

How many serious transfusion reactions  
can be prevented?

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Conflict of interest: part time employee  
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We  hemovigilance!



**Hemovigilance** is the systematic monitoring of side effects and adverse incidents throughout the chain from blood donor to recipient, and all other activities which can lead to safer and more effective use of blood components.

i.e. we should be preventing transfusion reactions!



- Hemovigilance in the Netherlands
- Potential approaches for preventing transfusion reactions:
  - blood component
  - hospital blood transfusion laboratory
  - blood management / avoidance of transfusion
  - premedication
  - error prevention
- How many serious reactions can be prevented?

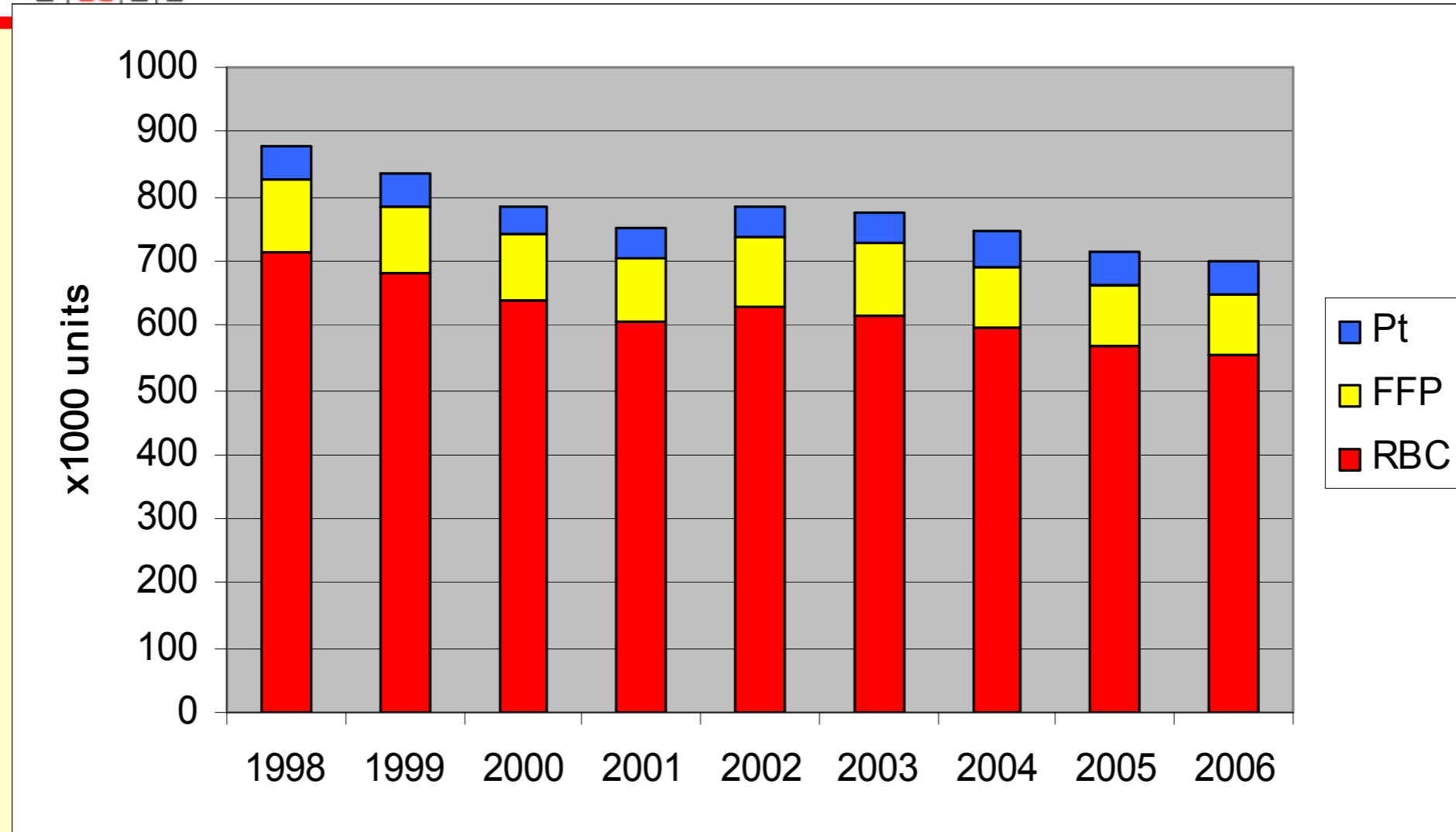


# Blood safety

- Voluntary unpaid donors
- Testing for infectious diseases (including minipool NAT for HCV and HIV); malaria antibody test (ex-patients); CMV and Parvo B19-safe available on request
- Universal leukodepletion since autumn 2001 (and exclusion of UK donors)
- Exclusion of transfusion donors since February 2005; male-only quarantine plasma for transfusion produced since autumn 2005
- Two vCJD cases reported to date

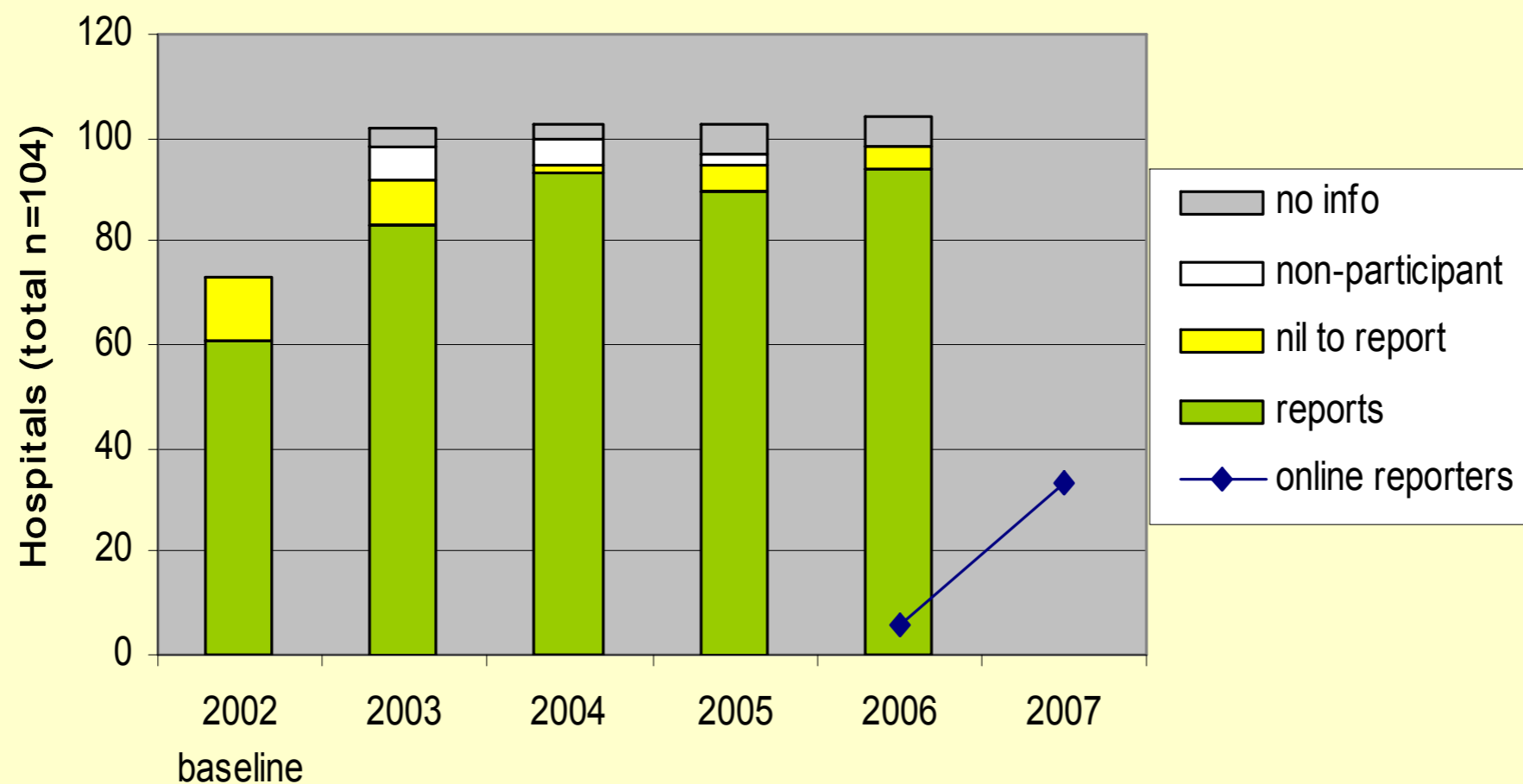


# Dutch blood use



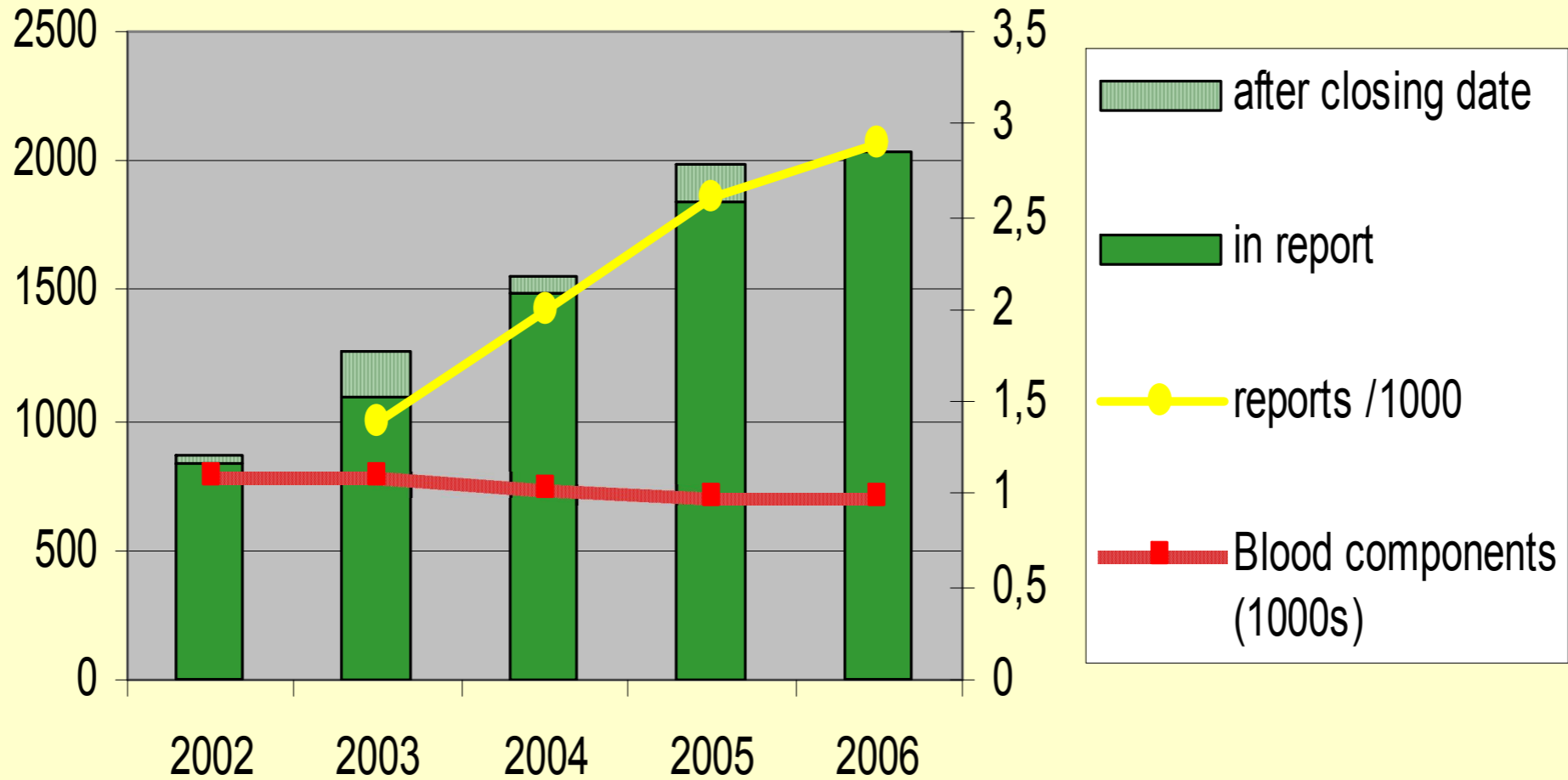


# Hemovigilance reporting by hospitals



TRIP: independent foundation, voluntary reporting, professional standard (all severity levels)

# Reports per year



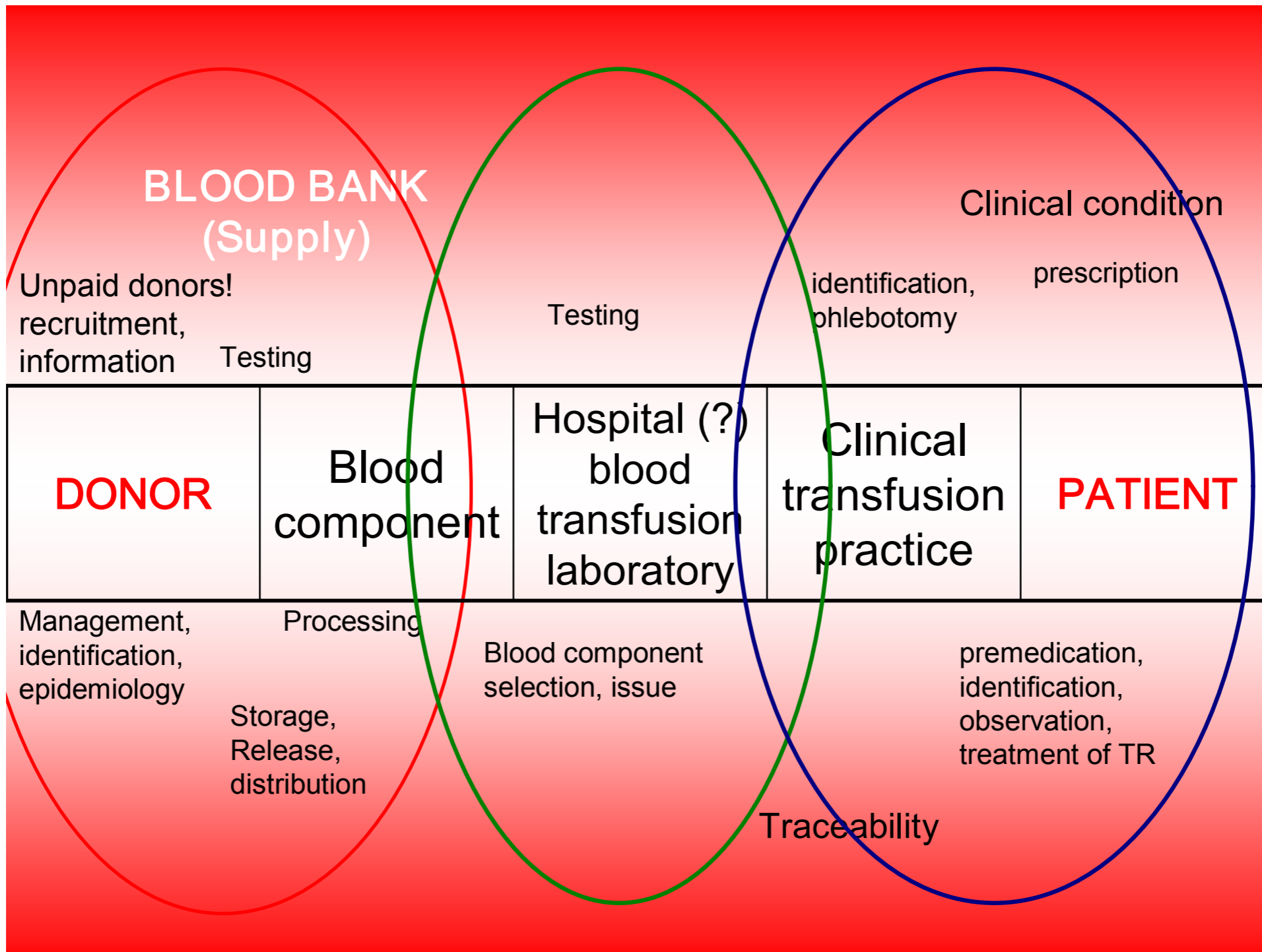


## International comparison

Country	captures	reports (IBCT) / 1000 units	Status
France (2005)	all	2.8 (0.08)	Mandatory
UK (2005)	serious	0.20 (0.16)	Voluntary
Ireland (2005)	serious	1.22 (0.72)	Voluntary
TRIP 2006	all	2.9 (0.09)	Voluntary

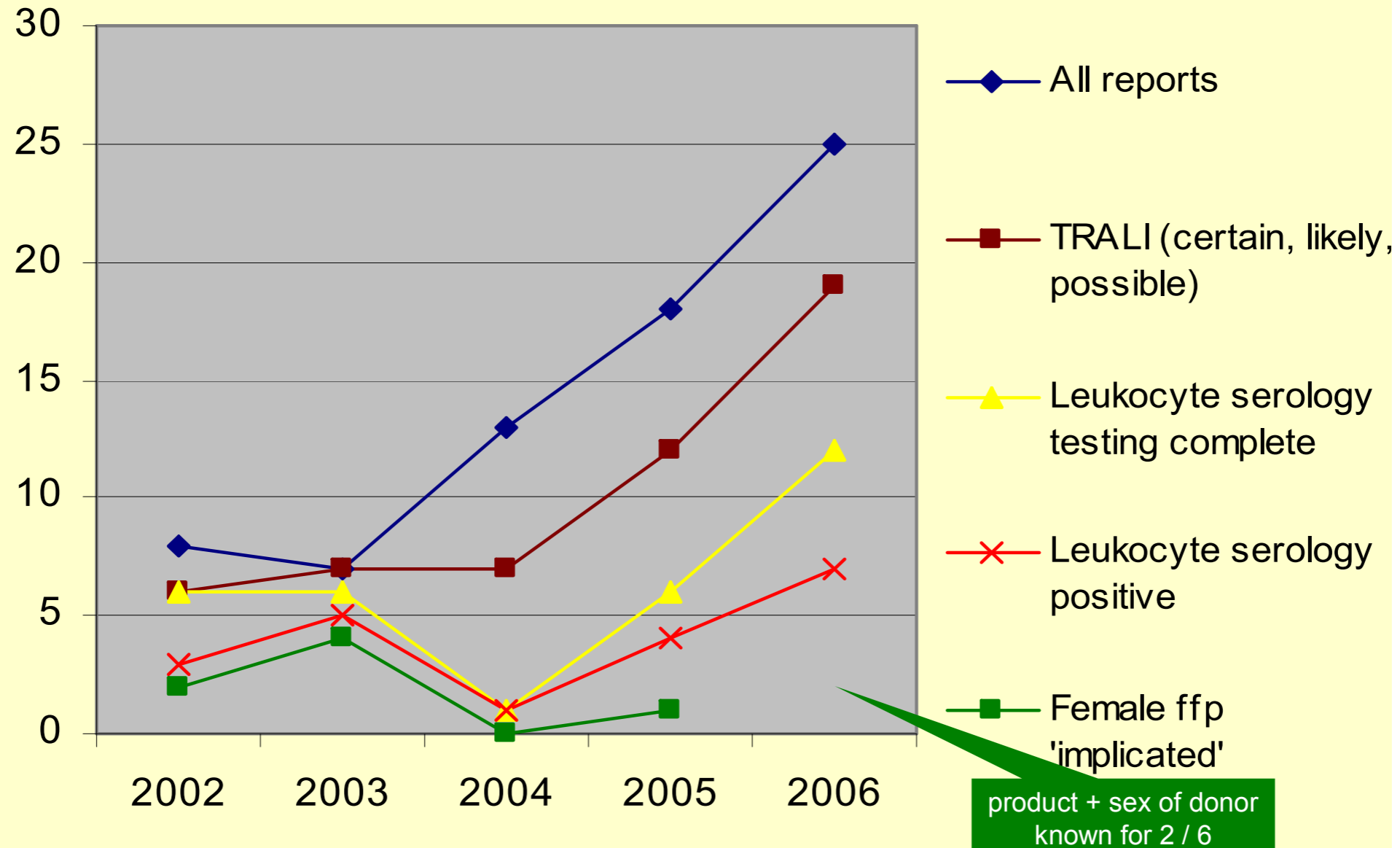
Reaction	2003	2004	2005	2006
NHTR	318	344	435	463
AHTR	8	14	9	17
DHTR	19	14	12	14
TRALI	6	9	17	23
Circulatory overload	7	6	27	34
Anaphylaxis	8	21	26	18
Other allergic reaction	132	171	219	208
Hemosiderosis	0	0	3	5
Bacterial contamination	9	5	10	7
Viral infection	5	7	8	7
T 1-2°C	326	341	375	322
New allo-antibody	244	428	571	603
Other TR	54	64	67	55
<b>Incident</b>				
IBCT	34	37	60	64
Other incident	5	14	53	87
Near miss	31	62	79	76
Pos. bacteria screening	60	10*	13*	27*
<b>TOTAL</b>	<b>1267</b>	<b>1548</b>	<b>1884</b>	<b>2030</b>

Reaction	2006	Serious (possible, likely or certain)	Preventable ?
NHTR	463	16	
AHTR	17	5	
DHTR	14	8	
TRALI	23	16	
Circulatory overload	34	22	
Anaphylaxis	18	12	
Other allergic reaction	208	9	
Hemosiderosis	5	3	
Bacterial contamination	7	3	
Viral infection	7	2	
T 1-2°C (elective category)	322	0	
New allo-antibody	603	0	
Other TR	55	2	
IBCT	64	2	
Other incident	87	1	
Near miss (elective)	76	0	
Pos. bacteria screening	27*	0	
<b>TOTAL</b>	<b>2030</b>	<b>98</b>	





# TRALI reports 2002-6



**TRALI**

SERIOUS HAZARDS OF TRANSFUSION

**SHOT**

# Bacteria

- Bacterially contaminated units are one of the top three killers
  - Canada: decrease of reports on introduction of improved skin prep and diversion pouch
  - NL: 50% reduction in positive bacteria screening of platelets
  - Disinfection ineffective against donor bacteraemia
- Most reports to TRIP have been of low imputability
  - ⇒ how many preventable?
  - ⇒ ?? Future role of pathogen inactivation



## Residual risk of infected donations in the Netherlands

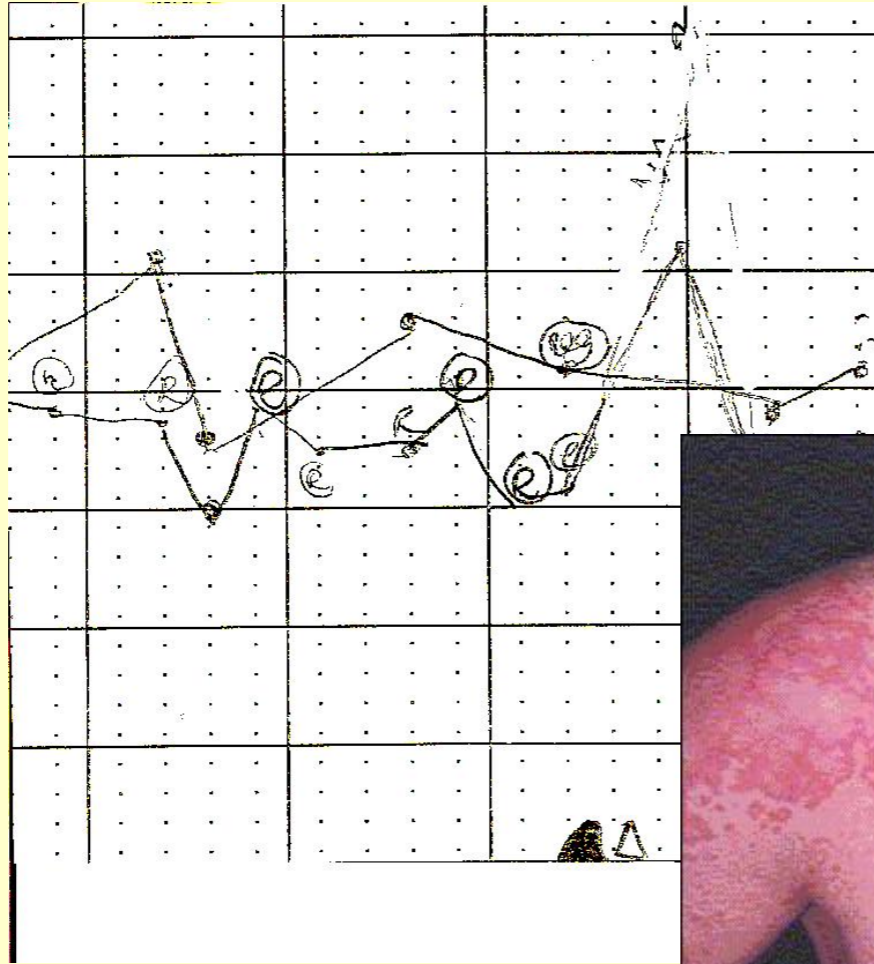
(C.L. van der Poel, courtesy of R. Coutinho, 2006)

	Probability of an infected donation/ million donations
HIV 1/2	0.3
HBV	5.4
HCV	0.1
HTLV 1/2	0.1

Donor management +  
epidemiology  
Testing  
Unpaid donation

Residual risk in product:  
Pathogen reduction by  
processing  
Process parameters (e.g.  
pool size; Janssen et al.  
2008)

# FNHTR (NHTR) and allergy





## Who needs premedication?

Previous TR:

- (at least) 9% of all patients with TR
- >15% of patients with allergic TR
- >12% with NHTR



## FNHTR (NHTR)

Wide range of quoted incidences, e.g.

0.09% (retrospective, LR platelets, 80% premed, Ezidiegwu et al 2004)

30.5% (temp. and/or allergic; prospective, non-LR plt, 70% premed; Patterson et al 2000)

Lower rates with prestorage LR of RBC or plts, poststorage LR of RBC, plasma reduction (washing, use of PAS)

Poor evidence base for

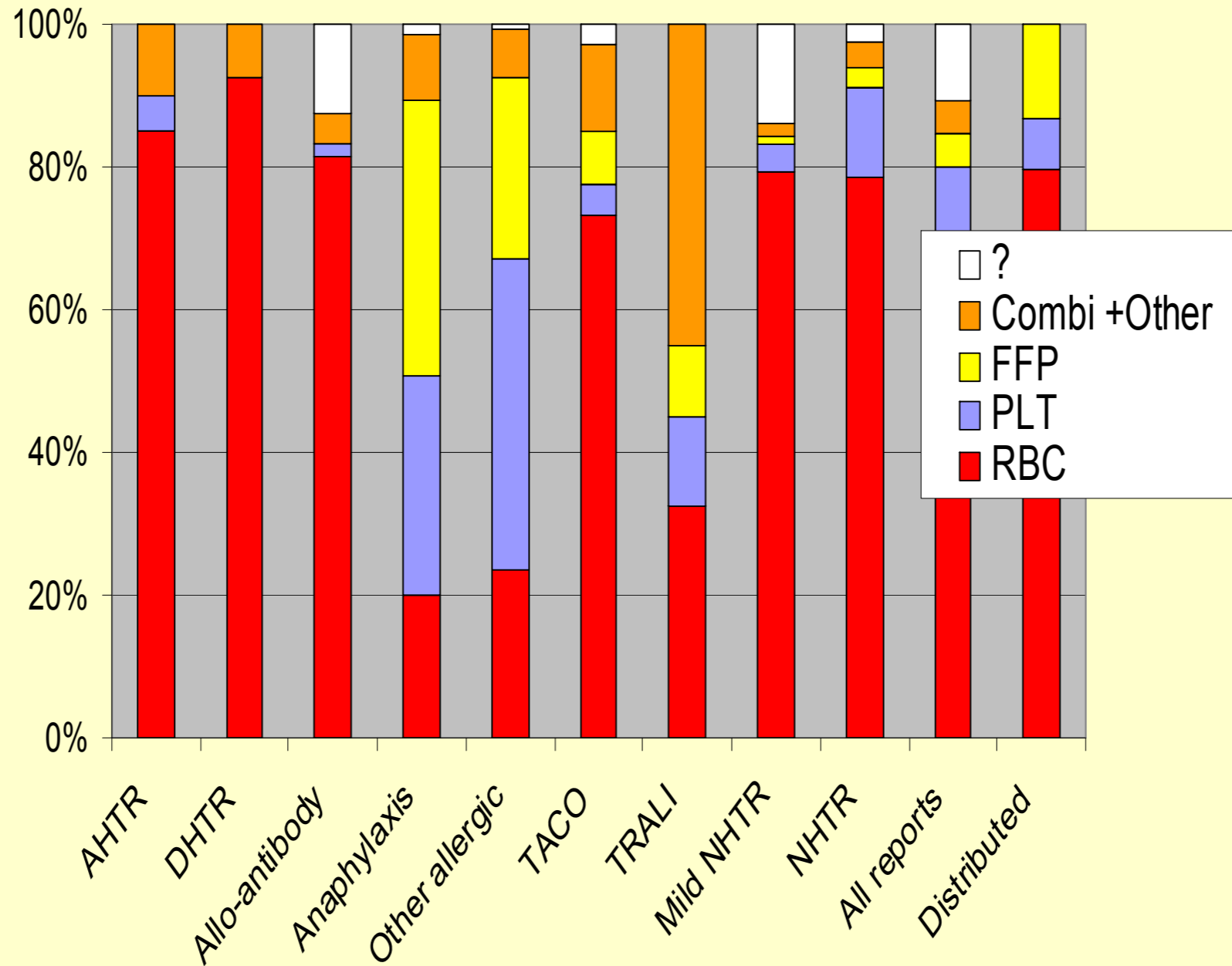
- indications for elective use of above product types
- premedication



## Allergic / anaphylactic reactions

- Some: anti-IgA (or IgA subclass)
  - found in <10% of anaphylaxis reports to TRIP
- Many investigated no further
  - tryptase, histamine levels
  - Asia: anti-haptoglobin
- Currently no evidence for specific donor factors (such as antigen in blood component or passive transfer of IgE)
- Washing, components from IgA deficient donors
- Limited role of premedication.

# Blood component



Reaction	2006	Serious (possible, likely or certain)	Preventable ?
TRALI	23	16	max. 6
Bacterial contamination	7	3	?
Viral infection	7	2	?
NHTR	463	16	?
T 1-2°C (optional category)	322	0	?
Anaphylaxis	18	12	?
Other allergic reaction	208	9	0
AHTR	17	5	More research needed!
DHTR	14	8	Donor epidemiology
New allo-antibody	603	0	Role of premedication?
Circulatory overload	34	22	(secondary prevention)
Hemosiderosis	5	3	
Other TR	55	2	
IBCT	64	2	
Other incident	87	1	
Near accident (optional)	76	0	
Pos. bacterial screening	27*	0	
<b>TOTAL</b>	<b>2030</b>	<b>98</b>	



## Special blood component selection

- Irradiated
- CMV-safe or Parvo B19-safe
- IgA-deficient
- Antibody-compatible
- Kell-negative
- Kell-negative + Rh phenotype
- HLA or HPA-matched

More sensitive tests?



National transfusion guideline



- extensive typing of donors
- developing and validating new component types

Reaction	2006	Serious (possible, likely or certain)	Preventable ?
TRALI	23	16	max. 6
Bacterial contamination	7	3	?
Viral infection	7	2	?
NHTR	463	16	?
T 1-2°C (optional category)	322	0	?
Anaphylaxis	18	12	?
Other allergic reaction	208	9	0
AHTR	17	5	0
DHTR	14	8	some
New allo-antibody	603	0	0
Circulatory overload	34	22	
Hemosiderosis	5	3	
Other TR	55	2	
IBCT	64	2	
Other incident	87	1	
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## Transfusion-Associated Circulatory Overload

- Increase of reports (Quebec: 1 in 4075 units transfused, 2004), important cause of mortality
- Cardiac marker: brain natriuretic peptide (1.5x increase in level)
- Prevention:
  - conservative transfusion policy
  - attention to fluid balance in vulnerable patients (minimum volume, diuretics)



# Hemosiderosis

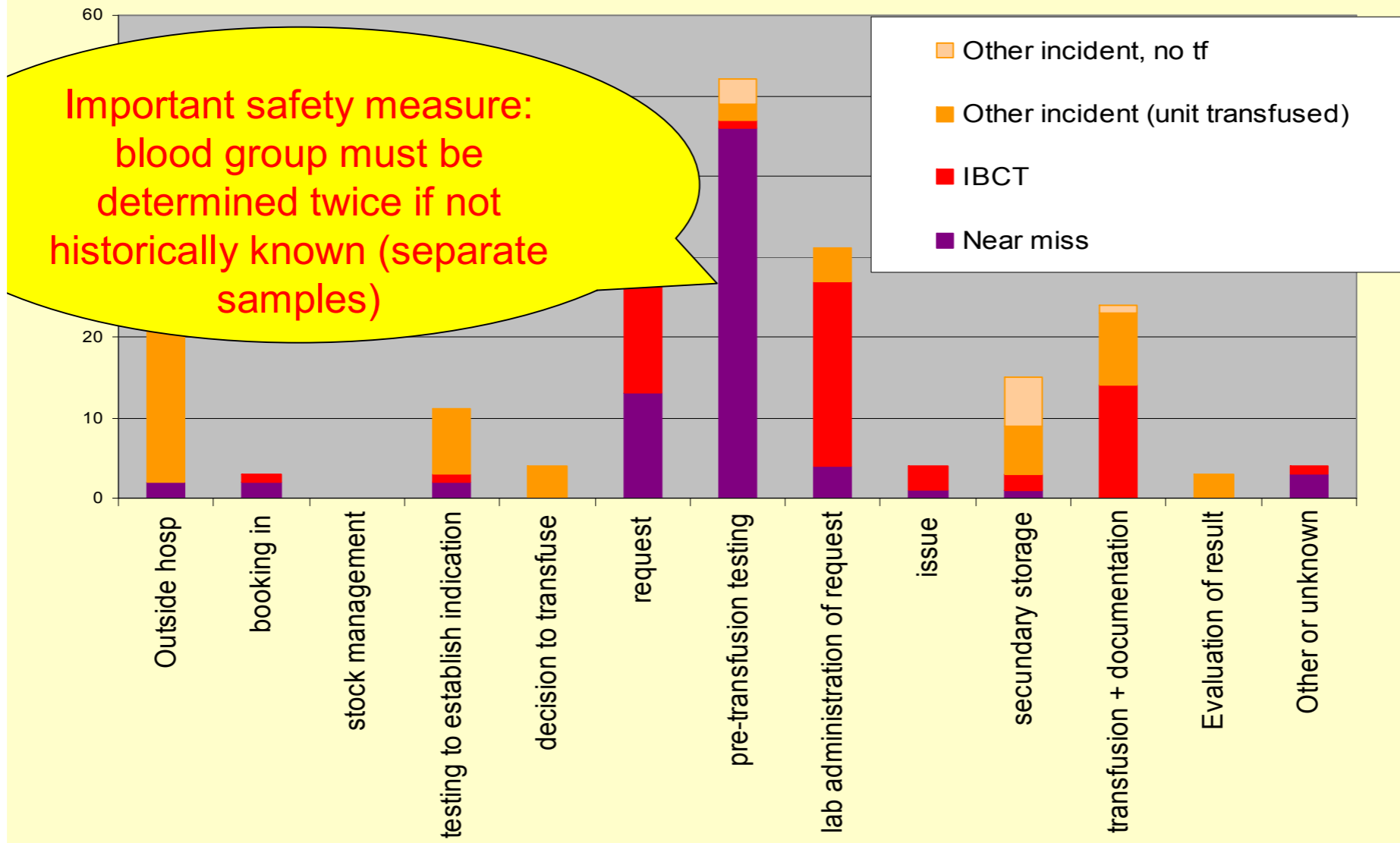
- poorly reported (5 to date)
- effective prevention / treatment (pharmacological; now also oral)

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Viral infection	7	2	?
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Other allergic reaction	208	9	0
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DHTR	14	8	some
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Near accident (optional)	76	0	
Pos. bacterial screening	27*	0	
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# ERROR PREVENTION

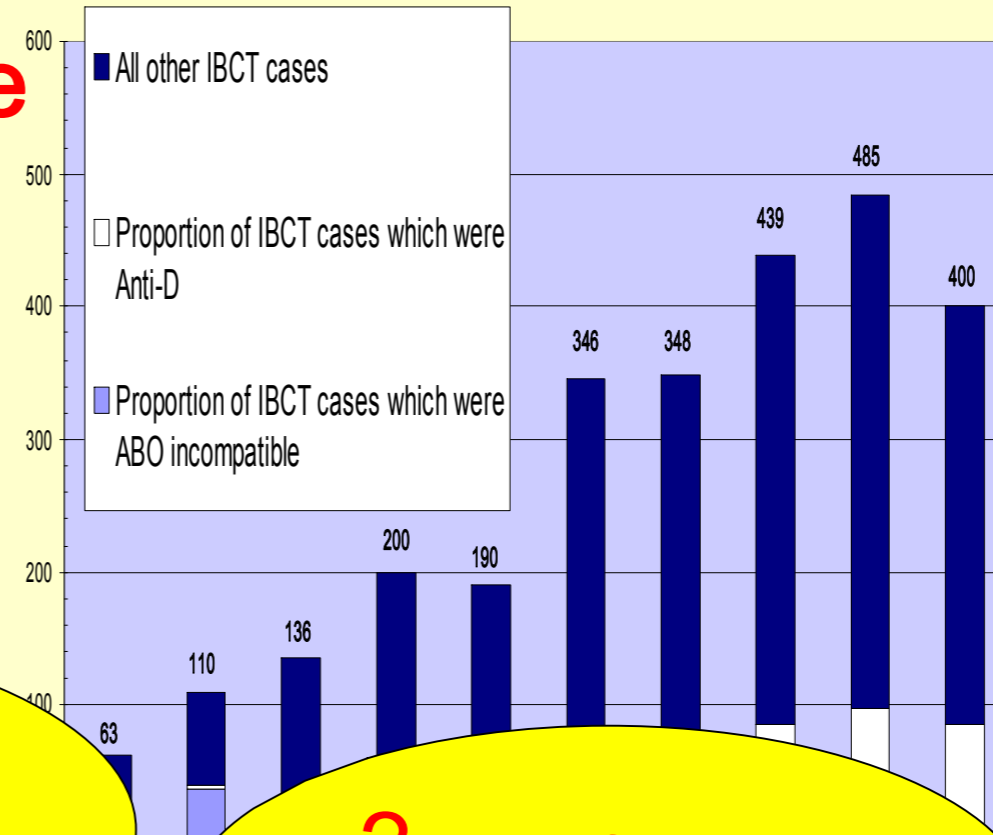


# Incidents in 2006: site of first error



# 2006 KEY FINDING – 2

**ABO incompatible transfusions are again lower: 8 cases in 2006**



- Training
- Optimising protocols + procedures
- IT systems

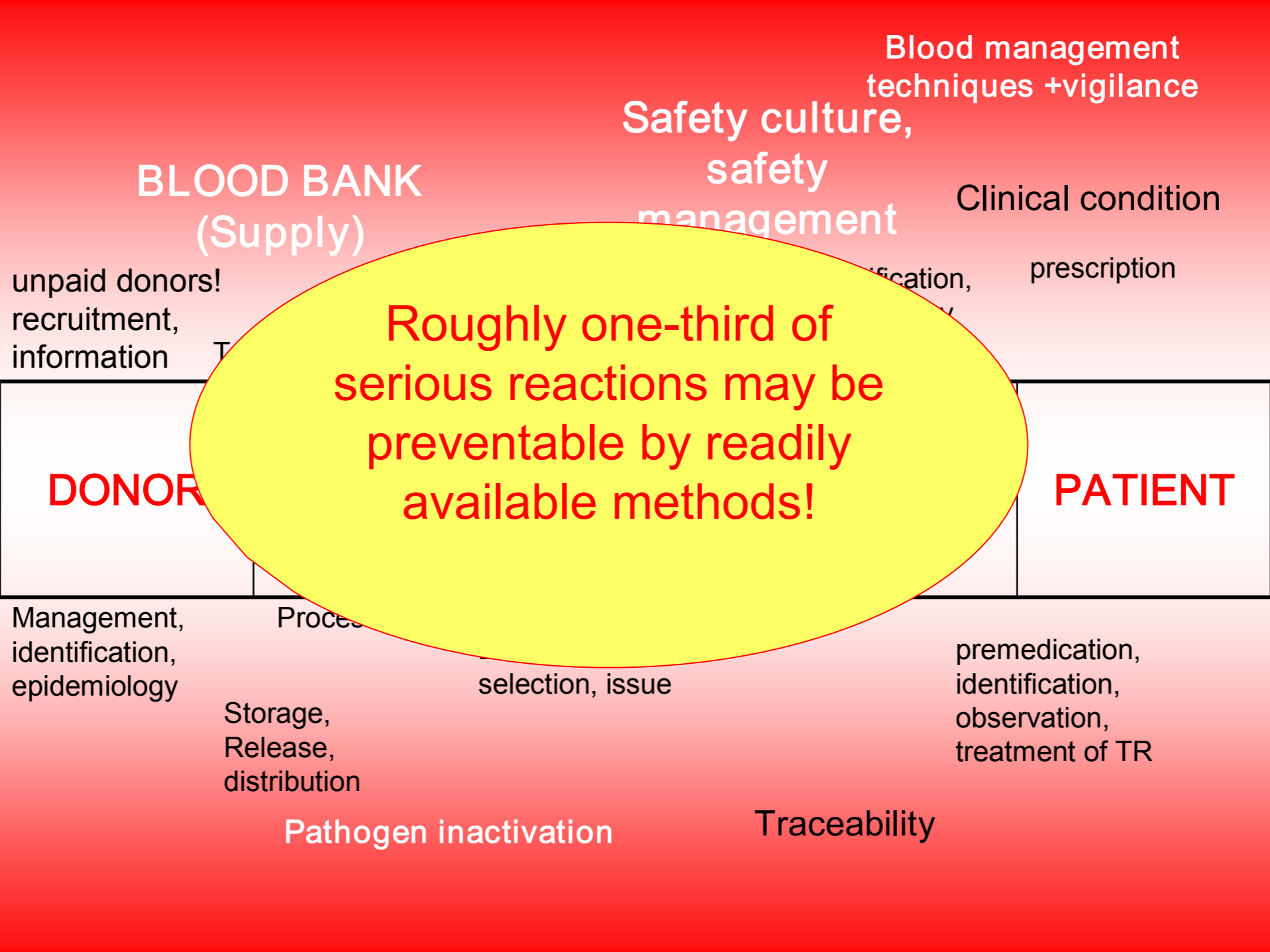
? Role of bedside ABO testing



## Underreporting

- unnecessary transfusion (analysis of IBCT reports)
- harm through delay in transfusion
  - FR anaesthesiology data: 100 deaths / year
  - failure to anticipate, logistics; no evidence that 'trigger' too low
  - optimal trigger insufficiently researched!
  - little known of adverse events associated with blood management techniques

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IBCT	64	2	2
Other incident	87	1	1
Near accident (optional)	76	0	0
Pos. bacterial screening	27*	0	0
<b>TOTAL</b>	<b>2030</b>	<b>98</b>	<b>approx. 30</b>





# Prevention of transfusion reactions

## Primary prevention:

- product (blood component)
- hospital laboratory
- special product selection
- avoidance of unnecessary transfusion
- practice in clinical areas
- safety culture

## Secondary prevention:

- premedication
- special product selection

## 'Tertiary' prevention:

- observation of patients under transfusion
- prompt response



# Role of Hemovigilance

1. uniform definitions + reporting
2. transparency, realistic risk perception
3. demonstrating priority areas and problems
4. input for decisions on new measures
5. highlighting questions, triggering research
6. monitoring trends



**Learning from  
each other!**