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Review Article

Haemovigilance: New approach for safe Blood transfusion

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Abstract

Haemovigilance is an urgent need of the country to identify and prevent occurrence or recurrence of transfusion related adverse reactions, thereby to increase the safety and quality of blood transfusion and blood products administration. Haemovigilance is an organised scheme of monitoring, identifying, reporting, investigating and analysing adverse events and reactions pertinent to transfusion and manufacturing blood products. Thus the information collected will facilitate corrective and preventive actions to minimise the potential risks associated with blood collection, processing and transfusion to patients. Indian Pharmacopoeia Commission has started a Haemovigilance Program of India (HvPI) in 2012 under its Pharmacovigilance Program of India (PvPI) in collaboration with National Institute of Biologicals (NIB), Noida, Uttar Pradesh, under Ministry of Health and Family welfare, Government of India with a primary objective to track adverse reactions/events and incidences associated with blood transfusion and blood product administration. The main objective of this article is to brief (s) about the system which monitors each and every step of transfusion reaction.

Keywords: Haemovigilance, Blood transfusion, Adverse Events, Imputability, Donor vigilance, Haemovigil software

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1. Introduction

Haemovigilance is a “Set of surveillance procedures covering the entire blood transfusion chain, from the donation and processing of blood and its components. A haemovigilance system is an integral part of quality management in a blood system and is essential for the continual improvement of the quality and safety of blood products and to increase the safety, efficacy and efficiency of blood transfusion. National Institute of Biologicals (NIB) will be the National Coordinating Centre for Haemovigilance. This program will be implemented under overall ambit of Pharmacovigilance Program of India (PvPI), which is being coordinated by Indian Pharmacopoeia Commission (IPC). HAEMOVIGILANCE PROGRAM OF INDIA (HvPI) was established on 2012 10th December. Various haemovigilance programs have been developed and implemented in several countries including Canada, United Kingdom and France; and they publish their annual reports of adverse events associated with blood transfusion. The aim of these programmes is to have a system of surveillance and thus lower the risks associated with transfusion. (1)

Objectives (2):

- ❖ To collect, collate and analyse data related to transfusion reactions of blood and its components(Blood include homologous and autologous whole blood, fresh frozen plasma, red blood cells, platelets, cryoprecipitate, plasma derivatives etc.)
- ❖ To create awareness amongst healthcare professionals in the country for participation in the programme.
- ❖ To generate evidence based recommendations and assist Central Drugs Standards Control Organization (CDSCO) for undertaking blood safety related regulatory decisions.
- ❖ To communicate relevant information to all key stakeholders and to create national and international linkages.

Benefits (3):**Table 1** Benefits in implementing haemovigilance

Stake holder	Impact/outcome
Blood donor	Improved donor safety with reduction in severity of donor complications.
Blood transfusion service	Improved donor retention, return. Early detection of deficiencies and weaknesses and continuous improvement in the quality.
Patients receiving transfusion therapy	Reduced risk of harm due to adverse events.
Hospital blood bank and health care facility	Reduction in errors, omissions and system failures. Systematic and consistent reporting of all adverse events. Development of skills and expertise in the area of total quality management. Reduction in adverse events to ensure better health care outcomes. Less medico-legal action with an overall improvement of the community's regard of a particular facility.
Regional and national health authorities, regulatory and health agencies	Early detection of emerging pathogens and the implementation of measures to mitigate the associated risks. Identification and mitigation of non-infective risks. Identification of trends in adverse events and opportunity for timely corrective action.
Community	Better care and stewardship of the gift of blood donation. Improved donor and patient confidence and trust in the blood system.
International bodies, societies, organizations	Benchmarking, developing best practice and creating awareness

2. Haemovigilance program of India

Haemovigilance programme of India (HvPI) was launched on 10th December 2012. It is a centralized, well-structured programme for monitoring adverse reactions associated with transfusion of blood and administration of blood products. It was launched by Indian Pharmacopoeia Commission (IPC), Ministry of Health & Family Welfare, Government of India in collaboration with National Institute of Biologicals (NIB), Noida, Ministry of Health & Family Welfare, and Government of India.

This was laid down with 4 phases (4)

- Initiation phase
- Expansion & Consolidation phase
- Expansion & Maintenance phase
- Optimization phase

a) Initiation phase (2012-2013)

- Develop systems, software and procedures for reporting
- Enrol participants and start data collection
- Zonal workshops for awareness
- Publication of newsletter
- Finalisation of transfusion reaction reporting form (TRRF)
- Development of indigenous software (Haemovigil software)
- Ensure security and confidentiality of data

b) Expansion and consolidation phase (2013-2015)

- Continue enrolment

- Awareness and training of staff
- Continue zonal workshops
- Publication of news letter

c) Expansion and maintenance phase (2015-2017)

- Identify gaps and address appropriately
- Reasons for not reporting and improve the quality of data

d) Further plan

- Launch of detailed website for Haemovigilance
- Implementation of revised TRRF
- State working groups on Haemovigilance.

Haemovigilance- organogram

The entire organogram was headed by CDSCO (state regulatory authority) which regulates each and every step in the transfusion chain. Blood safety related regulatory decisions are taken and are implemented in an organized way by creating appropriate guidelines.

Haemovigilance-Protocol of Working

- *MONITORING* of whole transfusion chain according to country's policy.
- *IDENTIFYING* lacunas in the whole transfusion chain.
- *REPORTING* of unexpected effects resulting from the therapeutic use of liable blood products.
- *INVESTIGATING* and analysis of adverse events.
- *NEAR MISSES* (i.e. errors/deviations from standard procedures or policies).

- **UPDATING IN POLICIES** accordingly related to transfusion and manufacturing to prevent their occurrence and reoccurrence.

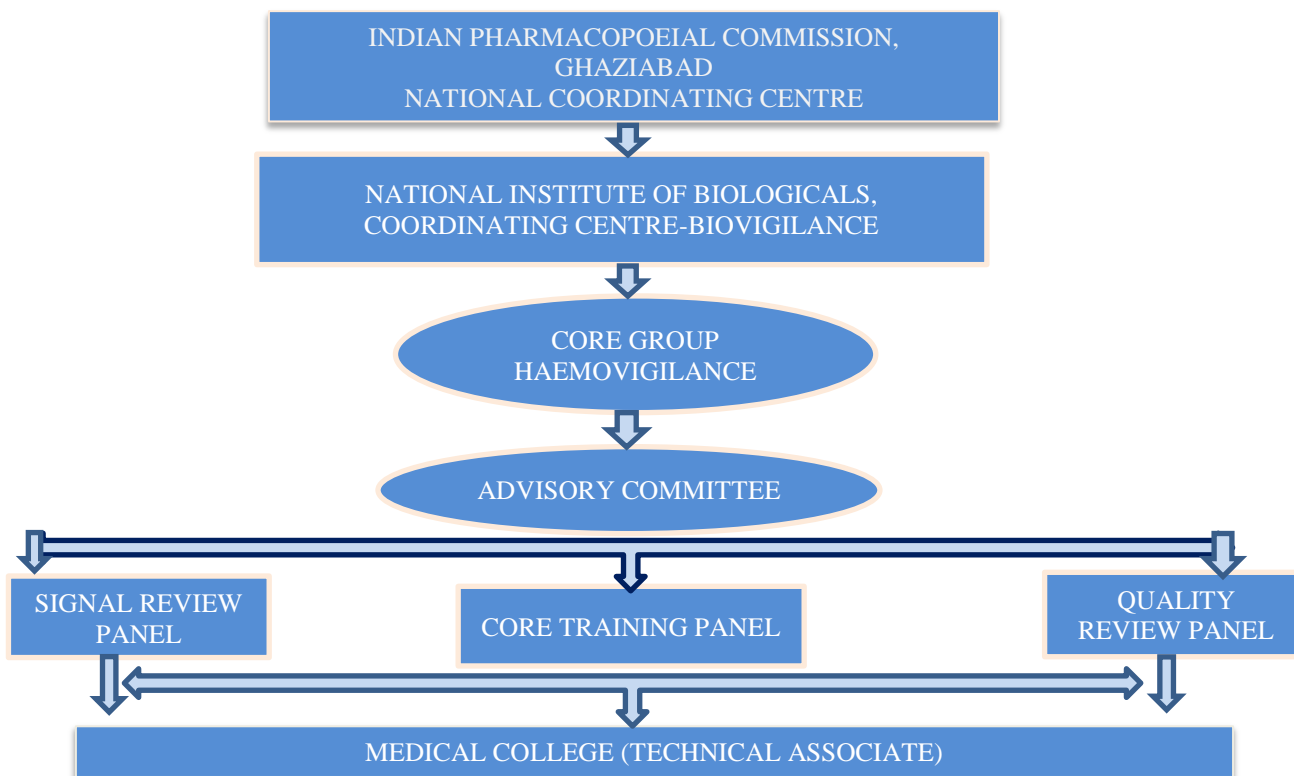


Figure 1 Organogram of haemovigilance

Procedure for enrolment in HvPI

Medical colleges / Institutes/ Hospitals / Blood banks in India can enrol in this programme. Head / In charge of Transfusion Medicine Department / Blood bank can apply by submitting a duly filled enrolment form to NCC-HvPI, at NIB by post or through E. mail to NCC at haemovigilance@nib.gov.in.

NCC verifies the details submitted by the applicant. After verification, NCC issues the user ID and password to the applicant to assess the Haemo-vigil software for reporting the transfusion reactions to NCC.

Types of adverse reactions possible with transfusion (5)

Based on their time of occurrence, pathogenesis and / or symptomatology adverse reactions are divided. According to the time of occurrence, it is subdivided as acute (< 24 hours after transfusion) and delayed (> 24 hours after transfusion) reactions. As per their pathogenesis, adverse reactions can be further divided as infectious and non-infectious adverse reactions. Major non-infectious acute reactions include Acute Haemolytic Transfusion Reactions (AHTR), Febrile Non-Haemolytic Transfusion Reactions (FNHTR), and allergic reactions including anaphylactic reactions, Transfusion Associated Acute Lung Injury (TRALI), Transfusion Associated Circulatory Overload (TACO), hypotensive reactions and hyperkalaemia. Non-infectious delayed transfusion reactions are Delayed Haemolytic Transfusion Reactions (DHTR), Delayed Serological Transfusion Reactions (DSTR), Post-Transfusion Purpura (PTP), Transfusion-Associated Graft Versus Host Disease (TAGVHD) and haemosiderosis. Out of all transfusion reactions, FNHTR and allergic reactions are most common form of

reactions. (5) These adverse events which are associated with the transfusion are to be reported to national haemovigilance authority.

3. Documenting and Reporting of Serious Adverse Reactions/Events in Blood & Blood products Transfusion (5)

- 1) **Standard Forms:** Reporting should be performed using a standard form, either by a paper or electronic system. A two-stage method of adverse event reporting may be used, in which an initial short report is submitted, followed by a more detailed report when investigations are completed.
- ✓ Adverse event reports to the national system should not include information that could identify the patient, donor, reporter or any other individual involved, but should include a unique identifier enabling the national haemovigilance coordinator to request further details if necessary.
- ✓ The adverse event report should include:
 - a description of the adverse event or near miss;
 - a graded assessment of the clinical outcome (from no reaction or minor signs to death, i.e. the severity);
 - an assessment of the probability that the adverse event was caused by the transfusion (i.e. the imputability);
 - Information on action taken by the blood centre or hospital.
 - Regarding documenting and reporting of transfusion reactions, a reporting format, Transfusion Reaction Reporting Form (TRRF)

has been prepared by HvPI, which mentions all information regarding the patient, transfusion reaction details, blood component or blood product details, list of relevant and necessary investigations needed to be done, nature of adverse reaction and imputability assessment.

(6)

2) **Rapid Alert Systems** The haemovigilance system may include a rapid alert or early warning mechanism for the rapid dissemination of information on important events, emerging hazards or trends. Such a system should not replace urgent notification to the blood centre of adverse events requiring immediate action, e.g. post-transfusion sepsis or blood bag defects.

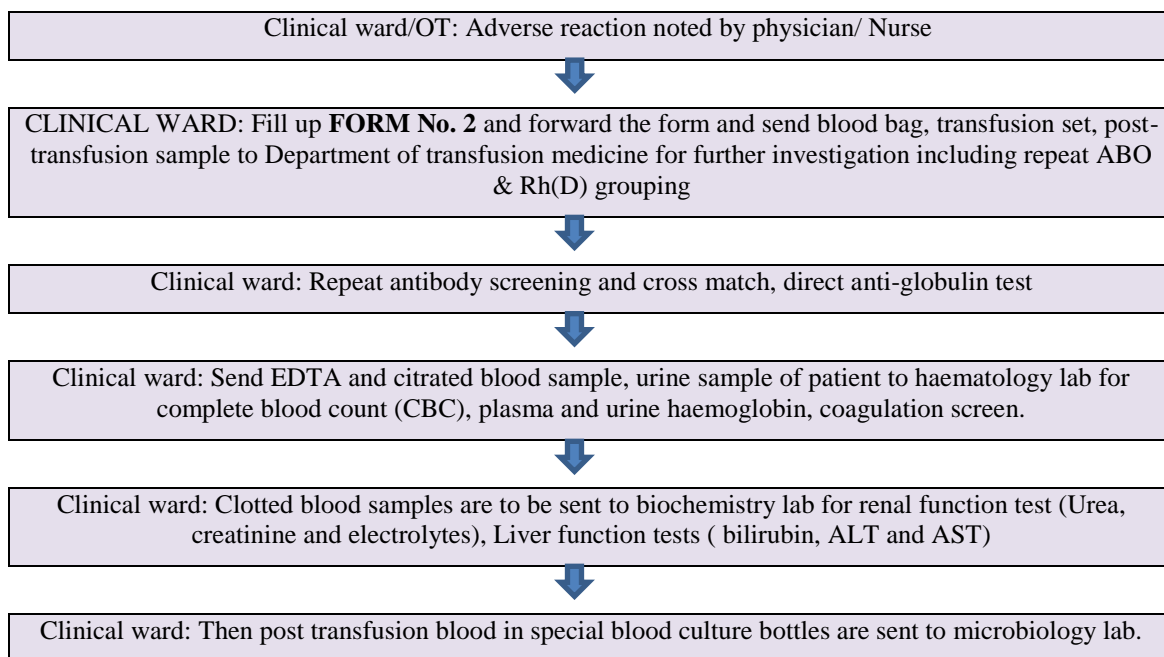
HvPI has received a very good response as most of the medical colleges and institutes have already enrolled and started providing data on adverse reactions. However, less attention has been paid to donor haemovigilance. Hence, a National Blood Donor Vigilance Programme (NBDVP) was started on 14th June, 2015 on the World Blood Donor Day under the scope of HvPI. (7) The main objectives of the NBDVP are to improve donor safety and satisfaction through monitoring and analysing the risk factors, implementing preventing measures with an ultimate goal of reducing the frequency of adverse donor reactions and increasing donation frequency. (7) A one page Adverse Donor Reaction Reporting Form (ADRRF) has been developed to collect information about adverse events or complications related to blood donation. This form has been prepared in line with the complications related to blood donation as formulated by ISBT working group on donor vigilance. ADRRF is also freely available in the website of HvPI (8) and all medical colleges are encouraged to get enrolled under the HvPI so that any adverse reactions associated with blood donation collected through ADRRF will be collated and analysed through the haemovigil software. ADRRF mentions all details which include donor information, details of blood

collected, type of complications, outcome of adverse reaction and imputability. This practice will help in identifying the trends and recommend best practices and interventions required to improve donor safety as well. (8)

However, documenting and reporting transfusion reactions in blood transfusion service involve many aspects and interrelationships among various departments:

1. Responsibilities of medical and nursing staff of the ADR monitoring centres.
2. Responsibilities of the transfusion service department of the ADR monitoring centres.
3. Responsibilities of the hospital transfusion committee of the ADR monitoring centres.
4. Responsibilities of the head, department of transfusion of the ADR monitoring centres.
5. Responsibilities of the technical associate IPC –PvPI posted in the ADR monitoring centres.
6. Responsibilities of haemovigilance centre, National Institute of Biologicals (NIB).
7. Responsibilities of PvPI, National Co-coordinating Centre (NCC), Indian Pharmacopoeia Commission (IPC).
8. Responsibilities of Central Drugs Standard and Control Organization (CDSCO), New Delhi.

A flow chart format for reporting serious adverse reaction on blood transfusion along with the roles and responsibilities of HvPI units have been described in the guidance document of IPC-NIB. The department of transfusion medicine in any hospital plays a major role in evaluating the adverse reactions which includes the assessment of imputability of adverse reactions in coordination with the attending physician.



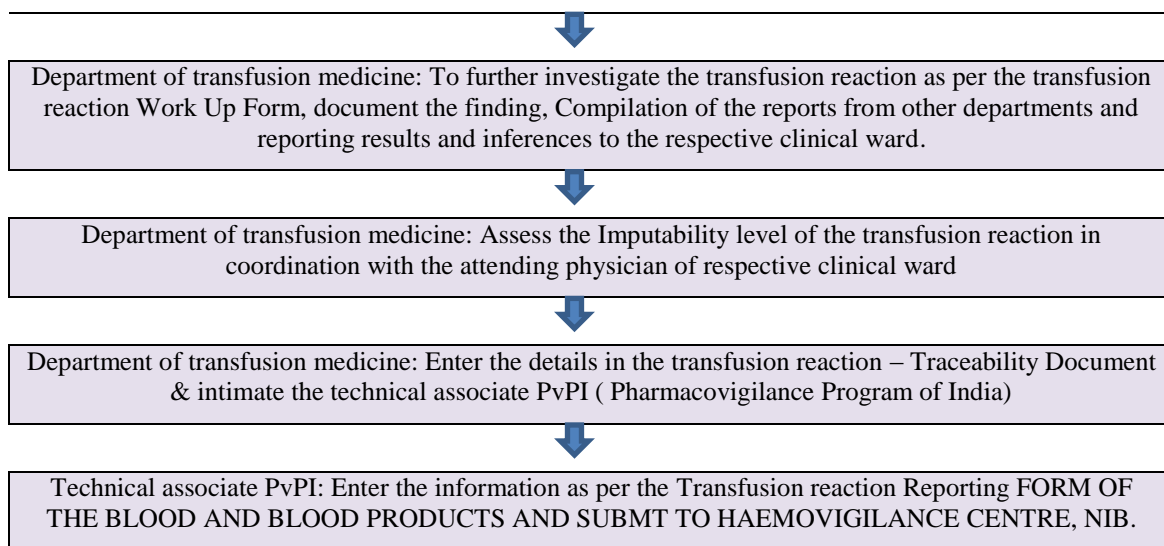


Figure 2. Reporting of Adverse reactions concerned with Blood transfusion (9, 10)

4. Roles and responsibilities of HvPI units (9)

The data on adverse transfusion reactions and events are entered into the “haemovigil” software from the transfusion medicine department/blood bank/hospitals/medical colleges and transmitted o HvPI-NCC, NIB. HvPI-NCC reviews completeness of data quality, prepare SOPs, guidance documents and communicate recommendations of to IPC. IPC finally forwards recommendations of haemovigilance advisory committee to Drug Controller General of India (DCGI)-**Table 2** Roles and responsibilities of HvPI units. (11)

CDSCO body. It is the DCGI-CDSCO who formulates blood and blood product transfusion safety related regulatory decisions and communicate to stakeholders. As per latest newsletter on haemovigilance, 206 centres including hospitals, medical colleges and blood transfusion centres have been enrolled under this program. A total of 2296 Transfusion Reactions have been received by NCC, Haemovigilance program in India has now become member of International Haemovigilance Network (IHN).

Medical colleges/institutes/blood banks	<ul style="list-style-type: none"> • Collection and causality assessment of transfusion reactions • Data entry into “ Haemo-vigil” software • Transmission of data to HvPI-NCC, NIB
HvPI-NCC (NATIONAL CO-ORDINATING CENTRE, NATIONAL INSTITUTE OF BIOLOGICALS (NIB)	<ul style="list-style-type: none"> • Review completeness of data quality • Preparation of SOP’s, guidance documents and training manuals • Publication of haemovigilance newsletter • Communicate recommendations of haemovigilance advisory committee to IPC.
PvPI, NATIONAL COORDINATING CENTRE, IPC	<ul style="list-style-type: none"> • Forward recommendations of NCC to DCGI-CDSCO
DCGI-CDSCO	<ul style="list-style-type: none"> • Formulate safety related regulatory decisions • Communicate blood and blood product related transfusion safety related decisions to stake holders

Therefore, the major recommendations for better haemovigilance program must incorporate better national blood quality and safety initiatives, reducing or minimising human errors, recruiting more trained personnel, generate data standard and improved reporting capacity.

Pre-requisites for a better haemovigilance system

- Legal framework
- Continuous and guaranteed budgeting and finance facility
- Central evaluation centre setup
- Commonly agreed definitions
- Standardised reporting system
- Development of rapid alert/early warning system

- Functional hospital transfusion committees
- Introducing the preventive or corrective procedures and along with these there should be organisational models for better functioning of a haemovigilance system

5. Organization model for a national Haemovigilance system

The basic premise of a national haemovigilance system is the development of a co-ordinated approach to the continuous improvement of the safety, availability and appropriate use of blood and blood products and related activities across all organisations involved in the transfusion chain. Regardless of the model used in a country, it is very important that the reporting process is simple and quick. Complex or time-consuming

procedures will be burdensome and will result in poor participation.

patient-identifiable information should not be recorded in haemovigilance reports.

It is also essential that donor and patient confidentiality is maintained and to this end donor- or

Table 3 Organisational models (5)

Model	Explanation of options
Centralised vs decentralised	*In a centralised model, there is an office that receives reports from institutions. * In a decentralised model there is no central collation of information.
Active surveillance vs passive surveillance	*Active surveillance is based on proactive and targeted search for adverse events in a systematic way. *Passive surveillance is characterized by reporting of adverse events as they are recognised in a spontaneous way.
Anonymized vs identified	*In an anonymized system the identities of the individuals or institutions involved in the adverse event may be reported into the haemovigilance system but are not identified in feedback reports. * In an identified system the identity of the individuals or institutions involved in the adverse event may be identified in feedback reports.
Voluntary vs mandatory reporting	*Voluntary model of reporting encourages but does not enforce reporting. It is dependent on the willingness of the clinicians and health care professionals to report adverse events. *A mandatory model is a statutory requirement that must be fulfilled by all health care workers and relevant stakeholders.
Non-punitive vs punitive systems	*In a non-punitive system, individuals are not punished for appropriately reporting adverse events and safety concerns. *In a punitive system individuals may be punished for appropriately reporting adverse events or safety concerns. Such systems may discourage participation by instilling fear.
Comprehensive vs limited	*A comprehensive system may request reporting of all types of adverse events and all levels of severity. *A system may be limited to a subset of adverse events; for example, the system may only require serious adverse events to be reported at national level.

It is recommended that a non-punitive and anonymized approach be used. Establishing such a system encourages individuals and organizations to report adverse events and to learn from them. The basic premise of a national haemovigilance system is the development of a coordinated approach to the continuous improvement of the safety, availability and appropriate use of blood and blood products and related activities across all organizations involved in the transfusion chain.

6. Conclusion

Haemovigilance programme is an integral part of a quality system in blood transfusion chain of a healthcare organisation and should be the best quality management system of the transfusion chain. The advice and information acquired from haemovigilance facilitate corrective and preventive actions to be taken to minimise the potential risks associated with quality and safety in blood processing and transfusion for donors, patients and staff, resulting in improved policies, procedures and practices in the blood transfusion chain. Hence, a functional haemovigilance system can act as a backbone to monitor the transfusion practices and be accountable to appropriate documentation, reporting and investigation of transfusion reactions.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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