

Review Article

Haemovigilance and Transfusion Safety: A Review

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Abstract: Blood transfusion saves lives and improves health, but many patients requiring transfusion do not have timely access to safe blood. Blood transfusion is always associated with some level of risk. Haemovigilance is a continuous process of data collection and analysis of transfusion-related adverse reactions/events in order to investigate their causes and outcomes, and prevent their occurrence or recurrence. It is a risk monitoring system integral to the practice of transfusion medicine whose ultimate purpose is to improve the quality and safety of transfusion therapy.

Keywords: Haemovigilance, National Haemovigilance Programme, Blood Safety.

INTRODUCTION

In 2005, the World Health Organization (WHO) published guidelines on Adverse Event Reporting and Learning Systems: from 'Information to Action' which emphasize the fundamental role of patient safety reporting systems in enhancing patient safety by learning from failures of the health care system, and that the effectiveness of such systems should be measured not only by data reporting and analysis but by the use of such systems to improve patient safety.

An adverse event is defined as an undesirable and unintended occurrence before, during or after transfusion of blood or blood component which may be related to the administration of the blood or component. It may be the result of an error or an incident and it may or not result in a reaction in a recipient. An adverse reaction is an undesirable response or effect in a patient temporally associated with the administration of blood or blood component [1].

The word 'haemovigilance' (he'movigilance in French) was coined in France in 1990 in analogy to the already existing term 'pharmacovigilance'. It is derived from the Greek word 'haema' = blood and the Latin word 'vigilans' = watchful. According to World Health Organization (WHO), International Haemovigilance Network (IHN) and International Society of Blood Transfusion (ISBT) "Haemovigilance" is defined as 'a

set of surveillance procedures covering the whole transfusion chain from the collection of blood and its components to the follow-up of its recipients, intended to collect and assess information on unexpected and undesirable effects resulting from the therapeutic use of labile blood products, and to prevent their occurrence and recurrence' [2, 3]. The system should include monitoring, identification, reporting, investigating and analysis of adverse events near-misses and reactions related to transfusion and manufacturing. A near miss is an error or deviation from standard procedures or policies that is discovered before the start of the transfusion and that could have led to a wrongful transfusion or to a reaction in a recipient [3]. It concerns the follow-up of whole blood and labile blood components for transfusion: red cell concentrates, platelets and plasma (fresh frozen plasma, FFP).

Haemovigilance, as a safety concept, appeared in the beginning of the 1990s. It was initially developed by the French Blood Agency as a national system of surveillance and alert, from blood collection to the follow-up of the recipients [4]. Haemovigilance systems now have been implemented globally in most developed countries, to monitor the adverse events and incidents associated with blood donations and transfusions [5].

It is now well-recognized as an integral part of quality management system in a blood programme, to monitor the adverse events and incidents associated with blood donations and transfusions. A national haemovigilance system is of value in identifying possible areas in need of improvement in the national transfusion system.

Blood safety and availability

Around 107 million units of blood donations are collected globally every year. Nearly 50% of these blood donations are collected in high-income countries, home to 15% of the world's population. In low-income countries, up to 65% of blood transfusions are given to children under five years of age; whereas in high-income countries, the most frequently transfused patient group is over 65 years of age, accounting for up to 76% of all transfusions. Blood donation rate in high-income countries is 39.2 donations per 1000 population; 12.6 donations in middle-income and 4.0 donations in low-income countries [6].

Global database on blood safety

The WHO Global Database on Blood Safety (GDBS) was established in 1998 to address global concerns about the availability, safety and accessibility of blood for transfusion. The objective of this activity is to collect and analyze data from all countries on blood and blood product safety as the basis for effective action to improve blood transfusion services globally. A questionnaire has been developed as a standardized tool for the collection of data, is based on the WHO Aide-Mémoire for National Health Programmes: Blood Safety, which covers the four major components of the integrated strategy for blood safety advocated by WHO [7]. The data collected through the GDBS questionnaire are analysed and reports are published on the WHO website. The focus of the analysis is to provide information on the current status of blood transfusion services, assess country needs in improving blood safety, formulate strategic recommendations to countries, plan and implement activities and evaluate progress.

National blood policy and organization

Providing safe and adequate blood should be an integral part of every country's national health care policy and infrastructure. WHO recommends that all activities related to blood collection, testing, processing, storage and distribution should be coordinated at the national level through effective organization and a national blood policy. This should be supported by appropriate legislation to promote uniform implementation of standards and consistency in the quality and safety of blood and blood products.

In 2011, 68% of countries had a national blood policy, compared with 60% of countries in 2004. Overall, 62% of countries have specific legislation covering the safety and quality of blood transfusion:

- 81% of high-income countries
- 60% of middle-income countries
- 44% of low-income countries [8].

National Haemovigilance Programme of India

Indian Pharmacopoeia Commission in collaboration with National Institute of Biologicals, NOIDA, Uttar Pradesh has launched a Haemovigilance Programme of India (HvPI) on 10th Dec 2012 across the country under its Pharmacovigilance Programme of India (PvPI). Primary objective is to track adverse reactions / events and incidences associated with blood transfusion and blood product administration (Haemovigilance) and to help identify trends, recommend best practices and interventions required to improve patient care and safety. In order to collect and collate the data pertaining to all over the country, a software "Haemo-Vigil" has been developed. Programme has already enrolled 117 Medical College and Hospitals in India. National Institute of Biologicals is the Coordinating Centre, for HvPI to collate & analyze data with respect to Biologicals & Haemovigilance. A Core Group & Advisory Committee in this regard has already been constituted and first meeting of advisory committee was held on 29th Nov, 2012 to finalize Haemovigilance Transfusion Reaction Reporting Form (TRRF) & Guidance Document. The ultimate goal of this Haemovigilance programme of India is to be a part of the International Haemovigilance Network (IHN) which presently has 28 countries as its member and provides a global forum for sharing best practices and benchmarking of Haemovigilance data [9].

Objective of reporting adverse reactions and adverse reactions in transfusion in National Haemovigilance Programme [9]

- Reporting is a tool for obtaining information which can be used to improve the product safety
- A national reporting system, therefore, can usefully be regarded as a tool to advance public policy concerning patient safety.
- Reporting can help identify hazards and risks, and provide information as to where the system is breaking down.
- This can help target improvement efforts and systems changes to reduce the likelihood of injury to future patients.
- Reporting of suspected adverse reactions in a timely manner facilitates effective risk management.
- ADR Monitoring Centers: are those medical colleges & institutes / hospitals/ blood banks in India that are registered with the Pharmacovigilance National Co-coordinating Center for reporting the adverse reactions that occurs during blood/ component transfusion or Blood Product (plasma derived products) administration.



Privacy and security of data

Haemovigilance reports will contain no identifiable or re-identifiable data; that no patient, clinician, staff member or healthcare facility is identifiable from materials contained within the report.

Responsibilities of Medical and Nursing Staff of the ADR Monitoring Centers [9]

Physicians and nurses attending to patients having suspected transfusion complications should perform the following documentation and reporting functions:

- Attending nursing staff should report suspected transfusion reaction immediately to the attending physician
- Document the details of the patient as well as the implicated units/ products in the Form and retain in the patient's file
- Send the details of the transfusion reaction to the Department Transfusion Medicine in the Form
- Assess the imputability levels of the adverse reactions in coordination with the Department of Transfusion Medicine
- Maintain records of the complication in the patient's medical record, including the report of the investigation completed by the Department of Transfusion Medicine.

- To enter the necessary details as per the documentation required in the Transfusion Reaction-Traceability document (TR-TD)

Imputability levels [9]

Imputability means the likelihood that a serious adverse reaction in a recipient can be attributed to the blood or blood component or blood product transfused. The Imputability levels are given below:

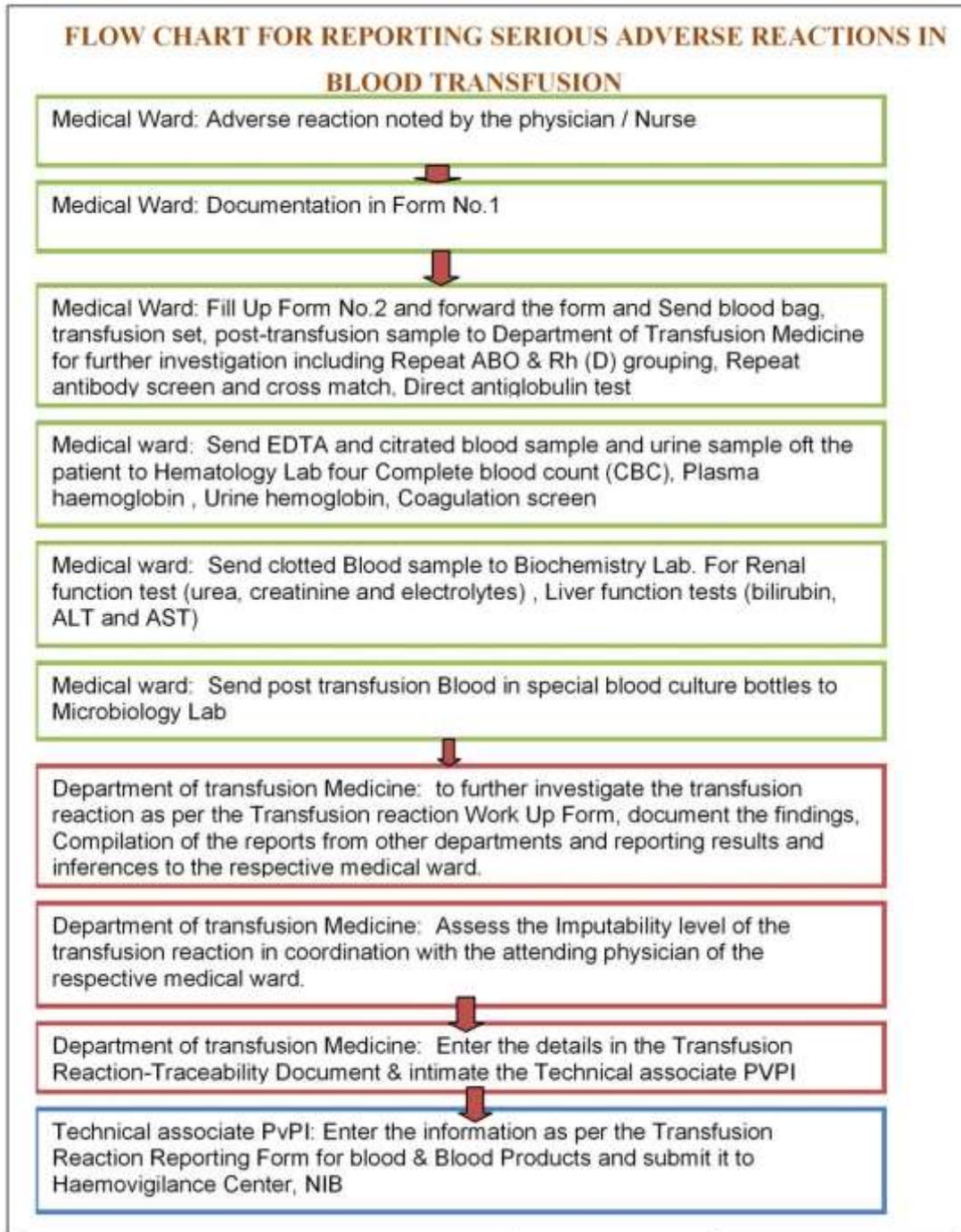
- **Definite (certain):** when there is conclusive evidence beyond reasonable doubt that the adverse event can be attributed to the transfusion.
- **Probable (likely):** when the evidence is clearly in favor of attributing the adverse event to the transfusion.
- **Possible:** when the evidence is indeterminate for attributing the adverse event to the transfusion or an alternate cause.
- **Unlikely (doubtful):** when the evidence is clearly in favor of attributing the adverse event to causes other than the transfusion.
- **Excluded:** When there is conclusive evidence beyond reasonable doubt that the adverse event can be attributed to causes other than the transfusion.

What is reported and when? [10]

- In most systems, not only adverse reactions (in patients) but also adverse events (AE) are reported.
- Reporting of all adverse events results is better for vigilance purposes and raises awareness as

serious AR are rare events. It requires more resources, however.

- Donor vigilance may contribute to reduce complications, lead to increased frequency of donation and improve donor satisfaction.



Importance of haemovigilance and reports on transfusion reaction in blood component

Study had shown that only 0.13% transfusion reactions were reported, points to the lack of regular reporting of transfusion reactions, as well as the fact that there is only one report of delayed transfusion reaction. In this study they have shown that in the period from 2000 to 2009, 180 transfusion reactions

were reported at the Department of Clinical Transfusion of the Service for Blood Transfusion of Vojvodina in Novi Sad. Out of 180 reported transfusion reactions, 98 (54.4%) were febrile non-haemolytic transfusion reactions, 69 (38.3%) allergic reactions and 2 (1.11%) haemolytic reactions. Blood components that caused most of transfusion reactions were erythrocytes (62.4%), fresh frozen plasma (11.2%) and platelets

(14.4%). All patients underwent multiple transfusions [11].

So, to improve and make blood transfusion safer it is necessary to respect all pre-transfusion procedures, constant follow up of blood transfusion must be done and patients with diagnosed non-haemolytic transfusion reaction should be given leukocyte reduced blood components.

Estimates of adverse event incidence in blood donors based on other published international studies range considerably from 5%-33% [12, 13].

Risks and factors contributing to transfusion related adverse events [14]

Certain factors may increase the likelihood of a transfusion related adverse effect and these include:

- Individual patient characteristics
- Blood component
- Equipment
- Concomitant medications and intravenous fluids

Individual patient characteristics

Patients who have previously been transfused, multiparous women and patients receiving emergency uncross-matched transfusion are at increased risk of immediate and delayed haemolytic transfusion reactions. Febrile, allergic and anaphylactic reactions occur more commonly in multiparous women and in patients with IgA deficiency and anti-IgA antibodies.

Blood component

Platelet and granulocyte transfusions are associated with the highest rates of febrile non-haemolytic transfusion reactions. The incidence of such reactions can be modified by changes to the blood component processed by leucodepletion. All red cell and platelet components produced by the blood service are leucodepleted. Platelets, which require storage at 20–24 °C, are associated with higher rates of bacterial contamination than red cells, which are routinely refrigerated. All platelets are subject to routine bacterial culture and screening, which allows detection of a bacterial contaminated product. Transfusion of fresh frozen plasma is associated with a higher risk of allergic reactions. Some reactions are mild, but severe life-threatening reactions such as anaphylaxis and Transfusion-related acute lung injury (TRALI) may occur.

Equipment

All blood components are administered through specifically designed intravenous giving sets, which incorporate a 170–200 micron filter to remove debris and clots that may have accumulated during storage. All equipment must be specifically designed, and assessed as safe for blood administration and used in accordance with the manufacturer's operational procedures.

Concomitant medications and intravenous fluids

No medication or solutions should be added to or infused through the same tubing with blood or components except 0.9% Sodium Chloride, Injection (BP). ABO-compatible plasma or 4% Albumin or other suitable plasma expanders may be used with approval of the patient's physician. Crystalloid and colloid solutions containing calcium (eg, Haemaccel) must never be added to or administered through the same intravenous line as blood or component collected in an anticoagulant containing citrate because they interfere with the anticoagulant effect, resulting in clotting.

Procedures

Clear written procedures and adequate staff training are essential for all aspects of the clinical transfusion process—from initial collection of samples for pre-transfusion testing through to final documentation of the transfusion process and outcome. There are numerous opportunities for error during this process if procedures are not strictly followed. Recent reports (2005) from the UK indicate that nearly 60% of adverse events associated with transfusion are a result of 'wrong blood to wrong patient' [15].

The majority of these errors are the result of failure to follow procedures, or inadequate or unclear procedures.

Recommendation for better haemovigilance program

- Better national blood quality and safety initiatives
- Reducing or minimizing human errors
- More trained personnel
- Generate data standards
- Improve reporting capacity

CONCLUSION

The information gained from the haemovigilance and analyses facilitate corrective and preventive actions to be taken to minimize the potential risks associated with safety and quality in blood processing and transfusion for donors, patients and staff. Such information is also key to introduce required changes in the applicable policies, improve standards, systems and processes, assist in the formulation of guidelines, and increase the safety and quality of the entire process from donation to transfusion. Developing guidelines, audit and haemovigilance systems in countries with limited resources can be achieved more readily through a stepwise implementation.

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