Blood Banking in India: Ten Years Later

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BloodCenter of Wisconsin
Milwaukee, WI

Celebrating 70 Years
Objectives

• Describe the Indian Immunohematology Initiative.

• Explain the transition in pretransfusion testing practice in India over the last 10 years.

• Discuss the successes and challenges of implementing a program.
Indian blood bankers soaking up U.S. know-how

Anne Ford

During his trips to India, where he has given several blood banking talks and workshops for health professionals over the past 15 months, Jim Perkins, MD, refuses to assume a preachy attitude. “I didn’t want to go someplace and say, ‘You should be doing this—that’s the way we do it,’” he says. “Because who am I to say, ‘This is an appropriate health priority at your stage of development?’” Dr. Perkins is director of Evanston Northwestern Healthcare Blood Banks, headquartered in Evanston, Ill., and assistant professor of pathology at Northwestern University’s Feinberg School of Medicine, Chicago.

As it turns out, however, he and the medical professionals he has met there share one of the same priorities: to improve the safety of the Indian blood supply, particularly in regard to blood group antibody testing, which few blood centers there perform. “The typical pretransfusion testing sequence in India is an ABO and Rh type on the donor and recipient, and then a crossmatch,” he says. “If they have a positive crossmatch, most places just simply keep crossmatching additional units, without identifying the cause of the positive crossmatch, and that’s a limited approach. They can’t deal with autoantibodies. If your crossmatches are positive with everyone, you don’t know, ‘Is this a clinically significant antibody against

know they wanted to do this. When a technologist sits in a laboratory and is getting positive crossmatches and has to issue incompatible blood, that’s a terrible thing. They’re afraid for the patient. And that provides a tremendous incentive for them to want to be able to solve these problems. So we have had a tremendously positive reception everywhere we’ve gone.”

Dr. Perkins’ interest in the topic stems from a visit to Pakistan in January 2004. During the trip, he and his blood banking colleagues Mohammed Pothisawala, MS, MT (ASCP)SBB, technical director of the blood bank at the University of Chicago Hospitals, and Syed Arif Azeem, MT (ASCP)SBB, Bhawan hospitals in Indore, India, offered to help arrange a similar trip to India. The result: a 17-day visit in November and December 2005, during which Dr. Perkins gave talks at the Indian Society of Blood Transfusion and Immunohematology meeting in the city of Udaipur, the Prathama Blood Centre in Ahmedabad, the Choithram Hospital in Indore, and (in the neighboring country of Nepal) the South Asian Association of Transfusion Medicine meeting in Kathmandu.

“As in Pakistan, I talked about everything,” Dr. Perkins says. “My primary talk at the ISBTI meeting was on setting up a peripheral blood stem cell transplant program. In Ahmedabad I talked about transfusion reactions, in Kathmandu I did case studies—i.e., told stories—and talked about antibodies, and in Indore I talked about antibodies, HDN, and indications for red blood cell transfusion.”

“His visit was a grand success,” Dr. Singhvi says. “I can still remember how he singlehandedly gave a nonstop three-hour talk at a symposium on blood banking and blood group antibodies that I had arranged at my institution. All my colleagues here were literally glued to their seats during that presen-
Indian Immunohematology Initiative
The goal of III is to improve the safety of blood transfusion in India by promoting implementation of up-to-date immunohematologic testing methods.
Indian Immunohematology Initiative

- Conduct hands-on (“wet”) workshops
- Provide and support immunohematology instruction at the annual ISBTI meeting
- Perform consultations and support for implementation of improved testing at Indian blood centers and hospitals
- Host Indian immunohematologists for technical training in members’ laboratories
## India - Demographics

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2016</th>
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<tr>
<td>Population, est.</td>
<td>1,111,713,910</td>
<td>1,326,801,576</td>
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<tr>
<td>Birth Rate/1,000</td>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>Infant Mortality Rate/1,000</td>
<td>54.6</td>
<td>41.8</td>
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<tr>
<td>Life Expectancy</td>
<td>64.7</td>
<td>68</td>
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http://data.worldbank.org/indicator/SP.DYN.LE00.IN
<table>
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<tr>
<th>Rank</th>
<th>Country</th>
<th>Population</th>
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<tr>
<td>1</td>
<td>China</td>
<td>1,373,541,000</td>
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<tr>
<td>2</td>
<td>India</td>
<td>1,326,801,000</td>
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<td>3</td>
<td>United States</td>
<td>323,996,000</td>
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<td>4</td>
<td>Indonesia</td>
<td>231,820,243</td>
</tr>
<tr>
<td>5</td>
<td>Brazil</td>
<td>205,824,000</td>
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</tbody>
</table>

Data updated 08-24-2016 Source: U.S. Census Bureau, International Data Base
Human Development Index (HDI)

- Life Expectancy Index
- Life expectancy at birth (in years)
- Education Index (EI)
- Mean years of schooling (in years)
- Expected years of schooling (in years)
- Income Index
- Per capita income
Human Development Index by Country

http://www.nationsonline.org/oneworld/human_development.htm
Developing Countries Blood Usage

• In low-HDI countries, up to 65% of blood transfusions are given to children under 5 years of age
• Childbirth
  • Globally ½ million women die from hemorrhage in childbirth
• Trauma

2001/2002 Data – Total WB Donations 81 million

Percentage of Global Total

Low HDI | Medium HDI | High HDI
---|---|---
3 | 11 | 36
71 | 61 | 18

Donations

Populations
Blood Supply Worldwide - 2016

July 2016 Data – Total WB Donations 112.5 million

Percentage of Global Total

Low HDI Medium HDI High HDI

3 11 50

Donations

11 47 19

Populations

37 70 0

Blood Supply Worldwide - 2016

Data – Total WB Donations 112.5 million
Indian Blood Banks

• 2006 – 1,850 blood banks
  • 52% of donors are volunteer

• 2016 – 2,760 blood banks!
Indian Blood Donors

• 2006
  • “Professional Blood Sellers”
    • Pose as replacement donors
    • Majority of public sector and physicians “buy” blood
  • Easier to “hire” a professional blood seller
  • ~50% volunteer

• 2016
  • ~30-100% volunteer (~65%)
Accreditation

• The National Accreditation Board for Hospitals and Healthcare Providers (NABH), an arm of Quality Council of India (QCI), launched its accreditation standard programme for blood banks and transfusion services on January 25, 2008.
Standards & Accreditation

- *Standards for Blood Banks and Transfusion Services – 1st ed. 2008*
- National AIDS Control Organization (NACO), Ministry of Health and Family Welfare, Government of India
- U.S Centers for Disease Control and Prevention (HHS/CDC) Division of Global HIV and TB (DGHT), India grant
  - Christian Medical College, Vellore & Christian Medical Association of India (CMAI), New Delhi
Assessment of NACO Supported Blood Banks 2016

• 1,126 NACO, Ministry of Health and Family Welfare (MoHFW) supported blood (~39.8% of total blood banks)
  • 79% (867) owned by public sector
  • 21% (234) owned by non-profit sector such as non-governmental/non profit, charitable trusts, societies, foundations
Assessment of NACO Supported Blood Banks 2016

• Component Separation
  • 39% (427) had components lab (most non-government)

• 70% of blood collected from blood banks have component lab (427)
  • Annual collection was 6,828,055 units
  ~ 60% of blood requirement based on WHO requirements (1% of population)
Crossmatch Laboratory - 2006

- Samples to BC from the area
- Pretransfusion Testing
  - ABO, Rh Forward type on slide
    - -A, -B, -A,B, -D
    - One tech performs and a second interprets
  - Reverse Type in tubes
  - Gel Crossmatch on IgG card

No routine Antibody Detection Test (Screen)!
Positive Crossmatch 2006

• Repeat crossmatch in saline IAT & albumin 37°C and IAT test tube
  • 1 minute centrifugation at 1,000 rpm
  • Very few small, benchtop centrifuges available

• No antibody detection test (screen)
Positive Crossmatch 2006

• Switch to O Rh Negative blood and crossmatch with all 3 methods
  • Gel
  • Saline IAT
  • Albumin IAT
Getting Ready to Leave

• Procure workshop samples
  • Known antibody positive donors
• Identify donors with antibodies that could be used for typing
• Label and aliquot tubes
• Pack cooler/suitcase
Curriculum

• Reading agglutination reactions: anti-A titration
• Method comparison; positive antibody screen due to anti-E
  • 2 drops/AHG, 4 drops/AHG, LISS /AHG, Gel
• Antibody I.D. panel & RBC selected cells; anti-E
• Reagent QC
Curriculum, cont’d

• Type & screen x2 & ISXM; 1 xm pos mislabeled unit
• Type & screen/ABO discrepancy due to anti-M
• Antibody Identification - anti-c
• Antibody Identification - anti-K + anti-Fya
• Warm autoantibody; panel, DAT, eluate
<table>
<thead>
<tr>
<th>Blood Group</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>B Pos</td>
<td>26%</td>
</tr>
<tr>
<td>O Pos</td>
<td>25%</td>
</tr>
<tr>
<td>A Pos</td>
<td>20%</td>
</tr>
<tr>
<td>O Neg</td>
<td>2-4%*</td>
</tr>
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</table>

* We’ll call you when we need you!
AABB AATM Meeting - Bangalore 2016
27 Respondents

- Blood Center: 9%
- Government Hospital: 57%
- Private Hospital: 30%
- Industry: 4%
- Other:
How often do you perform antibody detection/screen?

- With Every Crossmatch Order: 16
- When an Incompatible Crossmatch is Found: 17
- Only when ordered by patient's physician: 3
- Testing not available: 1
What is the routine technique used for antibody detection/screen?

Number of Responses

- Testing Not Available
- Solid Phase
- Tubes
- Column Agglutination Technology
Alloimmunization Rates in Thalassemics of Indian Origin


- 3.79% reported
- Rh and K antibodies account for >90% of antibodies
- Anti-c, Anti-E and Anti-K account for 60%
Lions Blood Bank - Delhi
2011 – 2014 Results

Unpublished Data courtesy of P. Shrivastava

• 61,994 patients
• 723 (1.16%) Positive Antibody Screen
  - 131 (0.21%) Autoantibodies
  - 592 (0.95%) Alloantibodies
• Autoantibodies 18.11%
• Alloantibodies 81.88%
Lions Blood Bank
Alloantibodies by Rh D Type

Unpublished Data courtesy of P. Shrivastava

<table>
<thead>
<tr>
<th>Type</th>
<th>Count</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Pos</td>
<td>494</td>
<td>83%</td>
</tr>
<tr>
<td>Neg</td>
<td>98</td>
<td>17%</td>
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<tr>
<td>Total</td>
<td>592</td>
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## Specificities of Alloantibodies

### Lions Blood Bank 2011-2014

Unpublished Data courtesy of P. Shrivastava

<table>
<thead>
<tr>
<th>Specificity</th>
<th>Single Ab N-412</th>
<th>Multiple Ab N-206</th>
<th>Total Ab N-618</th>
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<tr>
<td>-D</td>
<td>149</td>
<td>25</td>
<td>174</td>
<td>28.2 %</td>
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<tr>
<td>-C</td>
<td>06</td>
<td>27</td>
<td>33</td>
<td>5.33 %</td>
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<tr>
<td>-c</td>
<td>16</td>
<td>31</td>
<td>47</td>
<td>7.60 %</td>
</tr>
<tr>
<td>-E</td>
<td>63</td>
<td>53</td>
<td>116</td>
<td>18.8 %</td>
</tr>
<tr>
<td>-e</td>
<td>02</td>
<td>0</td>
<td>02</td>
<td>0.32 %</td>
</tr>
<tr>
<td>-K</td>
<td>13</td>
<td>14</td>
<td>27</td>
<td>4.36 %</td>
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<tr>
<td>-Le(^a)</td>
<td>57</td>
<td>8</td>
<td>65</td>
<td>10.5 %</td>
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<td>-Le(^b)</td>
<td>28</td>
<td>1</td>
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<td>-Jk(^a)</td>
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<td>12</td>
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<tr>
<td>-Jk(^b)</td>
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<td>03</td>
<td>07</td>
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<table>
<thead>
<tr>
<th>Specificity</th>
<th>Single Ab</th>
<th>Multiple Abs</th>
<th>Total</th>
<th>% of Total N-618</th>
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<tbody>
<tr>
<td>-Fy(^a)</td>
<td>08</td>
<td>04</td>
<td>12</td>
<td>1.94 %</td>
</tr>
<tr>
<td>-Fy(^b)</td>
<td>0</td>
<td>06</td>
<td>06</td>
<td>0.97 %</td>
</tr>
<tr>
<td>-M</td>
<td>32</td>
<td>08</td>
<td>40</td>
<td>6.47 %</td>
</tr>
<tr>
<td>-N</td>
<td>09</td>
<td>04</td>
<td>13</td>
<td>2.10 %</td>
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<tr>
<td>-S</td>
<td>08</td>
<td>04</td>
<td>12</td>
<td>1.94 %</td>
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<tr>
<td>-s</td>
<td>04</td>
<td>0</td>
<td>04</td>
<td>0.64 %</td>
</tr>
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<td>-C(^w)</td>
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<td>05</td>
<td>05</td>
<td>0.80 %</td>
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<td>-Xg(^a)</td>
<td>01</td>
<td>00</td>
<td>01</td>
<td>0.16 %</td>
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<tr>
<td>-H</td>
<td>04</td>
<td>0</td>
<td>01</td>
<td>0.64 %</td>
</tr>
<tr>
<td>others</td>
<td>06</td>
<td>0</td>
<td>06</td>
<td>0.96 %</td>
</tr>
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</table>
Points to Ponder

• Indian Studies on alloantibodies few, mainly focused on Thalassemia, multi-transfused or antenatal patients

• This study covers the general patient population of Delhi and alloantibody prevalence is ~ 1%

• Need for improving IH practices
Points to Ponder
Dr. Poonam Shrivastava’s Thoughts

• A Robust Rh D Immunisation Programme is needed

• Clinically significant antibodies identified and the problems of many patients who had been denied transfusion earlier from other facilities, were solved!
Bombay Incidence

• Frequency estimated as 1 in 13,000 in Bombay (Bhatia and Sanghvi 1962)
• In 1974 (Bhatia & Sathe) estimated the incidence to be 1 in 7600 in Bombay.
• A systematic screening of Ratnagiri and Sindhudurg districts of Maharashtra, showed the incidence to be 1 in 4500.
• Incidence is 1 in 2500 among Marathas of Ratnagiri and Raigad districts and Goa.
Dr. Joshi discovered Indian Blood Group! Ina & Inb
Challenges Over 10 Years

• Building resources in country
• High speed, bench top centrifuge
  • To teach advanced problem solving you need test tubes!
• Shipping samples
  • Improvement with new challenges
• Slow in moving to routine pretransfusion antibody detection (screen)
Challenges Today

• Too many blood banks
• Resources
  • Expense of reagents
• Physician education
• Laboratory Scientist clinical training
• Politics in business
• Enforcement of standards for sustainable improvement
Opportunities

• Increase in volunteer donations
• CDC grant
• NACO moving toward inspection
• Working with AABB to develop accreditation
• Professional Organizations
• Scientific Journals
  • Asian Journal of Transfusion Science
• Education
• Collaboration
First Class in 2006