in the operating theatre and up to 50% of deaths in the first 24 h after injury, and still trauma is the leading cause of death in all ages from 1 to 44 years. Cornerstones of sufficient management are the early recognition of massive bleeding, the prompt initiation of a goal-directed therapy, the anticipation of forthcoming therapeutic requirements and efficient interdisciplinary communication to provide mandatory logistic resources because the management of massive hemorrhage is usually only one component of the management of a critically unwell patient. [1].

Elements and phases for the development of guidelines

I. Systemic review on different literatures via PICO approach and on three phases;

- a) Critical bleeding /massive transfusion
- b) Medical and intensive care
- c) Obstetric and paediatric/neonates

II. Clinical direction or steering provided by tutors and under guidance of my seniors.

III. Clinical /Consumer Reference Groups (CRG):- experts working and colleagues.

Clinical research/background questions and material for the level of evidences

Systemic review questions

Question 1: In patients with undergoing surgery what is the effect of a multidisciplinary, multimodal programmatic approach to perioperative patient blood management on patient outcome?

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Question 2: In patients undergoing surgery what is the effect of perioperative strategies that minimise blood loss on morbidity, mortality and RBC transfusion?

Question 3: In patients undergoing surgery, is anaemia an independent risk factor for adverse outcomes?

Clinical guidance and some of Anaesthetic considerations

Recommendations-Perioperative Patient Blood Management

R1 C: Health-care services should establish a multidisciplinary, multimodal perioperative PBM program (Grade C). This should include preoperative optimization of red cell mass and coagulation status, meticulous attention to surgical homeostasis and minimization of perioperative blood loss.

Blood conservation strategies-Preoperative

Recommendation-Preoperative Autologous Donation (PAD)

R2 C The routine use of PAD is not recommended because, it reduces the risk of allogeneic RBC transfusion, it increases the risk of receiving any RBC transfusion (allogeneic and autologous) (C).

Blood conservation strategies-Intraoperative

Recommendation-Prevention of hypothermia

R2 A: In patients undergoing surgery measures to prevent hypothermia should be used (A).

Recommendation for Deliberate induced hypotension

R3 C: In patients undergoing radical prostatectomy or major joint replacement, if substantial blood loss is anticipated, deliberate induced hypotension (MAP 50-60 mmHg) should be considered, perfusion (C).

Recommendation-Acute Normovolaemic Haemodilution (ANH)

R4 C: In adult patients undergoing surgery in which substantial blood loss is anticipated, the use of ANH should be considered (C).

Anaemia management

Recommendations-Preoperative anemia assessment

R5 C: In patients undergoing non-cardiac surgery, preoperative anaemia should be identified, evaluated & managed to

Grade	Definition
A	Body of evidence can be trusted to guide practice
B	Body of evidence can be trusted to guide practice in most situations
C	Body of evidence provides some support for recommendation(s) but care should be taken in its application
D	Body of evidence is weak and recommendations must be applied with caution

A→Excellent, B → Good, C/→Satisfactory, D→Poor

Figure 1: Materials for the level of evidence.

Component	A - Excellent	B - Good	C - Satisfactory	D - Poor
Evidence base	Several Level I or II studies with low risk of bias	One or two Level II studies with low risk of bias or a systematic review, or multiple Level III studies with low risk of bias	Level III studies with low risk of bias, or Level I or II studies with moderate risk of bias	Level IV studies, or Level I-III studies with high risk of bias
Consistency	All studies consistent	Most studies consistent and inconsistency can be explained	Some inconsistency reflecting genuine uncertainty around clinical question	Evidence is inconsistent
Clinical impact	Very large	Substantial	Moderate	Slight or restricted
Generalisability	Population/s studied in the body of evidence are the same as the target population for the guideline	Population/s studied in the body of evidence are similar to the target population for the guideline	Population/s studied in the body of evidence are different to the target population, but it is clinically sensible to apply this evidence to the target population for the guideline	Population/s studied in the body of evidence are different to the target population and it is hard to judge whether it is sensible to generalise to the target population for the guideline
Applicability	Directly applicable to the Australian health-care context	Applicable to the Australian health-care context, with a few caveats	Probably applicable to the Australian health-care context, with some caveats	Not applicable to the Australian health-care context

Figure 2: Body of evidence matrix.

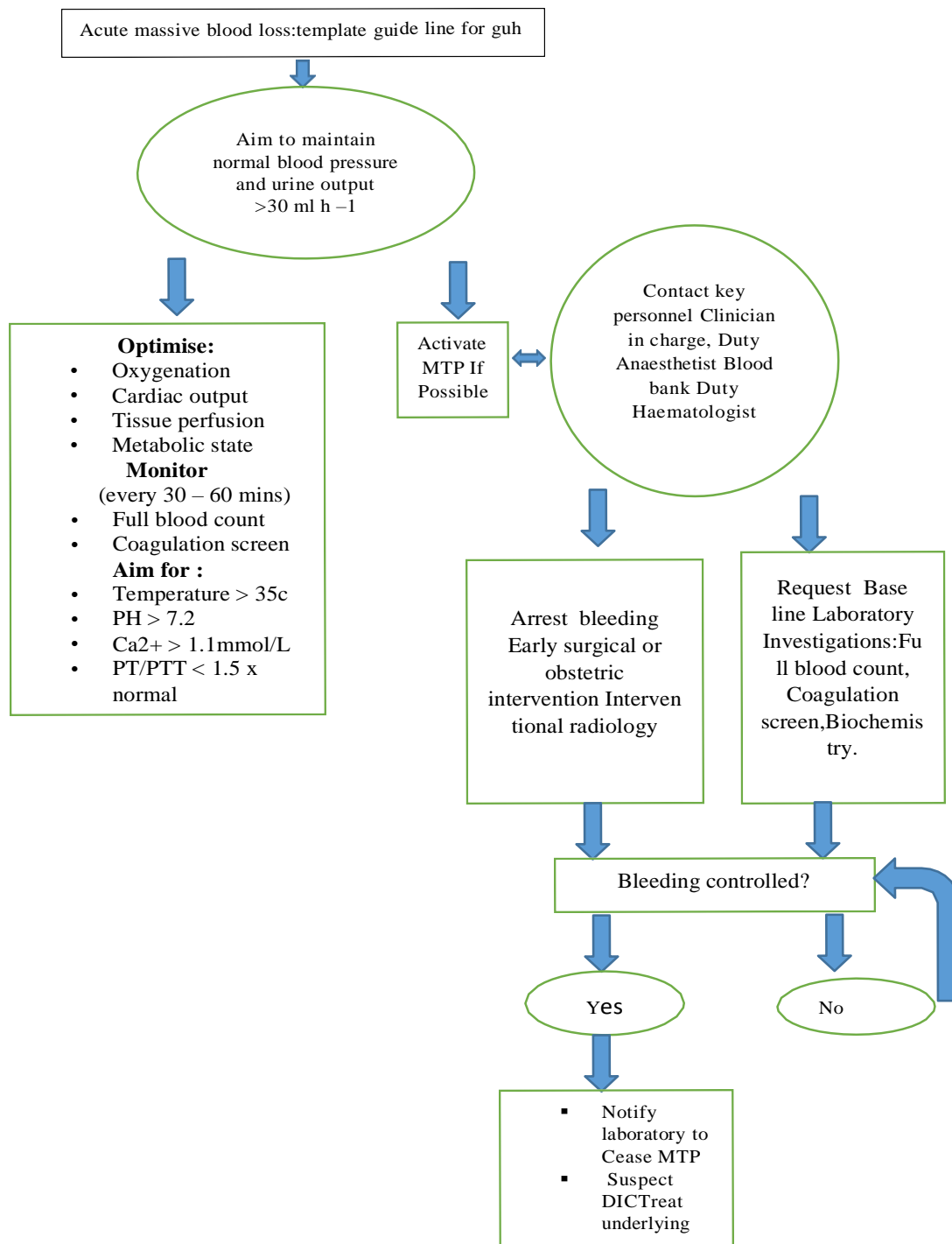


Figure 3: Management of Acute Massive Blood Loss: A Template guideline.

minimize RBC transfusion, which may be associated with an increased risk of morbidity, mortality, ICU length of stay & hospital length of stay (C).

R6 C: RBC transfusion should not be dictated by a Hb ‘trigger’ alone, but should be based on assessment of the patient’s clinical status. In the absence of acute myocardial or cerebrovascular ischemia, postoperative transfusion may be inappropriate for patients with an Hb level of >80g/L.

Some of Anaesthesiological techniques for saving blood

- Avoid hypertension and tachycardia.

- Avoid coughing, straining, and patient maneuvers.
- Controlled hypotension (a reduction of systolic blood pressure down to 80-90 mmHg, a reduction in mean blood pressure down to 50-65 mmHg, or a 30% reduction of the mean baseline blood pressure) can be obtained pharmacologically or by spinal or epidural anesthesia.
- Avoid intraoperative hypothermia
- Positioning /trendlenerg
- Vasoconstrictor infiltrations over the incision site

Table 1: Effect of perioperative patient blood management program.

Evidence statement- for perioperative patient blood management	Evidence	Consistency	Clinical-impact	Generalizability	Applicability
A multidisciplinary, multimodal programmatic approach to perioperative patient blood management is associated with a reduction in transfusion requirements on non-cardiac surgeries.	x/D	√√/B	√√/B	√√/B	√/C

Table 2: Effect of perioperative strategies that minimize blood loss.

Evidence statement- Preoperative Autologous Donation	Evidence	Consistency	Clinical-impact	Generalisability	Applicability
In adult patients undergoing surgery in which substantial bloodloss is anticipated, PAD may reduce the volume of allogenic blood transfusion.	√/C	NA	√√/B	√/C	√√/B
In adult patients undergoing surgery in which substantial bloodloss is anticipated, PAD reduces preoperative haemoglobin concentration.	√/C	√√/B	√/C	√√/B	√√/B
In adult patients undergoing surgery in which substantial blood loss is anticipated, PAD does not appear to have an effect on the overall volume of blood transfusion.	√/C	NA	√√/B	√/C	√√/B

Table 3: Effect of anaemia assessment on outcomes.

Evidence statement- anaemia	Evidence	Consistency	Clinical-impact	Generalizability	Applicability
In patients undergoing non-cardiac surgery, preoperative anaemia is associated with an increased risk of postoperative morbidity and mortality.	√√/B	√√/B	√/C	√√/B	√/C
In patients undergoing non-cardiac surgery, preoperative anaemia is associated with an increased likelihood of transfusion and increased hospital length of stay.	√/C	√√√/A	√√/B	X	√/C
In patients undergoing non-cardiac surgery, postoperative anaemia is associated with an increased risk of postoperative morbidity and mortality.	√√/B	√√/B	√√/B	X	√/C
In patients undergoing non-cardiac surgery, postoperative anaemia is associated with an increased likelihood of transfusion	√/C	NA	√/C	√/C	√/C

- Post-operative adequate analgesia

Anaesthetic methods

- Volatile or total IV general anesthesia
- Neuraxial and other techniques c/w general anesthesia
- Type of ventilation.

Further considerations and controversies yet

The optimal amounts of plasma, platelet, cryoprecipitate, and other coagulation factors in relationship to the RBC transfusion volume are currently unknown, but current data support the use of plasma: RBC: platelet ratio of 1:1:1. Future prospective clinical trials will hopefully assist in continuing to improve the transfusion management of massively transfused patients with hemorrhage. Additionally there is a need for further studies to clarify these issues and provide firm evidence on which future recommendations can be based.

Conclusion

It is emphasized that, if avoidable deaths are to be prevented, Surgeons, Anesthetists, Hematologists and blood bank staff need to improve communications closely in order to achieve the goals of secure homeostasis, restoration of circulating volume, and effective management of blood loss replacement while avoiding for extra risks. Blood is a scarce resource. A critical approach to the use of blood is needed to minimize the risk to the patient from transfusion. The objective of blood transfusion, as specified by the ASA guidelines, is to improve inadequate oxygen delivery secondary to anemia.

In recent evidences, low hemoglobin was the primary trigger (72%). The other two common but inappropriate triggers were hypovolemia and the anesthetist's or surgeon's choice. Prevention of peri-operative hypothermia, controlled hypotension in experienced hands, and a reduction in central venous pressure (1-5 mmHg)/for liver resection/ can increasingly contribute to reducing intra-operative bleeding in selected patients. Now recommended criteria from recent ASA guidelines used to evaluate the rate of appropriate transfusion are hemoglobin greater than 8 g dl±1, hemoglobin greater than 10 g dl±1 in patients with medical co-morbidities and blood loss greater than 20% of blood volume when more than 1000 ml. On a recent study medical co-morbidities were found in 30 of the 140 patients transfused (21.4%). These patients had a significantly higher rate of appropriate transfusion of (80%) compared with the other patients (P<0.05, c2 test). Medical co morbidities such as coronary artery disease, renal dysfunction, left ventricular dysfunction, and chronic obstructive airway disease were recorded to have more appropriateness for transfusion. Operative blood loss estimation is subjective and often unreliable, because of inaccuracies in measurement from drains and swabs, inter-compartmental fluid shifts during surgery, and the delusional effects of crystalloid therapy. This can result in an overestimation of blood loss, provoking an excessive response. In studies, intraoperative hemoglobin estimation was found to be the more appropriate one /the primary trigger (72.1%)/transfusions in these patients were often appropriate, with a low incidence of inappropriate use (10.3%). Which can be made by; Objective laboratory Ixs for an intraoperative Hgb concentration. Or Subjective assessment for clinical sign and symptoms of adequate tissue

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oxygenation, & hemoglobin concentration (stable/unstable); i.e. In the presence of adequate cardiorespiratory function, there is evidence that a hemoglobin concentration of 9 ± 10 g dl ± 1 improves capillary perfusion, reduces viscosity and improves tissue oxygenation. A hemoglobin level of 8 g dl ± 1 seems an appropriate threshold for transfusion in surgical patients with no risk of ischemia, whereas a threshold of 10 g dl ± 1 can be just increased for patients who have compromised cardiorespiratory function. In massive hemorrhage, mortality exceeds 50%. Coagulopathy after hemorrhage is thought to be a secondary event because of depletion and dilution of coagulation factors however recently its more likely from acute trauma induced coagulopathies, therefore early MTP protocols should be considered. In selected patients, allogenic transfusion complications can be reduced by autologous blood transfusion, intraoperative blood salvage, or intraoperative isovolaemic haemo-dilution. A Massive Transfusion Protocol (MTP) is necessary in treating the massively hemorrhaging patient undergoing massive transfusion. To mitigate the lethal triad of acidosis, hypothermia, and coagulopathy; and the two goals of the MTP should be; Earlier and more aggressive transfusion intervention and Resuscitation with blood components that approximate whole blood as a part of damage control resuscitation. But inappropriate use of blood squanders a limited resource, causes unwanted side effects, and raises the cost of patient care. Inappropriate transfusions can be prevented by using strict preset criteria for triggering homologous blood administration, encouragement in Hospital Transfusion Committee members for formulating audits and seminars and also to take in to account simple template guidelines which can be displayed in clinical areas of concerns.

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