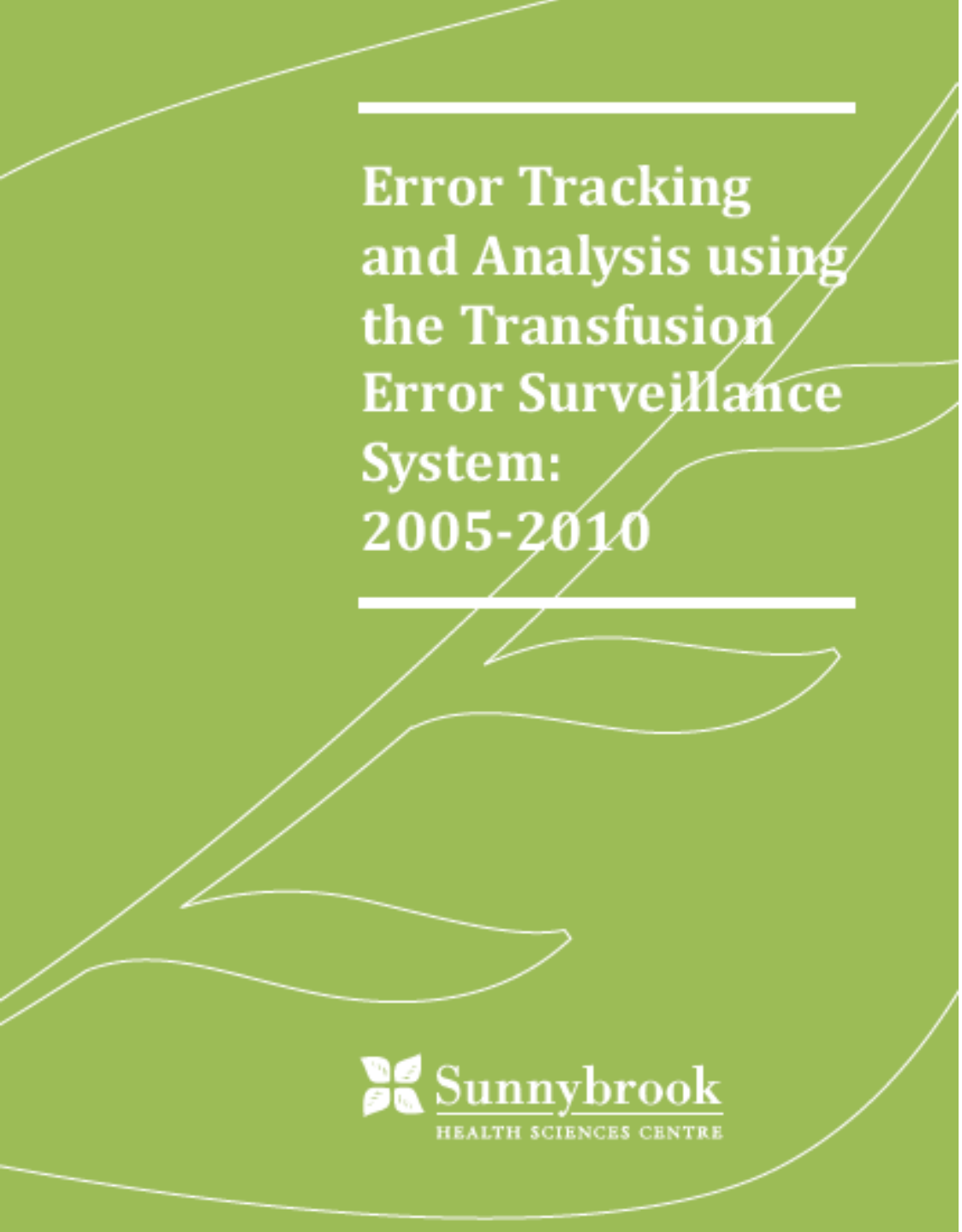
The Importance of Transfusion Error Surveillance

This is step #1 in error management

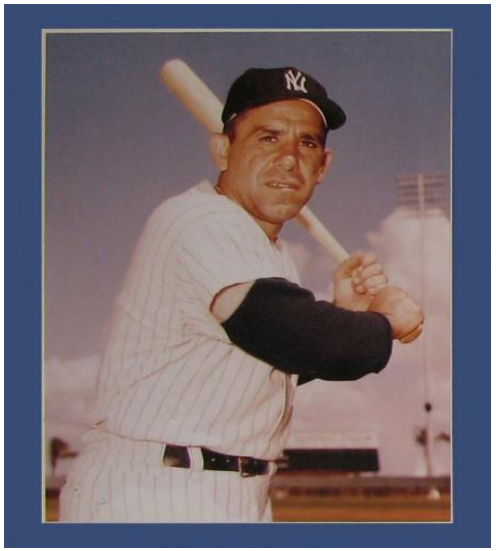
Jeannie Callum, BA, MD, FRCPC, CTBS



6051 Clinical Errors

9083 Laboratory Errors

15134 Errors over 6 years



“I don’t want to make the wrong mistake”

Yogi Berra

Outline

- **Case**
- Learning from other industries
  - Aviation
  - Anesthesiology
- Essential ingredients of transfusion error reporting
  - With examples from the Sunnybrook transfusion experience

ER – acute area
Nurse assigned to care for 3 patients

BED 15 **BED 16** **BED 17**

Patient on list to go
To the operating room
For hip fracture

ER – acute area
Nurse assigned to care for 3 patients

BED 15

BED 16

BED 17

On arrival
Group and Screen sent
Diagnosis: Chest pain
B POS

ER – acute area
Nurse assigned to care for 3 patients

BED 15 **BED 16** **BED 17**

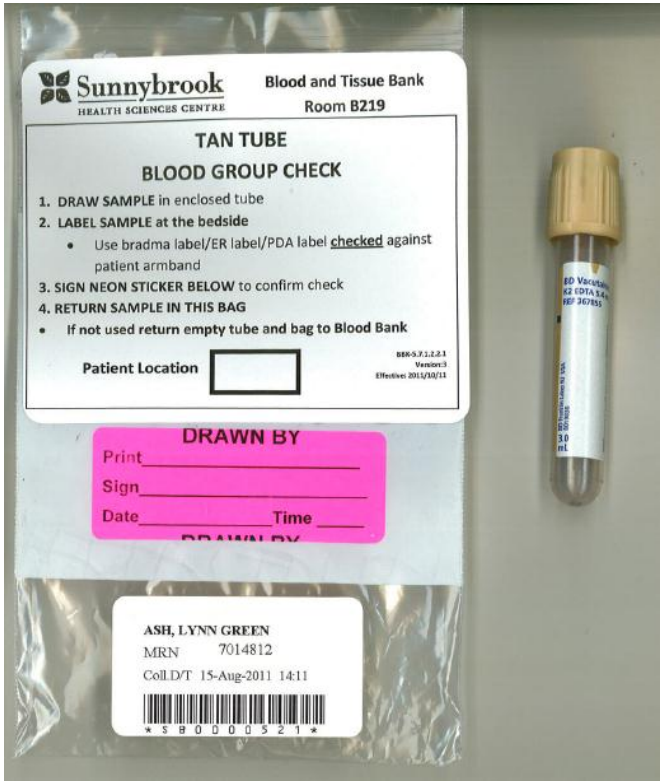
6 hours later
Group and Screen sent
Diagnosis: Hip fracture
Order: 2 units CM

ER – acute area
Nurse assigned to care for 3 patients

BED 15 **BED 16** **BED 17**

Technologists: calls down to RN to let her know we need a 'tan tube' to allow us to prepare blood [last sample less than 24 hours and new patient]
RN: There are no transfusion orders for Bed 16
Technologist: Requisition states patient is in Bed 15
RN: Oh dear! I drew a G&S from Bed 15 and put Bed 16 name on it!

Tan tube
Group check



So we can be assured that a sample on a new patient was independently drawn and labelled

ER – acute area
Nurse assigned to care for 3 patients

BED 15 **BED 16** **BED 17**

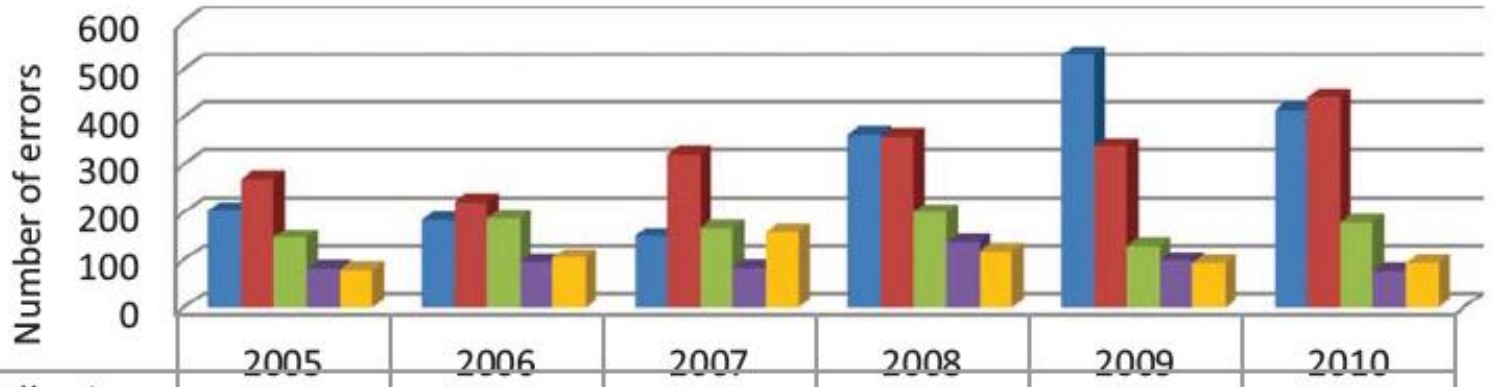
Still no sample from this Patient – OR delayed

But no ABO-incompatible transfusions!

Why did we implement the tan tube?

Our error tracking system told us we needed to!

And…multiple other system changes failed



	2005	2006	2007	2008	2009	2010
Sample Collection	205	185	151	363	531	414
Sample Handling	271	222	321	359	338	442
Product Request	148	188	169	201	130	180
Request for Pick-up	83	96	84	138	100	78
Unit Transfusion	80	106	161	119	94	94

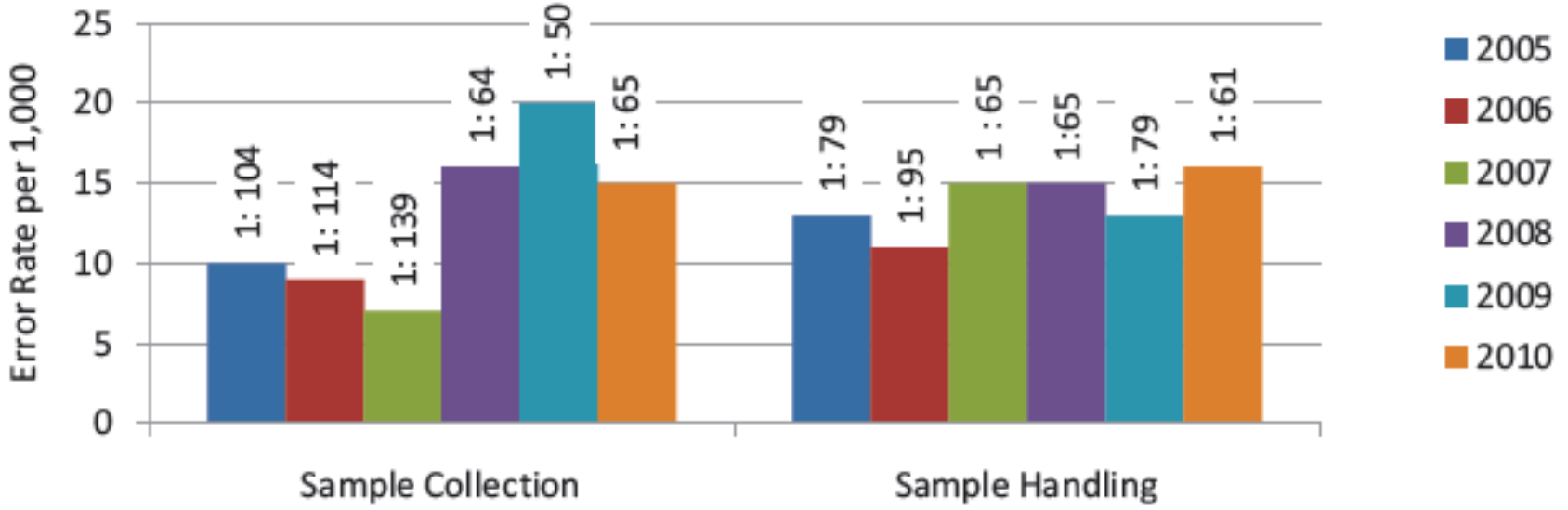
One error per day at just one hospital!

Table 4:
Errors in sample collection

Sample Collection	2005	2006	2007	2008	2009	2010	Total	%
01 Sample labelled with wrong ID	41	28	11	15	25	30	**150**	**8.1**
02 Not labelled	44	48	34	54	27	47	**254**	**13.7**
03 Wrong Patient collected	3	2	4	1	1	3	**14**	**0.8**
04 Collected in wrong tube	24	15	15	25	26	10	**115**	**6.2**
05 Sample NSQ (not sufficient quantity)	8	3	2	22	27	16	**78**	**4.2**
06 Sample hemolyzed	20	9	5	135	295	189	**653**	**35.3**
07 Label incomplete/illegible key patient identifiers	36	38	46	46	83	57	**306**	**16.5**
08 Sample collected unnecessarily	2	16	14	15	8	18	**73**	**3.9**
09 Requisition arrives without sample	21	17	17	48	35	7	**145**	**7.8**
10 Armband incorrect/not available	1	1	0	0	0	1	**3**	**0.2**
11 Sample contaminated	0	1	0	0	0	0	**1**	**0.1**
99 Other	5	7	3	2	4	36	**57**	**3.1**
Total	**205**	**185**	**151**	**363**	**531**	**414**	**1849**	**100.0**

Short-term: increase detection of these errors
Long-term: technology to eradicate these errors

Figure 3: Hospital error rates from 2005-2010 per 1,000 blood samples collected



Outline

- Case
- **Learning from other industries**
  - **Aviation**
  - **Anesthesiology**
- Essential ingredients of transfusion error reporting
  - With examples from the Sunnybrook transfusion experience

Success in the airline industry

Aviation safety

- In 1979, the Federal Aviation Regulations clarified the reporting of errors to clearly provide immunity
  - Actually, failure to report is considered a serious error – immunity only if reported within 10 days
  - Individuals who fail to report safety hazards need to bear risk from not reporting
- This resulted in a 6.75-fold increase in reports

Success in the US airline industry

1990 – Fatal accident rate
0.077 per 100,000 departures

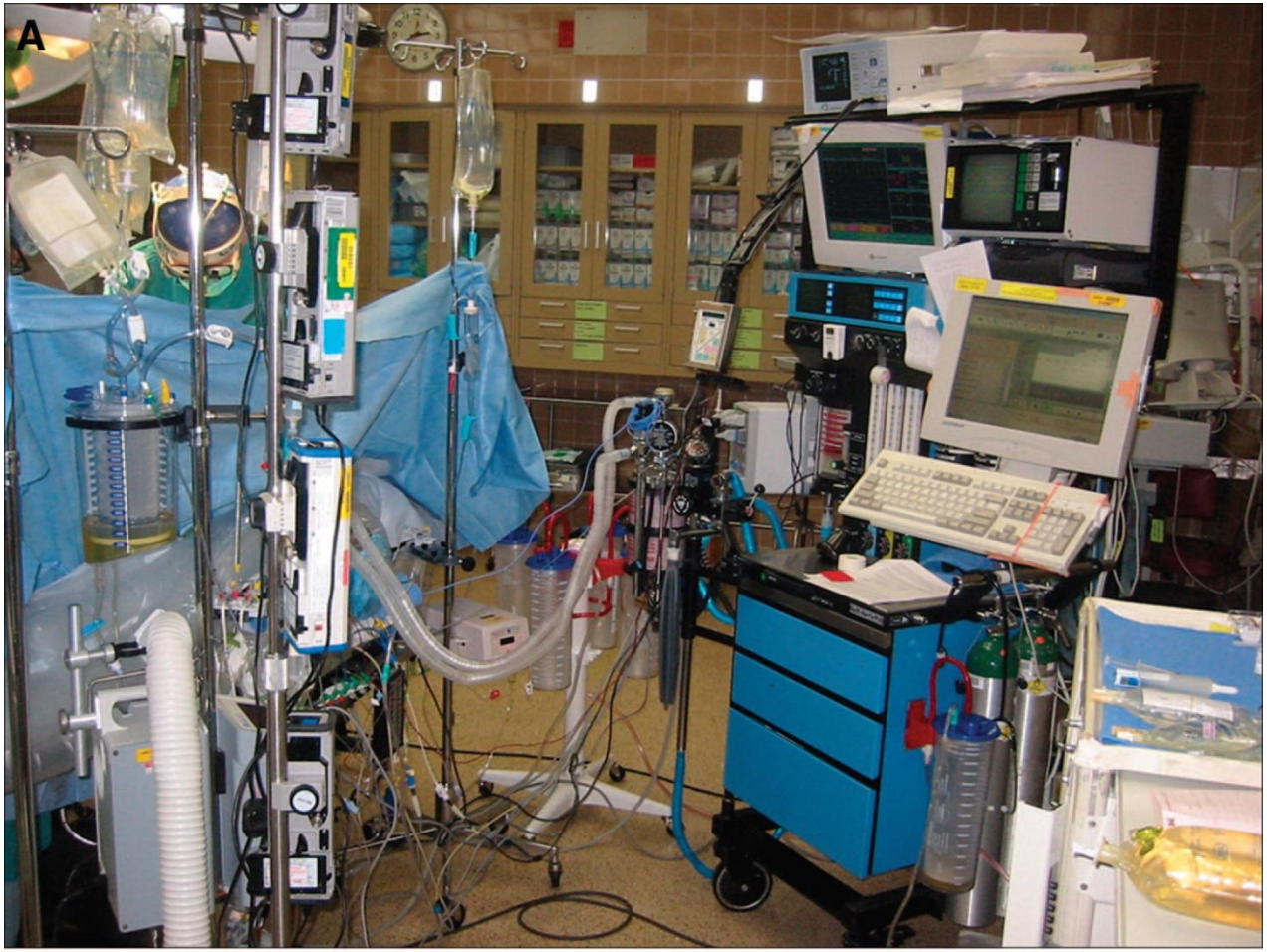
Systems level error-reduction policies

2004 – Fatal accident rate
0.009 per 100,000 departures

Why has the Aviation Safety Reporting System has been so effective?

Because the pilot is always the first to the crash site
Error reporting is part of self-preservation!

Success in anesthesia



Success in anesthesia

1954 – Mortality rate 1 in 1560

Systems level error-reduction Policies*

2000 – Mortality rate 1 in 200,000

*** Error tracking systems & developments in technology**

ORIGINAL ARTICLE

Critical incident reports concerning anaesthetic equipment: analysis of the UK National Reporting and Learning System (NRLS) data from 2006–2008*

ORIGINAL ARTICLE

Patient safety incidents involving neuromuscular blockade: analysis of the UK National Reporting and Learning System data from 2006 to 2008

ORIGINAL ARTICLE

An analysis of critical incidents relevant to pediatric anesthesia reported to the UK National Reporting and Learning System, 2006–2008

Clear recommendations

- Keep reporting critical incidents to national reporting system
- The problems reported could often have been prevented by the correct application of existing safeguards – no ‘workarounds’
- Preoperative checking procedures should prevent wrong site errors, detect patient allergies, fasting times, etc.

Pediatric Anesthesia **21** (2011) 841–847 © 2010 Blackwell Publishing Ltd

Identifies clear issues

- When anesthetists hand over to recovery staff, they should give explicit instructions on how and where they can be contacted in the event of a problem
- iv lines should be kept visible [regular checks for misconnection and extravasation]
- Plans should be in place to obtain essential equipment for safe anesthesia in the event of equipment failure

Pediatric Anesthesia **21** (2011) 841–847 © 2010 Blackwell Publishing Ltd

Success in race car driving?

Success in race car driving?

Safer on the driver?

Outline

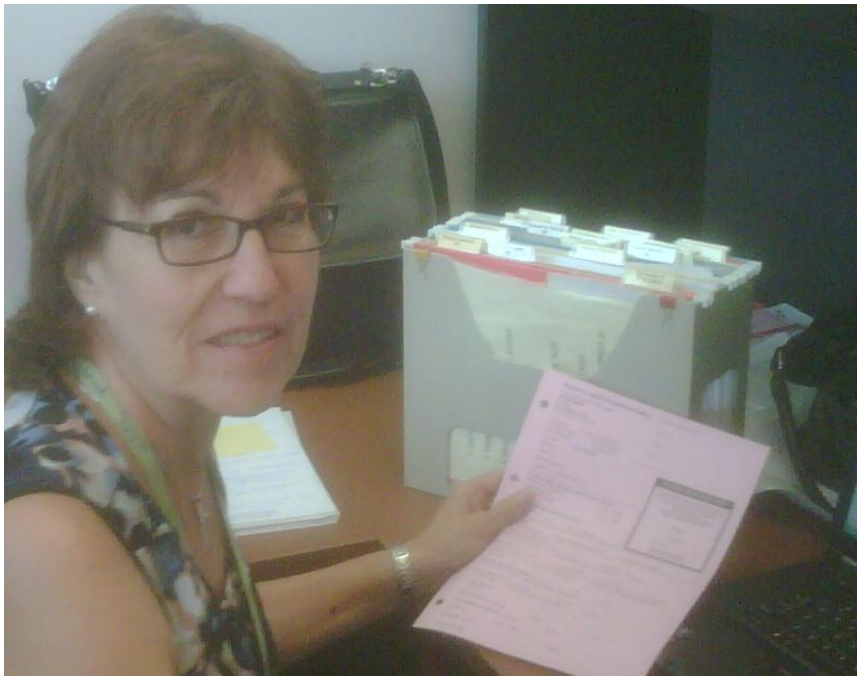
- Case
- Learning from other industries
  - Aviation
  - Anesthesiology
- **Essential ingredients of transfusion error reporting**
  - **With examples from the Sunnybrook transfusion experience**

Essential ingredients

- **Anonymous, non-discoverable, non-punitive, guarantee of immunity for those that commit and report errors**
  - Any reporting system that ignore immunity can not operative effectively, especially if voluntary
  - Meet: The transfusion error surveillance system (TESS)

Acknowledgement
2 key people to TESS

Ana Lima, Patient Safety Nurse



Helen Downie, Error Manager

Essential ingredients

- **Culture of safety**
  - **Focus on the system problems – 'latent errors'**
    - Organizational infrastructure:
      - hardware, software, policies, procedures, human resources policies (workload per person), and patient factors
    - Superficial look at errors focuses on the people rather than on the systems
  - **Not** the individual compliance with existing systems
    - "blame and shame" and "blame and train"
    - Inherently error prone people are rare
    - Identify only habitual rule-breakers – "cowboys"

Improvements in healthcare will come from improving the system, not from individual performance

Habitual rule-breakers – “cowboys”

- Rare in medicine – study of 2,000 physicians – not one ‘bad apple’
- Rare in transfusion medicine
  - Example:
    - Surgeon who takes a patient to the operating room for a high blood loss surgery without going through pre-admission clinic (no group and screen)
    - “A failure to plan on your part does not constitute an emergency on my part”

National Quality of Care Forum 1992; May 14-15.

Punitive unsafe culture:

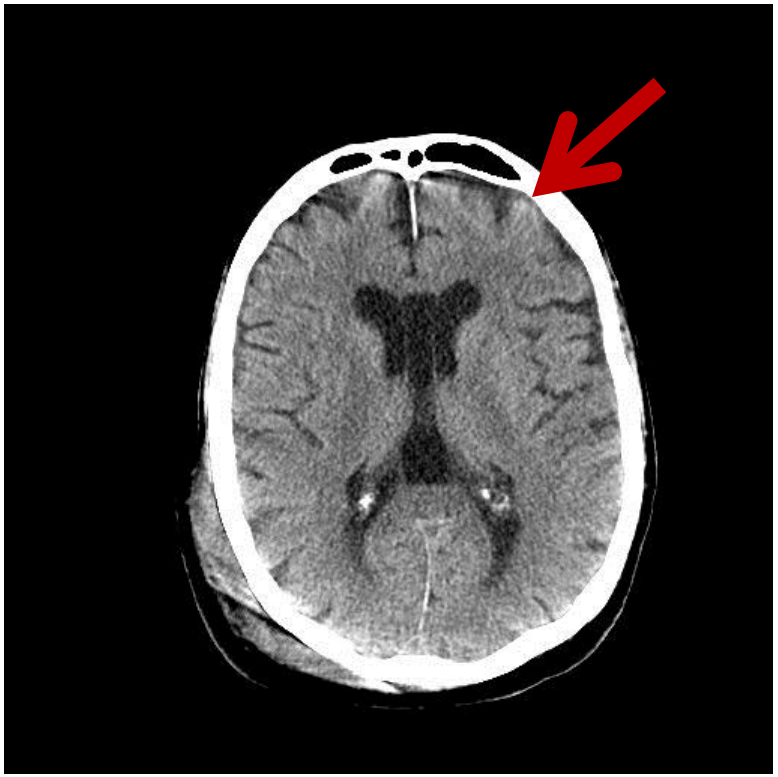
-Individual (not organizational) responsibility
-High workload despite known risk
-Tolerance of variability of care
-Pride in workarounds
-Casual communication

High reliability organization:

-Leadership committed to safety
-Reporting system
-Adequate resources
-Standardization around best practice
-Extensive team training
-Structured communication

Case

- 68 year old man presented to Sunnybrook after a trip and fall



Case

- Past history of chronic lymphocytic leukemia
- Platelet count 54 on arrival (his normal baseline)
- Patient admitted to neurosurgical intensive care with hematology consult
- Patient administered 4 pools of platelets over 3 days
- No bleeding – sent home

Error identified on return to hospital

None of the products were irradiated!

We did not blame the physicians or nurses! We blamed the systems in which they work

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Blood and Tissue Bank, 2075 Bayview Avenue, Toronto, ON M4N 3M5

BLOOD AND TISSUE BANK ORDER FORM

☐ **ROUTINE** ☐ **URGENT** ☐ **STAT**

Patient Location _____

☐ Trauma Room ☐ OR #____

PATIENT IDENTIFICATION

Transfusion or Procedure Date: 20 YY / MM / DD

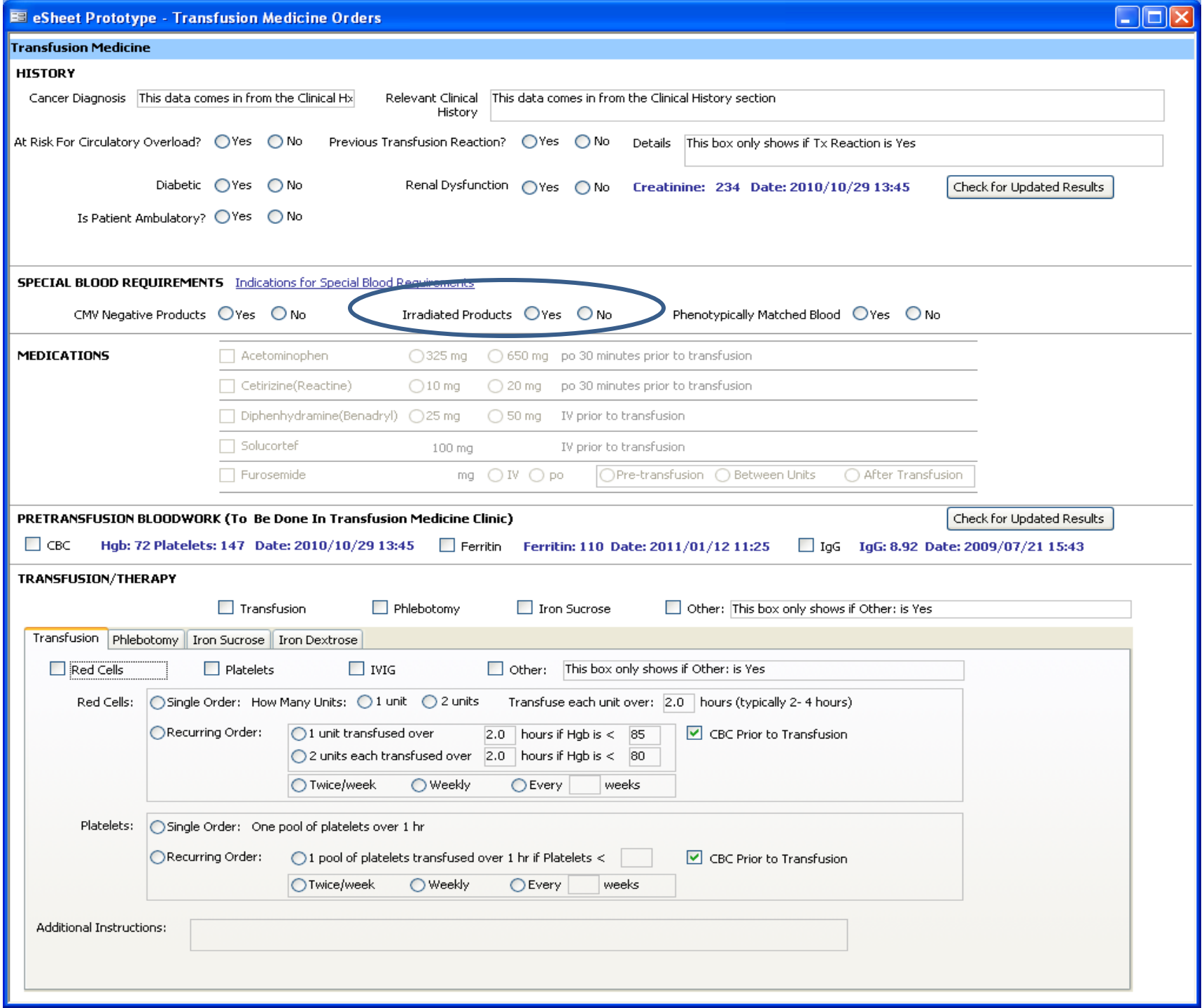
Ordering Physician .....

Pager # .....

Diagnosis or Procedure .....

Does the Patient also have any of the following: ☐ Sickle Cell Disease ☐ Lymphoma/Leukemia/Hodgkin's

☐ Stem Cell/Bone Marrow Transplant ☐ MDS/Myelofibrosis ☐ Congenital Immunodeficiency


eSheet Prototype - Transfusion Medicine Orders
Transfusion Medicine
HISTORY
Cancer Diagnosis
This data comes in from the Clinical Hx
Relevant Clinical History
This data comes in from the Clinical History section
At Risk For Circulatory Overload? Yes No
Previous Transfusion Reaction? Yes No
Details
This box only shows if Tx Reaction is Yes
Diabetic Yes No
Renal Dysfunction Yes No
Creatinine: 234 Date: 2010/10/29 13:45
Check for Updated Results
Is Patient Ambulatory? Yes No
SPECIAL BLOOD REQUIREMENTS
Indications for Special Blood Requirements
CMV Negative Products Yes No
Irradiated Products Yes No
Phenotypically Matched Blood Yes No
MEDICATIONS
Acetominophen 325 mg 650 mg po 30 minutes prior to transfusion
Cetirizine(Reactine) 10 mg 20 mg po 30 minutes prior to transfusion
Diphenhydramine(Benadryl) 25 mg 50 mg IV prior to transfusion
Solucortef 100 mg IV prior to transfusion
Furosemide mg IV po
Pre-transfusion Between Units After Transfusion
PRETRANSFUSION BLOODWORK (To Be Done In Transfusion Medicine Clinic)
Check for Updated Results
CBC Hgb: 72 Platelets: 147 Date: 2010/10/29 13:45
Ferritin Ferritin: 110 Date: 2011/01/12 11:25
IgG IgG: 8.92 Date: 2009/07/21 15:43
TRANSFUSION/THERAPY
Transfusion Phlebotomy Iron Sucrose Other:
This box only shows if Other: is Yes
Transfusion Phlebotomy Iron Sucrose Iron Dextrose
Red Cells Platelets IVIG Other:
This box only shows if Other: is Yes
Red Cells:
Single Order: How Many Units: 1 unit 2 units
Transfuse each unit over: 2.0 hours (typically 2- 4 hours)
Recurring Order:
1 unit transfused over 2.0 hours if Hgb is < 85
2 units each transfused over 2.0 hours if Hgb is < 80
CBC Prior to Transfusion
Twice/week Weekly Every weeks
Platelets:
Single Order: One pool of platelets over 1 hr
Recurring Order:
1 pool of platelets transfused over 1 hr if Platelets <
CBC Prior to Transfusion
Twice/week Weekly Every weeks
Additional Instructions:

Essential ingredients

- Knowing what to report
  - Anything that does not constitute quality care:
    - Providing care associated with the best outcomes
    - Not providing care that is not associated with the best outcomes
    - Providing it within the optimal period of time
    - Successfully delivering it as intended

Doing the right things, only doing the right things, at the right time, and in the right way

Clarke JR. The American Surgeon 2006; 72; 1088-91

Translation into transfusion medicine?

- Only giving blood when alternatives have failed or do not exist
- Remembering to give intravenous vitamin K to reverse warfarin so you don't need PCCs
- Giving the plasma right before surgery, not the night before
- Running the RBC slowly with furosemide for the patient with heart failure

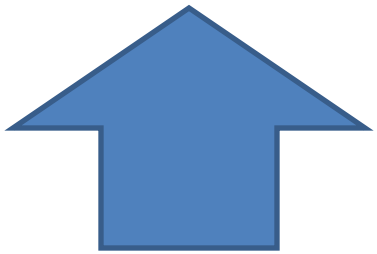
Doing the right things, only doing the right things, at the right time, and in the right way

Essential ingredients

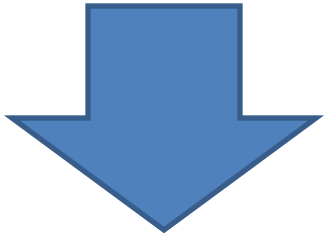
- Reporting near-misses (aka. 'near-hits')
  - Errors that do not harm the patient
  - These are signal of weaknesses in the system that **will** eventually lead to harm
  - They provide insight into solutions – captures successful recovery
  - They are 300x more common than adverse events
  - Allow you to calculate the recovery rate for each error type

Near-misses increase our awareness of the constant potential for disaster

Goal

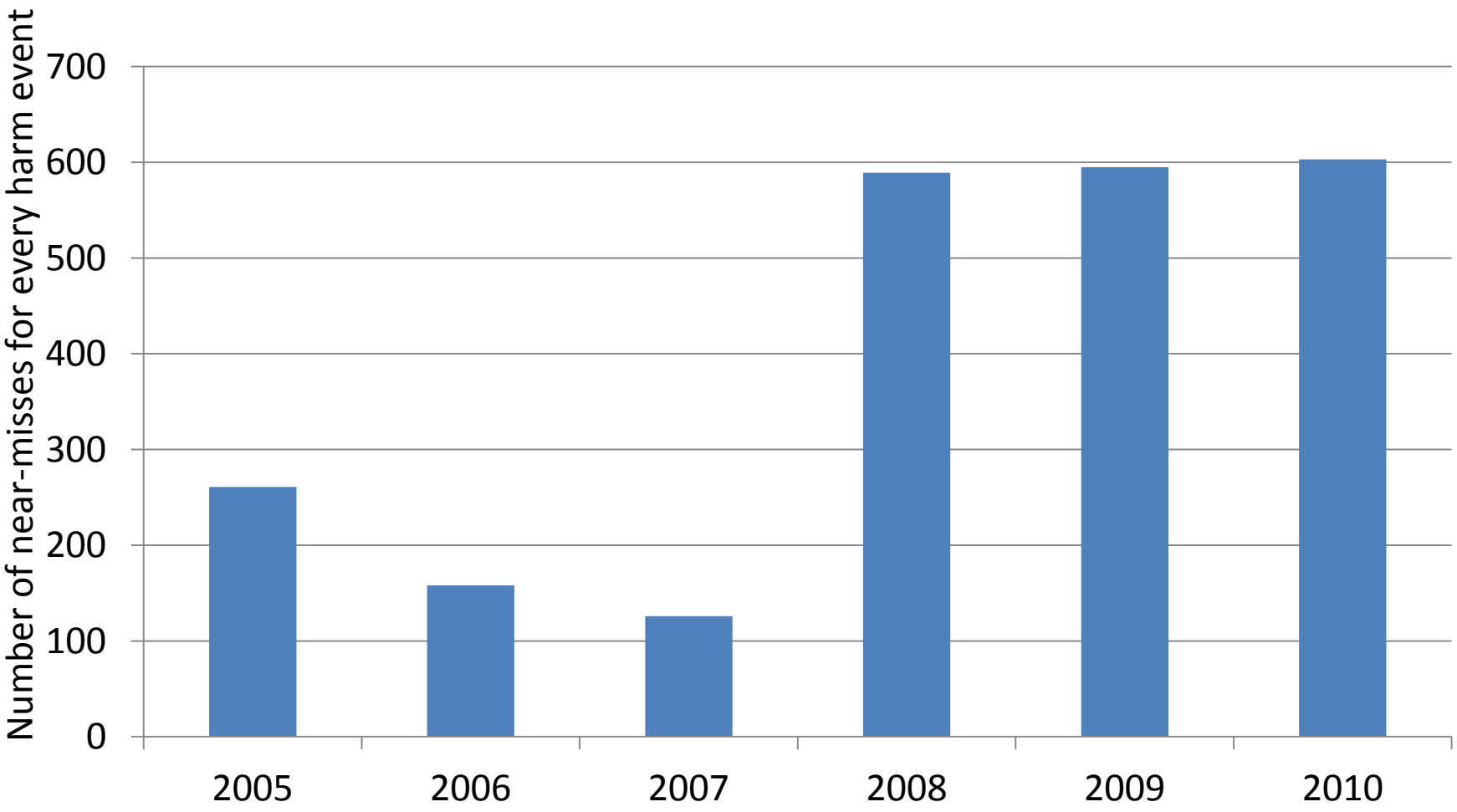


Near-miss Reporting



Adverse events

Clinical adverse event: Near miss ratio



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What about the blood bank laboratory?

1 in 4,541

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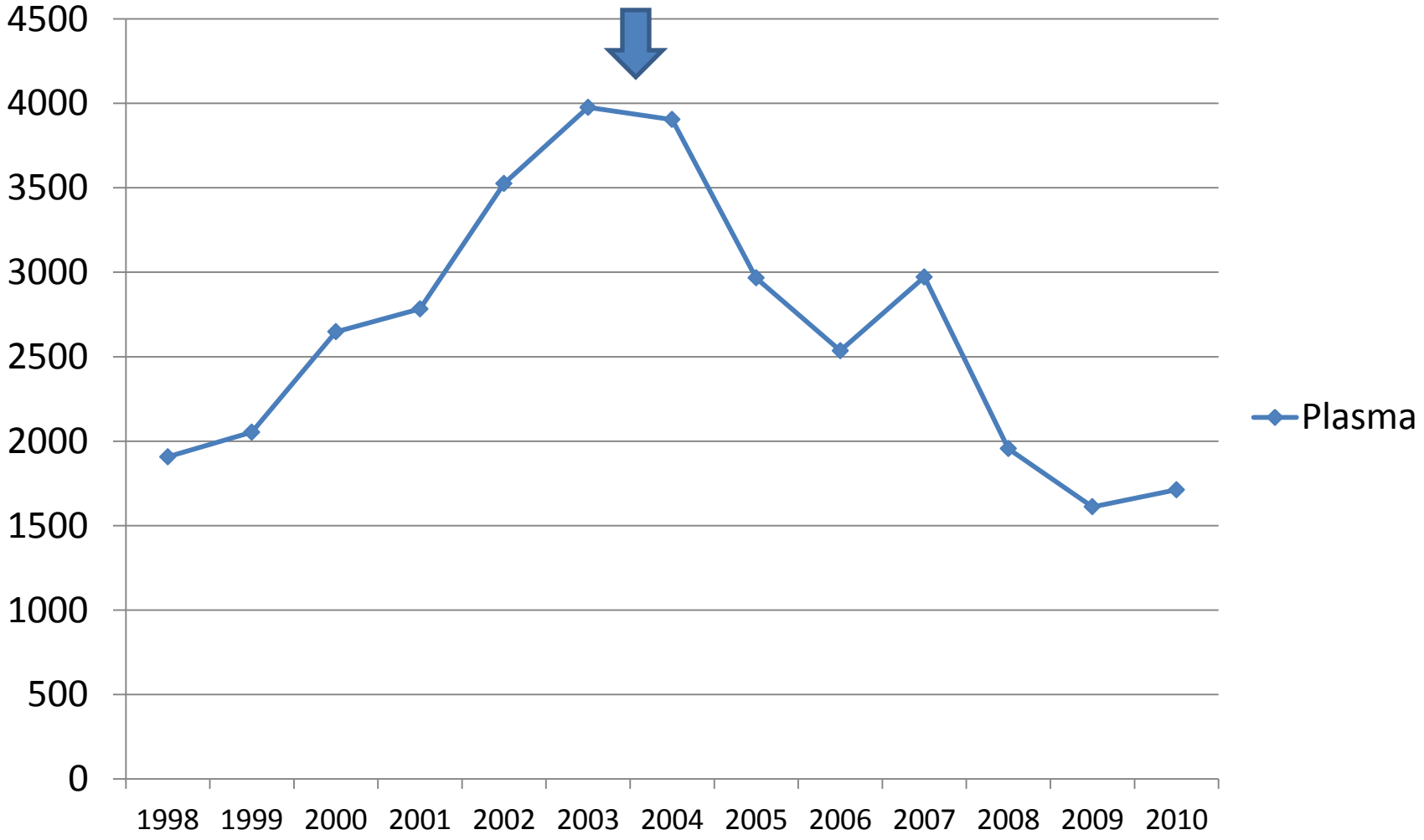
How are we decreasing harm?

- 21 harm events over 6 years
- 100% were adverse reactions from unnecessary transfusions
- Step 1: prospectively screen all orders for all blood products
- Step 2: mandatory competency assessment of all physicians

Plasma Use – Prospective auditing

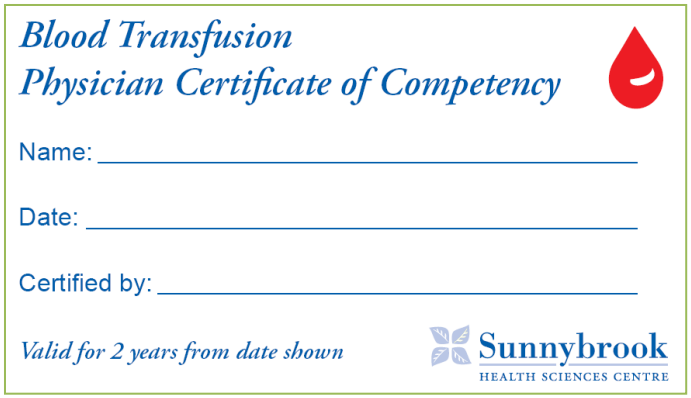


Mandatory Competency Assessment q2years

Coming Fall 2012

- Pre-test
- Module 1: Indication for products
- Post-test 1
- Module 2: Adverse reactions
- Post-test 2

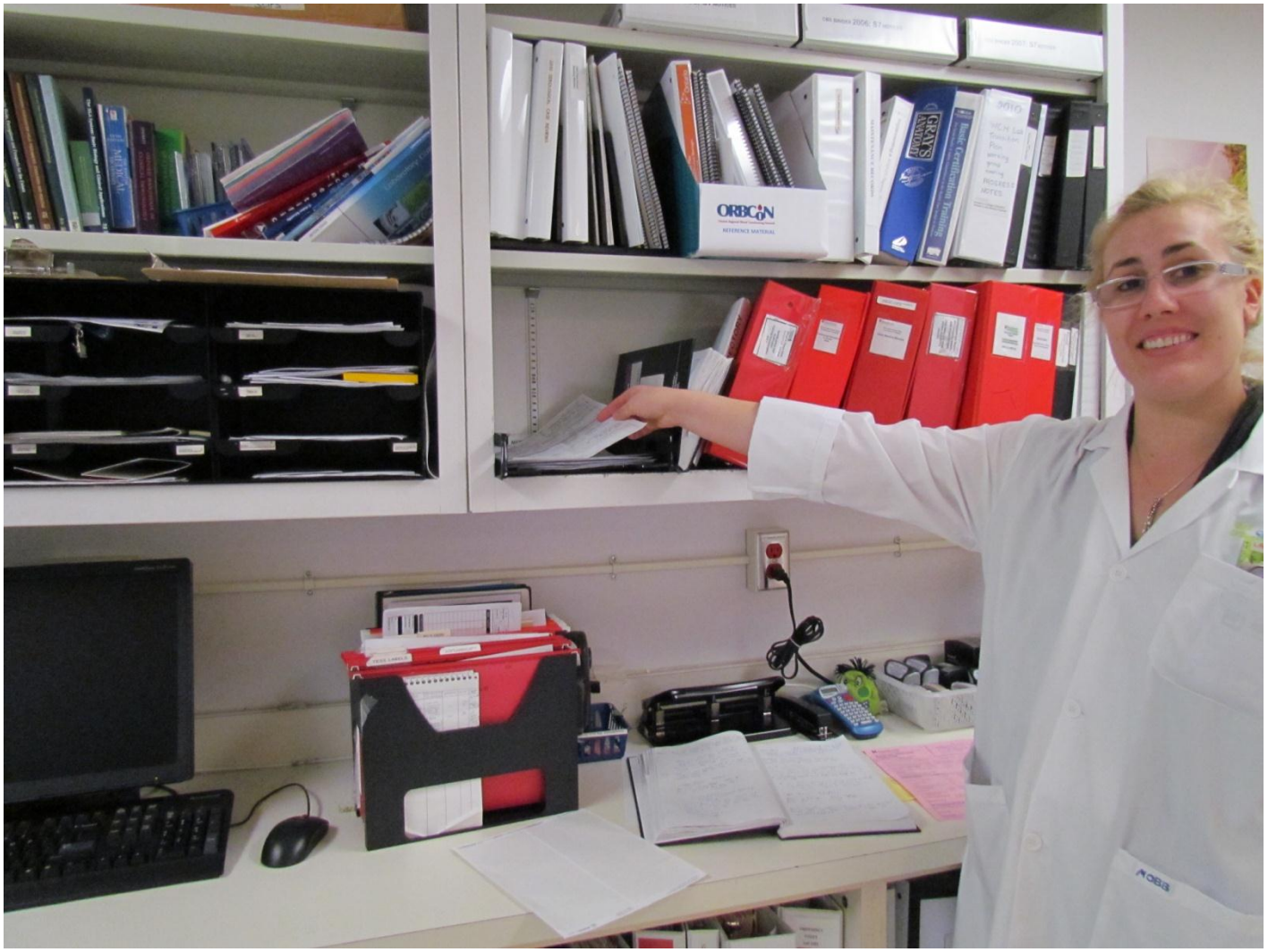
- Who: all resident and staff physicians



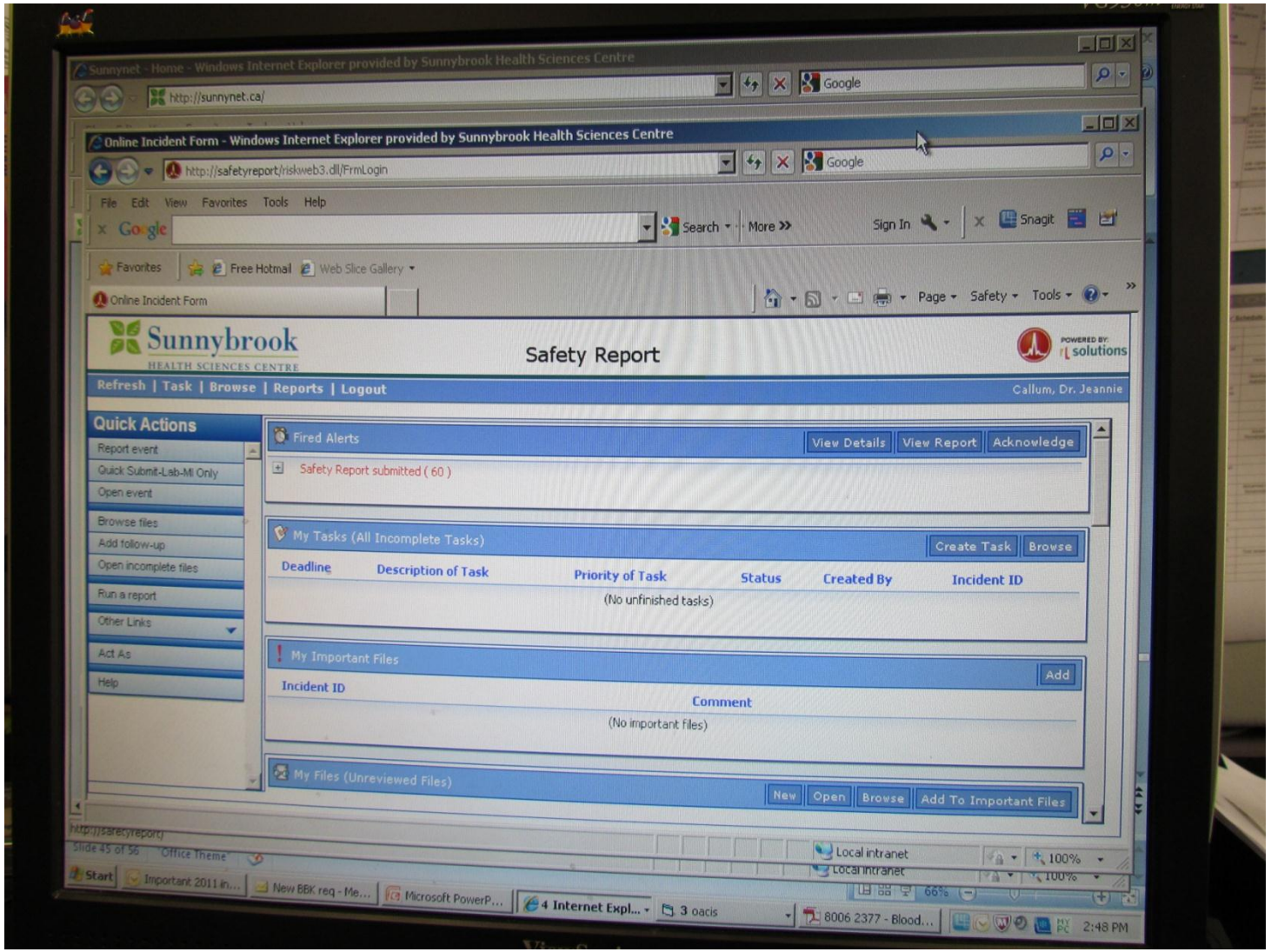
Essential ingredients

- **Easy to report**
  - Remove disincentives – concerns about anonymity and liability
  - Multiple methods to report – paper, electronic
  - Simple to report – clinical team already stressed at the workload level
  - Make improvements to motivate people to keep reporting

Helen’s drop box



E-safety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Safety Report
Refresh | Task | Browse | Reports | Logout
Callum, Dr. Jeannie
Quick Actions
Report event
Quick Submit-Lab-MI Only
Open event
Browse files
Add follow-up
Open incomplete files
Run a report
Other Links
Act As
Help
Fired Alerts
View Details
View Report
Acknowledge
Safety Report submitted (60)
My Tasks (All Incomplete Tasks)
Create Task
Browse
Deadline
Description of Task
Priority of Task
Status
Created By
Incident ID
(No unfinished tasks)
My Important Files
Add
Incident ID
Comment
(No important files)
My Files (Unreviewed Files)
New
Open
Browse
Add To Important Files

Essential ingredients

- **Feedback error data to clinical and laboratory staff**
  - Help encourage reporting
  - Benchmarking between departments
  - Help them to identify where they (and you) need to start first

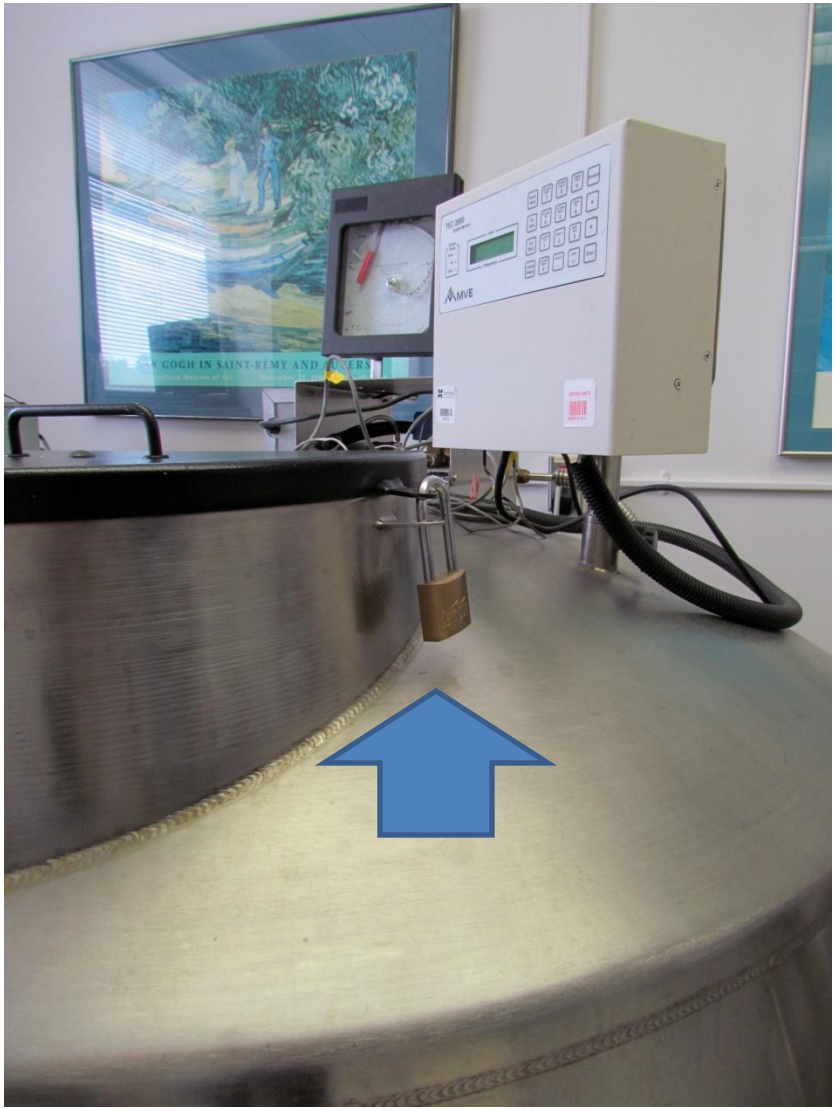
a. Sample collection ranking

Sample Collection	Error rate per 1,000 samples collected from 2005-2010
1.Holland Centre	1
2. Outpatient Clinics	3
3. Medical/Surgical	5
4. Obstetrics	9
5. Intensive Care Unit	15
6. Emergency Department	23

Essential ingredients

- **Adding defense mechanisms**
  - Information system alerts you if you of a potential high severity error
    - Failing to meet a requirement (e.g., irradiation)
  - Bedside positive patient identification alarms
  - Bedside labeling devices with a 15 sec time out
  - Locks on quarantined products

Lock on quarantined skin



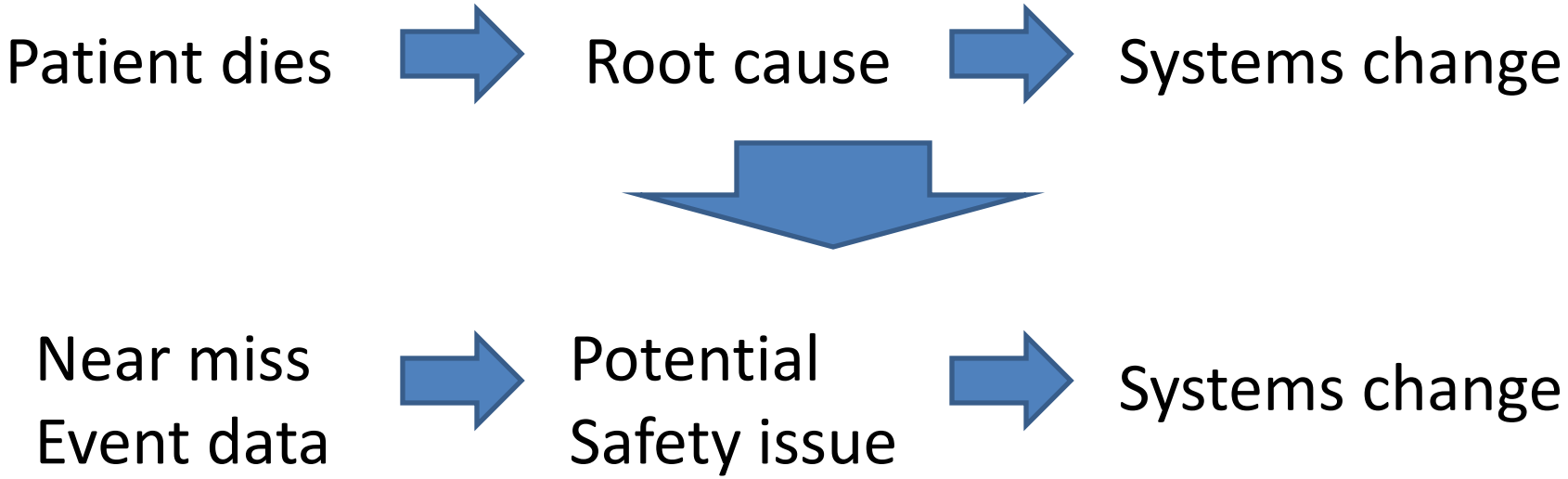
Any Mismatch

Essential ingredients

- **Overcome organizational and financial obstacles**
  - Success will require that we overhaul organization, staffing, training, and technology
  - If severe financial pressures lead to focus on short-term economic survival – patient safety will be left behind
  - In blood transfusion – we need to transition from focus on the blood centre to focus on the transfusion process at the hospital

Essential ingredients

- **Migrate from reactive to proactive management of errors**



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Essential ingredients

- **Solve common irritating problems**
  - control the chaos

Table 4:
Errors in sample collection

Sample Collection	2005	2006	2007	2008	2009	2010	Total	%
01 Sample labelled with wrong ID	41	28	11	15	25	30	**150**	**8.1**
02 Not labelled	44	48	34	54	27	47	**254**	**13.7**
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05 Sample NSQ (not sufficient quantity)	8	3	2	22	27	16	**78**	**4.2**
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10 Armband incorrect/not available	1	1	0	0	0	1	**3**	**0.2**
11 Sample contaminated	0	1	0	0	0	0	**1**	**0.1**
99 Other	5	7	3	2	4	36	**57**	**3.1**
Total	**205**	**185**	**151**	**363**	**531**	**414**	**1849**	**100.0**

Where & why?

Table 5:
Errors in sample collection

Sample Collection	2005	2006	2007	2008	2009	2010	Total	%
01 Sample labelled with wrong ID	11	3	5	3	6	8	**36**	**4**
02 Not labelled	11	19	13	17	8	11	**79**	**10**
03 Wrong Patient collected	3	0	1	1	0	1	**6**	**1**
04 Collected in wrong tube	4	3	2	1	2	1	**13**	**2**
05 Sample NSQ (not sufficient quantity)	3	0	2	16	21	14	**56**	**7**
06 Sample hemolyzed	3	2	1	88	199	141	**434**	**54**
07 Label incomplete/illegible key patient identifiers	12	20	10	12	22	10	**86**	**11**
08 Sample collected unnecessarily	1	11	10	4	4	7	**37**	**5**
09 Requisition arrives without sample	6	5	4	18	14	4	**51**	**6**
10 Armband incorrect/not available	1	0	0	0	0	0	**1**	**0**
11 Sample Contaminated	0	1	0	0	0	0	**1**	**0**
99 Other	1	2	0	2	2	3	**10**	**1**
Total	**56**	**66**	**48**	**162**	**278**	**200**	**810**	**100**

These errors cost a lot of money

- Recollection of samples $24.79 per re-collection
- N=3802 samples rejected
- $95,250 just for the blood bank samples

The cost of lost products

Table 15:
The cost of wasted products[1]

	2005	2006	2007	2008	2009	2010	Total	Cost ($)
RBC	58	61	82	114	76	70	**461**	**$393,002.50[2]**
Platelets	0	7	25	7	2	1	**42**	**$16,207.80**
Plasma	12	15	6	24	16	16	**89**	**$3,471.00**
Cryoprecipitate	10	0	20	4	0	20	**54**	**$7,290.00**
Factor VIIa	1	4	1	2	0	0	**8**	**$42,998.00**
Anti Thrombin III	0	0	0	1	0	0	**1**	**$1,084.38**
Albumin 25%	1	4	1	0	0	2	**8**	**$581.36**
Albumin 5%	2	11	3	1	3	2	**22**	**$799.26**
IVIG	8	8	0	8	7	0	**31**	**$42,581.60**
RhIG	3	0	3	2	1	2	**11**	**$865.92**
PCC	0	0	0	6	12	4	**22**	**$12,650.00**
Total								**$521,531.82**

RBC: red blood cell, IVIG Intravenous Immune Globulin, Rh IG: Anti- D Immune Globulin and PCC: prothrombin complex concentrate

The location of lost products

Table 16:
Ranking of clinical services according to cost (ranked highest to lowest)

Clinical Service	Total Cost of Errors
1. Operating Room	$175,292.38
2. Medical/Surgical	$ 127,202.73
3. Intensive Care Unit	$ 98,367.17
4. Emergency Department	$77,269.92
5. Other (e.g. Obstetrics, Outpatient Clinics)	$43,399.62

If we don’t make it happen others will ‘encourage’ us to do it

To trigger giant leaps forward in the safety, quality and affordability of health care by:

- Supporting informed healthcare decisions by those who use and pay for health care; and,
- Promoting high-value health care through incentives and rewards

Outline

- Case
- Learning from other industries
  - Aviation
  - Anesthesiology
- Essential ingredients of transfusion error reporting
  - With examples from the Sunnybrook transfusion experience

“Error-reporting should not be our final goal, but only a means of learning from our shortcomings to help improve the future care of our patients”

Charles H. Andrus

Dept. Surgery, San Joaquin General Hospital, California