Clinical Safety & Effectiveness
Cohort # 11

Reducing CMV Negative Blood Transfusions in Pediatric Hematology-Oncology

CENTER FOR PATIENT SAFETY & HEALTH POLICY
UT Health Science Center™
SAN ANTONIO
Educating for Quality Improvement & Patient Safety
Financial Disclosures

• Team members have no conflicts of interest to report.
The Team

• Division
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  – *Aaron Sugalski, DO (PDHO Faculty)
  – Bradley Scoggins, MD (PGY-2, Pediatrics)
  – Leopoldo Cobos (Transfusion Services Supervisor)

• Sponsor Department
  – Pediatrics

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What We Are Trying to Accomplish?

OUR AIM STATEMENT

We propose to decrease by 50% the number of unnecessary CMV negative red blood cell transfusions in pediatric hematology-oncology (PDHO) patients at the Children’s Hospital of San Antonio over 90 days.
Project Milestones

• Team Created
  February 2012

• AIM statement created
  March 2012

• Bi-Monthly Team Meetings
  March 2012

• Background Data, Brainstorm Sessions,
  Workflow and Fishbone Analyses
  June 2012

• Interventions Implemented
  June 2012

• Data Analysis
  January 2012 -
  Ongoing

• CS&E Presentation
  Sept. 14, 2012
Transfusion Associated CMV Infection

- Children with cancer require red cell transfusions to treat chemotherapy induced anemia.
- Transfusion associated-CMV (TA-CMV) increases mortality.
  - TA-CMV rates of 30-60% in Hematopoietic Stem Cell Transplant (HSCT) with non-tested, non-leukoreduced blood products\(^1\).
  - Leukoreduction decreased TA-CMV to 2.5\%\(^2\).
  - Using CMV negative donors and leukoreduction, TA-CMV rate decreased to 1.5\%\(^2\).

References:  
CMV Negative Blood Is Rare.

• 30-80% of blood donors are CMV sero-positive\(^1\).
  – CMV survives in circulating white blood cells in CMV positive blood donors\(^3\).

• Leukoreduction reduces risk of TA-CMV.
  – Each unit of red cells = 2-5 \( \times 10^9 \) White Blood Cells (WBC)
  – Third generation leukocyte filters decrease below 1-5 \( \times 10^6 \) WBC

Current Recommendations

• CMV sero-negative oncology patients who are candidates for HSCT should receive CMV negative blood products.

• CMV negative blood products should be reserved for CMV sero-negative patients.
Pedi Heme-Onc Ordering Practices

High rate of un-necessary CMV negative blood products.

• Review of 41 patients with CMV negative orders
  – 14 patients CMV sero-negative
  – 13 patients had CMV positive serology
  – 14 patients were untested b/c they did not need CMV negative products

• 66% (27/41) did not require CMV negative products but received them anyways.
• CMV negative product order rate should be 30%.
Pt identified needing blood transfusion → MD/PNP Order for Transfusion

Blood Bank Identifies Unit → Blood Bank Receives Type and Cross

Two Nurses Verify Blood Unit → Patient Receives Red Cell Transfusion

Order Entry (MA or RN) → Patient Receives Blood Band

Blood Bank Receives Order (Electronic) → Nurse Collect Type and Cross

Inpatient Standardized Orders

Outpatient Handwritten Order
Fishbone

Medical Assistant
- Order entry without MD order if unable to locate chart

Nurse
- Pre-order blood products without
  - Lack of understanding of who needs CMV neg blood products

Patient
- Unclear clinical diagnosis
  - No CMV testing performed

Problem Statement
- High rate of unnecessary CMV negative blood products

Intervention: Create Transfusion Labels

Physician
- No standardized outpatient order set
- Housestaff inexperience
- Lack of Attending oversight
- Outdated knowledge
  - Never question CMV neg blood order
  - Any CMV neg blood order marks as CMV neg

Blood Bank
- No mechanism to update pt CMV status

Intervention:
1. Create Decision Tree
2. Faculty education
3. Housestaff education
4. Nursing/MA education

Intervention:
1. Update and change incorrect patient status
2. Review all new CMV negative orders
Intervention

• **Education**
  – Faculty & PNP
    • Create and disseminate decision tree.
  – Resident Inpatient School
    • Discuss CMV Decision Tree and standardized transfusion orders.
  – Nursing staff
    • Reviewed decision tree
    • Transfusion labels on patient charts.

• **Blood Bank**
  – Review and correct labels for existing patients
  – Revise Order Process for Old Patients
    • Question any CMV order if varies from known status
  – Create Order Process for New Patients
    • CMV status reviewed by MD and included in pt record
Decision Tree

UNKOWN

CMV Status

NEGATIVE

CMV Negative
1. < 3 months of age
2. New leukemia or lymphoma diagnosis
3. Aplastic Anemia
4. HLH
5. HR-ALL
6. Relapsed ALL/AML
7. AML
8. Burkitt’s Leukemia-Lymphoma
9. CRF on dialysis
10. Solid organ transplant

CMV Safe
1. Solid Tumors
2. Brain Tumors
3. Sickle Cell Disease
4. Standard Risk ALL
5. Hodgkin’s Lymphoma
6. Non-Hodgkin’s Lymphoma
7. Auto Transplant
8. Hemolytic Anemia
9. Iron Deficiency anemia
10. Healthy, immune-competent
11. Hemophilia

POSITIVE

Order CMV Safe Blood Products if patient is > 3 months and NOT hemodialysis, allo-HSCT or solid organ transplant.

CMV Negative
1. Age < 3 months
2. Burkitt’s Lymphoma-Leukemia
3. Aplastic Anemia
4. AML
5. High risk ALL
6. Relapsed ALL/AML
7. HLH
8. Thalassemia Major
9. CRF on dialysis
10. Solid organ transplant

CMV Safe
1. Solid Tumor
2. Brain Tumors
3. Histiocytosis
4. Hodgkin’s Lymphoma
5. Sickle Cell Disease
6. Standard risk ALL
7. Non-Hodgkin’s Lymphoma
8. Auto Transplant
9. Hemolytic Anemia
10. Iron Deficiency Anemia
11. Hemophilia
Implementing the Change

• April 26, 2012 - Faculty Create CMV Decision Tree
• May, 2012 – Transfusion Labels
• May 8, 2012 – Updated CMV status with Blood Bank
• June, 2012 – Nursing Meeting
• August 9, 2012 – Housestaff Inpatient School
Results/Impact

PDHO Transfusions

# of Transfusions

Jan Feb Mar Apr May Jun July Aug

CMV Decision Tool
Blood Bank
Housestaff

Ttl Trans
CMV Neg
CMV Safe
Expansion of Our Implementation

• Type of Blood Product
  – Platelets
• Other medical and surgical services
• Integrate into housestaff curriculum
• CPOE
  – Standardized order sets created to be implemented with CPOE hospital wide.
Return on Investment

- South Texas Blood and Tissue Charge to Hospital for CMV neg blood = $36/unit
- Annual cost prior to intervention = $17,280
  - 80% of units ordered CMV negative
- Annual cost after intervention = $8,640
  - 40% of units ordered CMV negative
- Annual Savings = $8,640
Conclusion/What’s Next

• Through simple, inexpensive measures, we successfully reduced un-necessary CMV negative blood product ordering in Pedi Heme-Onc patients.

• In the future, we will disseminate CMV Decision Tree to other pediatric services in our hospital.

• Long-term Goal
  – Integrate into CPOE
Thank you!