

# PEDIATRIC TRANSFUSION MEDICINE AS A SUB-SPECIALITY TO TRANSFUSION MEDICINE



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# Why the need for a distinct sub-speciality

- **Unique pathophysiology**
- **Children are not just little adults**
- **Disease conditions are different**
- **Distinct adverse effects of blood transfusion**
- **Indications, triggers and dosage differ**
- **Special situations- exchange transfusions and intrauterine transfusions**
- **Metabolic concerns- Hyperkalemia**

# Why the need for a distinct sub-speciality

- **Testing differences- NN grouping, maternal screens**
- **Blood components- age of red cells, aliquots , additive solutions**
- **Infectious diseases- long life ahead**
- **Hemoglobin disorders- thalassemia major, sickle cell disease**
- **Plasma derived medicines- coagulation factor concentrates, IVIG**
- **Donor red cell defects- G6PD deficiency**

# Pediatric Transfusion Medicine

- The physiology, developmental stage and the sequential transition from fetus to neonate to childhood to adolescence, the ever-changing weight, blood volume, post-transfusion life span, pathophysiology of diseases and spectrum of disorders requiring transfusion vary from those seen in adults.
- Pediatric transfusion medicine as a discipline, therefore, can be seen as ensuring the collection, processing, testing and availability of blood components and derivatives **optimally suited to the variable needs of patients undergoing multi-organ growth and development and/or suffering from the effects of congenital disorders.**

# Building up the speciality -1

- **The Transfusion Medicine/Hemostasis Clinical Trials Network (TMH CTN) was created by the National Heart, Lung and Blood Institute (NHBLI) USA, in 2002 to perform trials in children and adults. There were no initiatives in pediatric transfusion.**
- **In 2005 the NHLBI formed a Working Group on Pediatric Transfusion Medicine (PTM) to identify research agenda in the field.**
- **Their recommendations resulted in curriculum development grants named the Pediatric Transfusion Medicine Academic Awardees (PTMAA) program.**

# Building up the speciality -2

- **In 2008 the PTMAA sponsored a working group to focus on clinical and translational research gaps and three major areas of concern were identified;**
  - (i) Transfusion strategies**
  - (ii) Short-and long-term consequences of transfusion**
  - (iii) Transfusion-transmitted disease as they relate to neonatal and pediatric patients.**
  
- **American Board of Pathology allowed board eligible pediatricians to apply directly into TM fellowship after residency.**

# Building up the speciality -3

- **In 2016 NHLBI FDA sponsored meeting on scientific priorities in PTM for next 10 years. Six key areas were targeted:**
  - **Neonatology and perinatology**
  - **Oncology and transplant**
  - **Chronic transfusion**
  - **Devices and surgery**
  - **Intensive care and trauma**
  - **Teenage blood donation**

## NEONATOLOGY AND PERINATOLOGY

- **1. What are the best strategies to identify neonates who will benefit from transfusion (RBCs, platelets, or Fresh Frozen Plasma), and what are the systemic effects of transfusions of each and a combination of products in this population?**
- **2. What is the best mechanism to gather national epidemiological data on neonatal transfusions?**
- **3. What are the best blood management strategies for neonates?**
- **4. How can primary RBC or platelet glycoprotein alloimmunization be prevented in the setting of pregnancy setting?**
- **5. How can the dangers of pre-existing maternal RBC alloantibodies or platelet glycoprotein alloantibodies be minimized, using targeted therapies that go beyond intrauterine transfusions, therapeutic plasma exchange, or IVIg?**



# ONCOLOGY AND TRANSPLANT

- 1. What are the mechanisms, biomarkers, and treatment adjuncts to prevent and **manage hemorrhage in this patient population?**
- 2. What is the impact of pre-transplant platelet and red cell transfusions on transplant and oncology patients' outcomes?
- 3. What are the physiologic responses, clinical consequences and optimal use of red cell transfusions in transplant and oncology patients?
- 4. What are the best strategies to optimize the appropriate use of platelets in the setting of oncology treatment, transplant support and platelets refractoriness?
- 5. What are the effects of irradiation and pathogen reduction technology on the safety and efficacy of blood products and what studies are required in children to ensure there are no short or long term effects?

## POPULATIONS

- **1. In children with Sickle Cell Disease (SCD) thalassemia and other transfusion-dependent anemias, what are the host immunologic and donor red blood cell (RBC) factors that determine alloimmunization risk?**
  
- **2. Is chronic erythrocytapheresis a more effective RBC transfusion modality compared to chronic simple transfusion, assessed by adequate hemoglobin S suppression and ability to avoid or mitigate iron overload in patients with SCD?**
  
- **3. What donor RBC characteristics in stored blood impact RBC survival, function, and clearance (immunologic or non-immunologic) in vivo in patients requiring chronic transfusion?**

# DEVICES AND SURGERY

- **1. What are optimal transfusion strategies to prevent and treat severe bleeding for children who require surgery and/or extracorporeal device support?**
- **2. What are optimal red blood cell (RBC) transfusion strategies for anemia, not related to acute hemorrhage, in children who undergo surgery?**
- **3. What are optimal RBC transfusion strategies for anemia not related to acute hemorrhage, in children supported by extracorporeal devices (e.g., ECMO, ventricular assist devices [VAD], cardiopulmonary by-pass [CPB])?**
- **4. What are the mechanisms of hemostatic dysfunction for children with severe intra-operative bleeding or who are supported by extracorporeal devices, both short term and long term?**
- **5. What are optimal blood conservation/management methods to reduce unnecessary blood and blood derivative exposure for intra/post-operative patients and patients supported by extracorporeal devices (ECMO, VAD, CPB)?**

# INTENSIVE CARE AND TRAUMA

- **1. What are the optimum means to monitor and manage hemostatic dysfunction in trauma and critical illness?**
- **2. What are the optimal means for RBC transfusion decision making in critical illness and trauma?**
- **3. What are the consequences of transfusion and how can we optimize approaches to identify and mitigate non-infectious serious hazards of transfusion (NISHOT), including transfusion-related acute lung injury (TRALI), transfusion-associated circulatory overload (TACO), acute respiratory distress syndrome (ARDS) and transfusion-related immunomodulation (TRIM)?**
- **4. What are the strategies to optimize blood product stewardship, including the best ways to identify, evaluate, and disseminate safe and effective blood management strategies?**

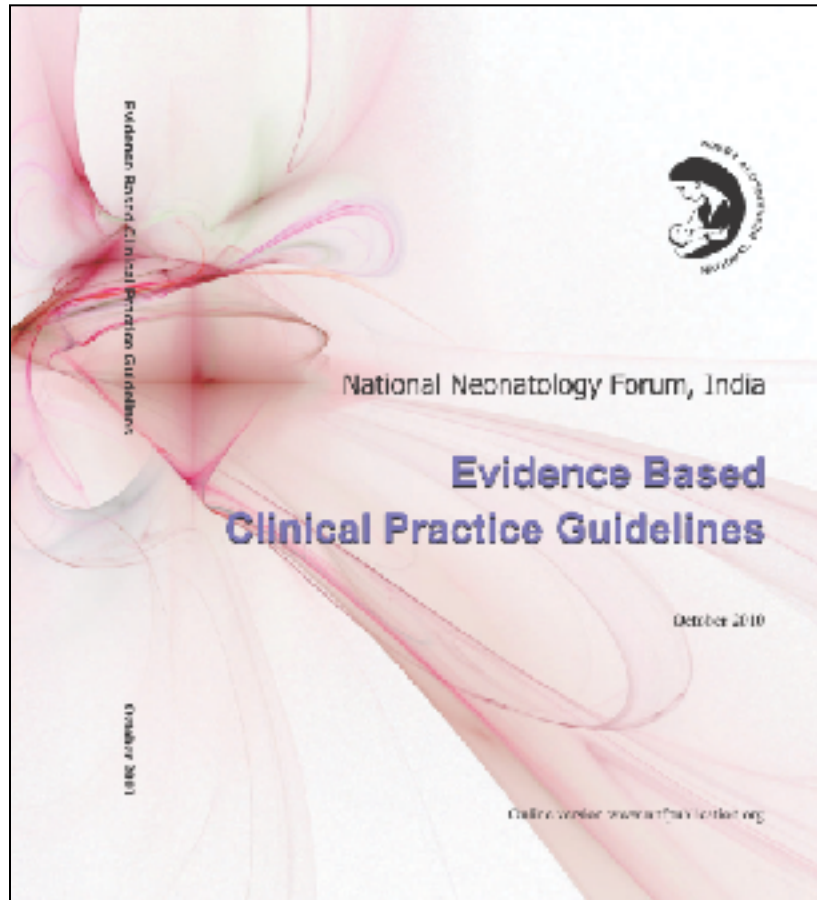
# TEENAGE BLOOD DONATION

- **1. Does the age at first blood donation correlate with behaviours likely to result in future donation and long-term donation behavior in adulthood?**
- **2. What are the long- term effects of blood donation-induced iron deficiency including neurocognition in teenagers?**
- **3. Can blood centers reduce the risk of syncope and injuries after blood donation on high school blood drives?**
- **4. What are the short term effects of blood donation-induced iron deficiency in teenagers?**

# Indian Scenario

- **Pediatric Transfusion Medicine as distinct subspecialty ?**
- **Evidence based clinical practice guidelines**
- **Research in the field of Pediatric Transfusion Medicine**

# Indian Pediatric Transfusion guidelines




# Research in the field of Pediatric Transfusion Medicine from India

Indian J Pediatr (February 2016) 83(2):107–113  
DOI 10.1007/s12098-015-1841-0



ORIGINAL ARTICLE

## Double Volume Exchange Transfusion in Severe Neonatal Sepsis

Abhishek Somasekhara Aradhya<sup>1</sup> • Venkateshan Sundaram<sup>1</sup>  • Praveen Kumar<sup>1</sup> •  
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 Journal of  
Clinical Apheresis



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Research Article

## Efficacy and safety of therapeutic plasma exchange by using apheresis devices in pediatric atypical hemolytic uremic syndrome patients

Rekha Hans, Ratri Ram Sharma , Neelam Marwaha, Deepti Suri, Rakesh Kumar, Anju Gupta, Surjit Singh



View Issue TOC  
Volume 31, Issue 4  
August 2016  
Pages 381–387



## Audit of Pediatric Transfusion Practices in a Tertiary Care Hospital

Shalini Bahadur · Neha Sethi · Sangeeta Pahuja ·  
Chintamani Pathak · Manjula Jain

Published online: 03 May 2014

S. Bahadur · N. Sethi · S. Pahuja · C. Pathak · M. Jain  
Department of Pathology and Blood Bank, Lady Hardinge Medical  
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## Factors affecting efficacy of packed red blood cell transfusion in neonates

Rakesh Kumar Pilonia<sup>1</sup> · Shiv Sajan Saini<sup>1</sup> · Sourabh Dutta<sup>1</sup> · Reena Das<sup>2</sup> ·  
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# Dedicated donor unit transfusions reduces donor exposure in pediatric surgery patients

Satyam Arora, Neelam Marwaha<sup>1</sup>, Hari Krishan Dhawan<sup>1</sup>, K. L. N. Rao<sup>2</sup>

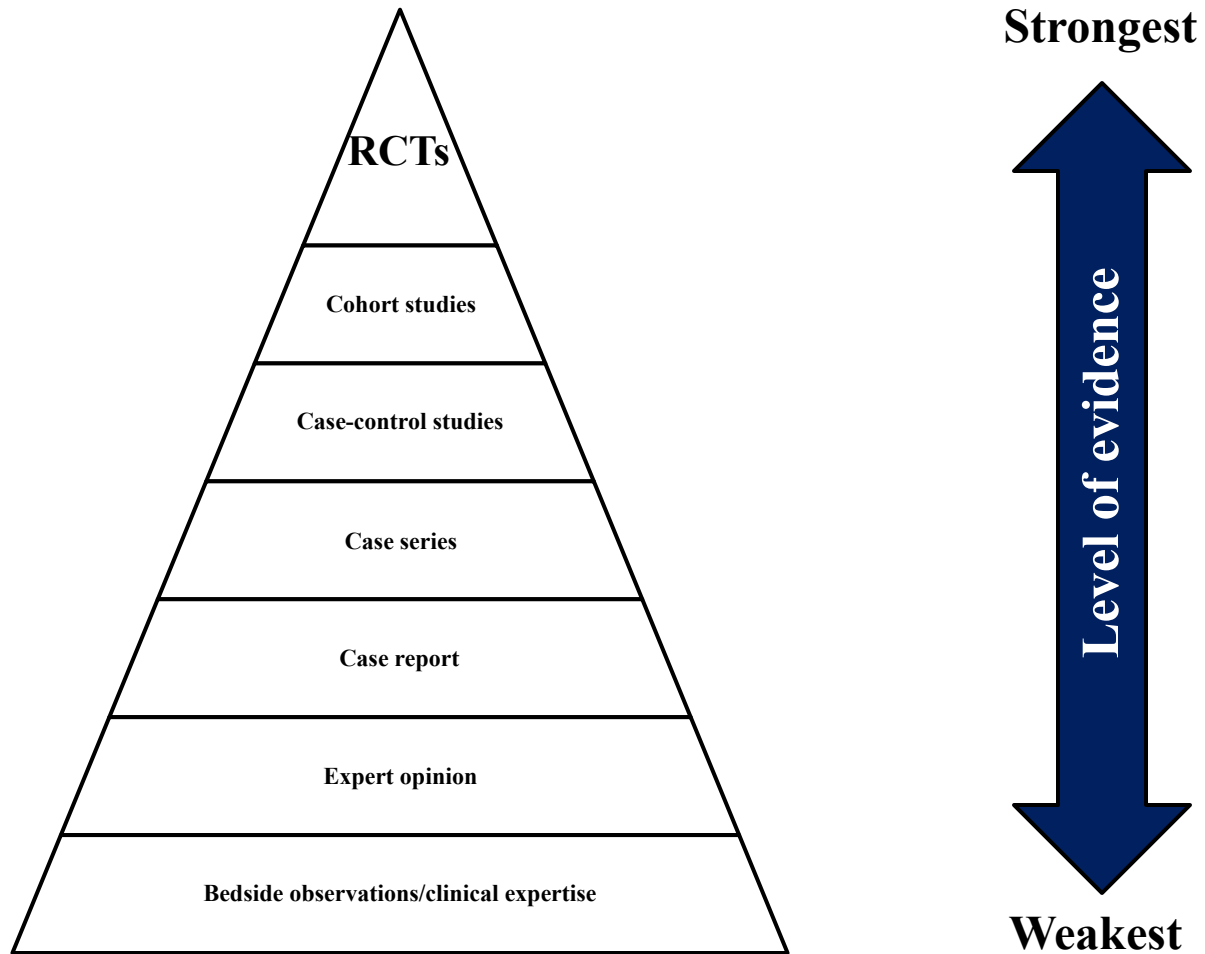
**Asian J Transfus Sci 2017 (Accepted, Ahead of Print).**

**A pilot randomized controlled trial comparing “ Lower versus Higher hemoglobin threshold” for Transfusion in children with acute respiratory distress syndrome.**

**Liberal versus restrictive platelet transfusion for treatment of hemodynamically significant patent ductus arteriosus in thrombocytopenic preterm neonates-A randomized open label, controlled trial.**

**Role of middle cerebral artery peak systolic velocity for detection of fetal anemia in red cell alloimmunised pregnancy after more than one intra uterine transfusions.**

# Do we have evidence?



# Future prospects for India

- **Institutes dedicated to pediatric care or those with advanced pediatric centres should take a lead.**
  - To develop specially trained manpower in the field
  - To identify key research areas relevant to Indian context.
  - To develop evidence based clinical practice guidelines.

- **Professional Societies**

- Concerned sub-specialities of pediatric medicine and surgery, intensive care,
- National Neonatology Forum and
- Indian society of Transfusion Medicine

**We can have special working groups to address gaps in training and generate reliable evidence in various areas of Pediatric Transfusion Medicine.**

# To Summarize



**There are known knowns**

**These are things we know that we know**

**There are known unknowns**

**There are things that we know we don't know**

**But there are also unknown unknowns**

**There are things we don't know we don't know**

**Donald Rumsfeld. US, Department of Defence, Feb 12,2002**

**Thank you**

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