

A **blood bank** is a specialized medical facility or section within a hospital dedicated to the collection, testing, processing, storage, and distribution of blood and its components (like red cells, plasma, and platelets) for transfusion. Its primary goal is to ensure that **safe, compatible blood** is available for patients during medical procedures, surgeries, or emergencies.

### Blood Banking Process

**Blood banking** refers to the entire practice associated with managing blood and its components. This process includes:

- Donor selection and blood collection
- Blood grouping and compatibility testing
- Screening for infectious diseases
- Component separation (e.g., plasma, platelets, red blood cells)
- Safe storage and proper labeling
- Distribution for transfusion

### Historical Evolution of Blood Transfusion

**Blood transfusion** is a medical procedure where blood or its components are transferred from a donor to a recipient. The practice has a rich history:

- **William Harvey's** : discovery of the circulation of blood in 1628.
- physician Richard Lower : The **first recorded successful blood transfusion** was performed between dogs in 1665 .
- by Dr. James Blundell : The **first successful human blood transfusion** was performed in 1818 to treat postpartum hemorrhage using human blood.
- **Karl Landsteiner's** : improve Safety and effectiveness dramatically and discovery of blood groups in 1900. Further advances, such as blood typing, cross-matching, and the introduction of **anticoagulants** (which allowed for longer storage), enabled widespread blood transfusion services. Today, transfusion is a common and generally safe procedure used to replace lost blood components crucial for maintaining life.

## Blood Donation

- ❖ Blood donation is a voluntary act where a person gives blood for use in transfusions or for making blood-derived products.

### Types of Donors

1. **Autologous donors** — give blood for their *own* upcoming surgery; less strict infectious screening, but done under medical supervision.
2. **Apheresis donors** — give *specific components* (platelets, plasma); stricter vein and health standards.
3. **First-time vs. Regular donors** — *regular donors* are safer due to repeated screening and consistent health records.

### Blood Donor Selection Criteria

To Ensure:

- **Safety of the donor** (no harm from donation).
- **Safety of the recipient** (blood is disease-free and effective).

Screening includes:

- Pre-donation questionnaire
- Physical exam
- Lab testing

### 1. Age

- Normal range: **18–60 years**. Some countries allow up to **65 years** for first-time donors, and **70–71 years** for regular, medically fit donors.
- Under 18: only under *special supervision* and *parental consent*.

## 2. Body Weight

- $\geq 50$  kg for whole blood ( $\approx 450$  mL donation).
- Lighter donors risk *fainting or hypovolemia*.
- Apheresis donors must have *adequate weight and vein size* due to machine circulation.

## 3. General Health

- Donor must be *clinically healthy* on donation day, No acute illnesses (fever, flu, diarrhea, infection).
- Must be free from *infectious diseases* (Hepatitis, Malaria, and TB).
- *Recent antibiotics or vaccination*  $\rightarrow$  temporary deferral (depending on vaccine type).

## 4. Medical History Evaluation

A detailed questionnaire rules out risks:

- **Chronic diseases:** diabetes, hypertension, epilepsy — depends on control/medication.
- **Recent surgery or hospitalization:** defer 6–12 months.
- **Certain drugs:** isotretinoin, finasteride, anticoagulants  $\rightarrow$  temporary deferral.
- **Pregnancy/lactation:** defer until **6 months postpartum** or after breastfeeding ends.
- **Recent blood donation:**
  - Whole blood: wait **12 weeks (3 months)**
  - Apheresis: **2–4 weeks**

## 5. Risk Behaviors : Screening identifies behaviors that increase infection risk:

- IV drug use or needle sharing.
- Illegal intercourse.
- Tattoos, piercings, acupuncture ( defer **6–12 months**.)
- Prison history or exposure to endemic infection areas.
- *Confidential self-exclusion* lets donors privately withdraw unsafe blood.

## 6. Physical Examination

Before donation:

- **Pulse:** 50–100 bpm, regular
- **BP:** 100–140 / 60–90 mmHg
- **Temperature:** <37.5°C
- Must look healthy, hydrated, and alert.

These steps prevent fainting, low BP, or other adverse reactions.

## 7. Hemoglobin & Hematocrit

Ensures enough red blood cells remain post-donation.

- **Hematocrit:**  $\geq 38$ –40%
- **Hemoglobin:**
  - Males  $\geq 13.5$  g/dL
  - Females  $\geq 12.5$  g/dL

8. Laboratory Testing : Every donation is tested for infectious markers:

- **ABO & Rh typing** for blood compatibility
- **HIV, HBV, HCV, Syphilis,  $\pm$  Malaria /WNV** (as per country).
- **Platelet count & Total protein.** for apheresis donors.

## Donor Deferral & Counseling

- **Temporary deferral:** illness, vaccination, pregnancy, risk behavior.
- **Permanent deferral:** chronic infection (HIV, HBV, HCV), heart disease, or risky behaviors.

## Post-Donation Care

- Rest, hydrate, no heavy exercise for 24 hours.
- Observe for dizziness, bruising, fainting.
- Provide education on **iron-rich diet** for regular donors.