

## A CLINICAL AUDIT ON BLOOD TRANSFUSION AMONG POST-CORONARY ARTERY BYPASS GRAFT SURGERY PATIENTS IN CARDIAC SURGICAL INTENSIVE CARE UNIT

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### Abstract

**Objective:** To evaluate the effectiveness of blood transfusion protocol among the post-coronary artery bypass graft (CABG) surgery patients in intensive care unit (ICU) in order to improve blood transfusion safety.

**Methods:** The audit was done retrospectively in the cardiac surgery ICU of Sheikh Mohamed Bin Zayed Al Nahyan Institute of Cardiology, Quetta (SMBZAN ICQ) Baluchistan. All CABG patients' who received blood transfusions postoperatively in the surgical ICU from 1st July 2023 to 1st January 2024 were included and the National Blood Authority's (NBA) audit tool was modified for data collection.

**Results:** It was found that 54% of patients underwent packed cell volume (PCV) transfusion during this period. Among these; the transfusion rate was 64% for men and 36% for women. 93% of transfusions were based on clinical symptoms including respiratory and hemodynamic instability. Furthermore, 7% of transfusions based solely on low haemoglobin levels, were considered inappropriate because there was no evidence of respiratory or hemodynamic decompensation in the health record.

**Conclusion:** The audit signifies positively impacted PCV transfusion appropriateness in post CABG patients, both in terms of quality and quantity.

### INTRODUCTION

One of the most prevalent interventions for patients after surgery is blood transfusion, especially for those who have undergone major surgeries. Previously, PCV was administered to target a haemoglobin level exceeding 10 g/dL, even though there was no evidence to support this practice. This practise was based on the assumption that anaemia is not well

tolerated in sick people and that raising the haemoglobin concentration would enhance oxygen delivery to the tissues, thus reducing the disparity between oxygen demand and supply. [1] Transfusions are not absolutely risk-free. In addition to the high risk of infectious complications, blood transfusions also pose a significant risk of life-

threatening non-infectious complications such as transfusion-related acute lung injury (TRALI) and transfusion-associated circulatory overload (TACO). They appear to have immunomodulatory effects, which can elevate the likelihood of nosocomial infections. [2] Coronary artery bypass grafting (CABG) is a major cardiac surgical procedure. Cardiac surgery consumes the most blood products in the medical field, accounting for 10% to 15% of the US blood supply, with half of patients requiring blood products.[3]. An important clinical problem in patients undergoing coronary artery bypass grafting (CABG) is peri-operative bleeding leading to transfusion of allogeneic blood components. This problem persists despite ongoing improvements in operative and anaesthesia techniques and postoperative management. Anaemia is a common complication in cardiac surgery during the postoperative period and may result in transfusion in up to 90% of this population. According to various studies, transfusion of blood products in cardiac surgery is associated with increased mortality and morbidity. [ 4,5]. Numerous procedures are performed on the heart and major vascular structures in its proximity during cardiac surgery. In general, cardiac surgery has a higher risk than non-cardiac surgery of major adverse postoperative complications. McCartney SL et al. summarised the available literature on postoperative anaemia and its contribution to adverse outcomes after cardiac surgery. [6]. Additionally, transfusion aims to reduce the potential risks associated with anaemia. Cardiovascular disease decreases the ability to tolerate anaemia.[7]. Experimental evidence suggests that anaemia is less tolerated in cases of cardiovascular disease; however, no study has examined the effect of cardiovascular disease on outcome in anaemic patients. [8,9,10]. Despite the fact blood transfusions are not completely safe, they are associated with a number of complications listed below. [11,12]

Increased rate of discharge to ongoing inpatient care

Increased length of hospital stays

Worse surgical and medical outcomes

Allergic reactions

Transfusion-related acute lung injury

Transfusion-associated circulatory overload

Venous thromboembolism

Graft versus host disease

Immunosuppression

Postoperative infections

There are no known Universal Guidelines for blood transfusion in post CABG patients. There are many parameters that should be considered before blood transfusion in post CABG including the Hemodynamic instability, active bleeding, red cell volume, circulatory status, and oxygen requirement [13]. Since Hebert and colleagues published their study on critical care transfusion requirements, the usage of transfusion triggers has been the subject of considerable debate. [14].

Some of the International guidelines regarding the blood transfusion include:

NICE guidelines NG 24–Blood transfusion (2015)- <70 g. l–1, <80 g. l–1 (patients with acute coronary syndrome)

British Society for Haematology–Guidelines on the management of anaemia and red cell transfusion in adult critically ill patients (2012)- <70 g. l–1

Association for the Advancement of blood and biotherapies AABB (2023)- < 7 g/dL.

<8 g/dL (for patients undergoing cardiac surgery)

Talking about post operative patients the decision to transfuse PCV or whole blood depends on the amount of the blood loss, the Hb concentration and the patient's clinical condition. [15,16,17,18,19,20,21]. The tables 1 and 2 adapted from: “Recommendations for the transfusion management of patients in the peri-operative period. III. The post-operative period” state the criteria for transfusion in patients with acute post-operative anaemia [15].

(Tables 1 and 2 are described below)

The main objective of this audit was to assess the use of allogeneic blood products among patients who had undergone CABG and to compare transfusion practises among post-CABG patients in the surgical ICU with international guidelines. Furthermore, review whether there were any indications apart from Hb that led to transfusion and what the outcome was. Make the necessary amendments to our current protocols in order to provide the best possible postoperative care to the patients and to reduce the risk of complications associated with blood transfusion. It will not only benefit the patients but

also improve the clinical skills and practise of the doctors as well.

## Material/Subjects/Patients and methods

Data was collected retrospectively from hospitals health record system, each PCV unit administered was classified as a single or multiple-transfusion episode. In cases where a patient received transfusions exceeding one unit within a span of six hours, the occurrence was classified as a multiple-unit episode. The patient's medical record was examined for additional information that was not documented during the transfusion but could have justified it, such as notes from the operating room indicating significant blood loss or deranged patient's observations. The audit was carried out in the cardiac surgery department of SMBZAN ICQ. Among the 55 patients who underwent cardiac surgery from July 1st, 2023, to January 1st, 2024, the sample comprised 30 patients who underwent CABG and received a blood transfusion postoperatively in the ICU during this period. This audit was to assess whether the transfusions were according to the guidelines, did the patients develop any short-term or long-term complications, and were there any hemodynamic improvements post-transfusion. 25 patients were excluded; the criteria for exclusion were those who underwent other cardiac surgeries, including valve replacement, ASD, myxoma removal, or those CABG patients who did not receive transfusions in the surgical ICU. An ethics approval was granted from the hospital Human Research Ethics Committee (HREC) as the data were collected for auditing and quality improvement. A National Blood Authority (NBA) audit tool was modified for data collection [22].

## Results

54% patients underwent PCV transfusions from July 2023 to January 2024; among these, the transfusion rate was higher in males (64%), while 36% were females. The audit highlighted that 93% of transfusions were based on clinical symptoms, including respiratory and hemodynamic instability. Only 7% of transfusions were based on low haemoglobin levels and were deemed inappropriate due to a lack of evidence in the health record of respiratory or hemodynamic decompensations.

Furthermore, a marked improvement in clinical symptoms post-transfusion was noted.

(Table-3: Results are described in the table below)

## Discussion

Blood transfusions are a crucial and frequently used procedure in cardiac surgery. Although there is ample evidence and established guidelines, there is significant variability in clinical practices regarding blood transfusion. Studies suggest that blood transfusions lead to serious complications and can dramatically increase the risk of morbidity and mortality, especially in IHD [23]. When it comes to heart, it is important to consider all the parameters before taking any decision. Anaemia as well as blood transfusion both pose risks to patients, especially after cardiac surgery. Therefore, it is important that international guidelines are considered before taking any decision for the welfare of patients.

## Conclusion

This clinical audit highlights the appropriateness of the implementation of clinical guidelines in our institute both in terms of quality and quantity. In light of the above, further such audits on transfusion practices are needed to bring in additional improvements and adherence to guidelines in order to decrease the number of transfusions further through education and compliance.

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**Table 1: Criteria for transfusion in patients with acute post-operative anaemia**

Class of haemorrhage	Reduction of blood volume (%)	Blood loss (mL)	Indication for transfusion of PCV
Class I	15%	<750	Not necessary, unless pre-existing anaemia
Class II	15-30%	750-1500ml	Not necessary, unless pre-existing anaemia and/or cardiopulmonary disease
Class III	30-40%	1500-2,000	Probably necessary
Class IV	>40%	>2,000	Necessary

mL: millilitre, PCV: packed cell volume

**Table 2: Criteria for the transfusion of patients with acute post-operative anaemia**

Hb value	Presence of risk factors/mechanisms of compensation	Transfusion Therapy
≤60 g/L	Transfusion therapy is almost always necessary	Yes
60–80 g/L	Absence of risk factors/adequate mechanisms of compensation	No
	Presence of risk factors (e.g. coronary artery disease, heart failure, cerebrovascular disease/limited mechanisms of compensation)	Yes
	Presence of symptoms indicative of hypoxia (physiological transfusion triggers: tachycardia, hypotension, electrocardiographic signs of ischaemia, lactic acidosis, etc.)	Yes
80–100 g/L	Presence of symptoms indicative of hypoxia (physiological transfusion triggers: tachycardia, hypotension, electrocardiographic signs of ischaemia, lactic acidosis, etc.)	Yes
>100 g/L	Transfusion therapy is very rarely needed	No

g/L: gram per litre

**Table 3: Results are described in the table below**

Number of patients transfused	30
% Male	64%
% Female	36%
Number of transfusion episodes	
1 unit	15
2 units	15
> 2 units	0
Haemoglobin pre-transfusion (Average)	7.6
Haemoglobin post transfusion	9.04
Clinically appropriate	93%

Clinically not appropriate	7%
Reason for transfusion	
Excessive bleeding(perioperatily)	0
Symptomatic anaemia	28
Haemoglobin only	2
No reason	0

