

# Cases That Have Kept Me Up At Night

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# Case 1: First Do No Harm

- 27 year old female
- 1<sup>st</sup> pregnancy
  - RhIg given at 28 weeks gestation
  - Uneventful delivery
  - Infant petechiae & thrombocytopenia
    - Alloimmune thrombocytopenia
      - HPA-1 antibody detected
      - Platelet transfusion therapy

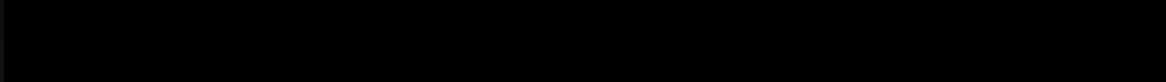
# Case 1: Ob History

- Second Pregnancy
  - Referred to Perinatology @ 22 wk gestation
    - History of alloimmune thrombocytopenia
    - Anti-D and anti-C antibodies detected
  - Mother blood type was AB negative
  - Father blood type was O positive
    - Antigen typing = D, C, c positive
  - Fetal Rh phenotype = D, C, c
  - Fetal platelet – HPA-1 & HPA-2 positive

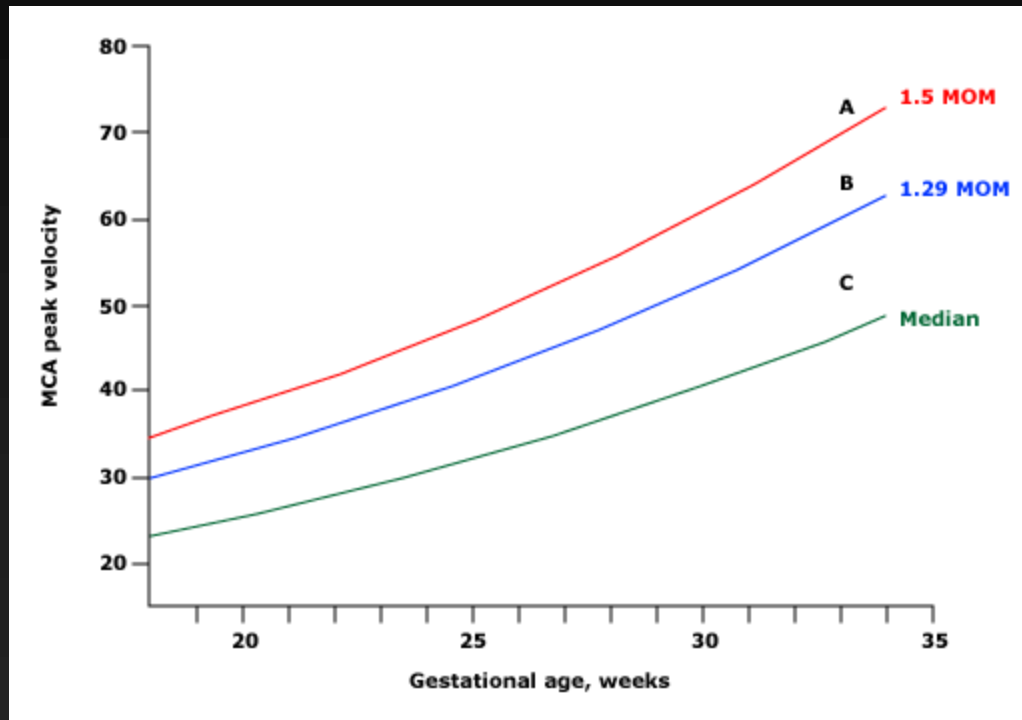
# Case 1: Management Plan

- Risk of serial fetal sampling
  - 6% fetal mortality
  - Exacerbation Rh sensitization
  - Hemorrhage from TCP
- Conservative management plan
  - Weekly US & MCA peak velocity
  - Weekly 1 g/kg IVIg
  - Delay fetal blood sampling as long as US reassuring

# MCA Peak Velocity



# MCA Peak Velocity Interpretation



A – moderate to severe anemia

B – mild anemia

C – no anemia

# MCA Peak Velocity Values

Gestational Age	MCA m/s	Clinical Zone
22wk 1d	0.30	C
24wk 5d	0.33	C
26wk 5d	0.37	C
27wk 5d	0.37	C
28wk 5d	0.39	C
29wk 5d	0.53	B
30wk 2d	0.66	A
30wk 4d pre	0.64	A
30wk 4d post	0.43	C
31wk 4d	0.60	B
32wk 2d	0.60	A

# Case 1: Clinical Course

- 29 weeks 5 days
  - MCA peak velocity increase
  - Anti-D increased from 1:16 to 1:256
  - Anti-C increased from 1:1 to 1:4
- PUBS performed
  - Transfuse 30 mL O neg RBC
    - Hct 30 → 36%, MCA 0.64 → 0.40 m/s
  - Transfuse 15 mL O pos HPA-1 negative platelets

# Case 1: Clinical Course

- 32 weeks, 2 days gestation (12d later)
  - Decreased fetal movement
  - MCA peak velocity = 1.1 m/s
  - Sinusoidal fetal heart rate tracing
    - Indicative of moderate fetal hypoxemia
- C-section performed
  - 1915 g infant
    - Apgar 5 at 1 minute & 8 at 5 minutes (7-10)
    - Cord pH values were 7.31 & 7.37 (7.14 – 7.50)

# Case 1: Infant Findings

- Infant Lab values
  - Hb 3.0 g/dL
  - Platelet count 258 at birth → 71 at 6 hours
  - Cord bilirubin 10 mg/dL
  - Fetal blood type B positive
- No evidence of:
  - Fetal maternal hemorrhage
  - Retroplacental hemorrhage
  - Amniotic fluid was clear

# Case 1: Infant Treatment

- Infant therapy included:
  - RBC & platelet transfusions
  - EPO
  - Phototherapy
- Hospitalized for 29 days

# Case 1: Transfusion History

Date	Tx	Volume	Hb	PC
8/20	R	40	3.6	258
8/21	R & P	28 & 28	10.3	71
8/22	P	50		65
8/23	P	50		64
8/24	R & P	40	10.6	39
9/4	P	50	10.1	300
9/6	R	30	14.9	308

# Case 1: Summary

- Presumed risk of both fetal anemia & thrombocytopenia
  - Fetal anemia treated with RBC transfusion
  - Rapid platelet count not available
  - Prophylactic platelet transfusion given
    - Group O, HPA-1 negative
  - Group O plasma incompatible with Group B fetal RBC
    - Hemolysis & anemia

# Case 1: Summary

- No group B cells detected at birth
  - Hemolysis
    - Anti – B
    - Anti-D and anti-C ???
  - O negative RBC transfusions
- Future prevention
  - AB, HPA-1 negative platelets
  - O, HPA-1 negative washed platelets

Yeast JD, Plapp FV, Am J Obstet Gynecol 2003;189:874-6

# Case 2: T was the Night After Christmas.....

- Blood bank notified of Level 1 Trauma
  - 3 males with multiple gunshot wounds
  - Identified as Trauma I, K & S
  - Issued 3 sets unxm O neg RBCs
- 7 additional O neg RBCs dispensed for K
- Blood bank inquired about patient status
  - Trauma I diverted
  - Trauma K in transit to OR
  - Trauma S still in ED

# Case 2: Communication

- BB requested specimens on Trauma K & S for blood typing
  - BB informed that one patient had died
  - O neg RBC issued for I & S returned to BB
    - Assumed Patient S had died
  - Specimen for Trauma K typed as A positive
  - 4 A positive RBC sent to OR for Trauma K

# Case 2: What a Gas!

- Anesthesia resident arrived at BB
  - Specimen labeled as Trauma OR9
  - Requested 6 more RBC STAT
  - 5 A positive RBC issued
    - Labeled as Trauma K
- Chemistry received ABG specimen labeled as Trauma S
  - Specimen appeared mislabeled
  - Notified BB of mislabel & critical Hb of 5.8

# Case 2: Error Detected

- BB typed ABG specimen as O positive
- Specimen delivered by resident typed as O positive
- BB called OR to stop all transfusions because of misidentification
- 1¼U A+ RBC set up for Trauma K had been transfused to Trauma S who was O+

# Case 2: Trauma S

- 33y male with 5 GSW to chest, abdomen, arm, thigh, spine
  - Liver & diaphragm lacerations
- Transfused with 16 RBC, 8 FFP, 4 platelet, 10 cryo, 4.8 mg rF7a
- Very abnormal vital signs
  - Trauma versus acute hemolytic reaction?
- Transfusion reaction workup

# Case 2: Post-transfusion samples

# Case 2: Transfusion Reaction Workup

	<b>Pre-Tx</b>	<b>Post-Tx</b>
DAT	Negative	Negative
Ab screen	Negative	Negative
Compat	Incompatible	Incompatible
ABO/Rh	O positive	O positive
Hemolysis	Absent	Present
Urine Hb	NA	Present
Bilirubin	0.2	0.4
Haptoglobin	104	24

# Case 2: What Went Wrong?

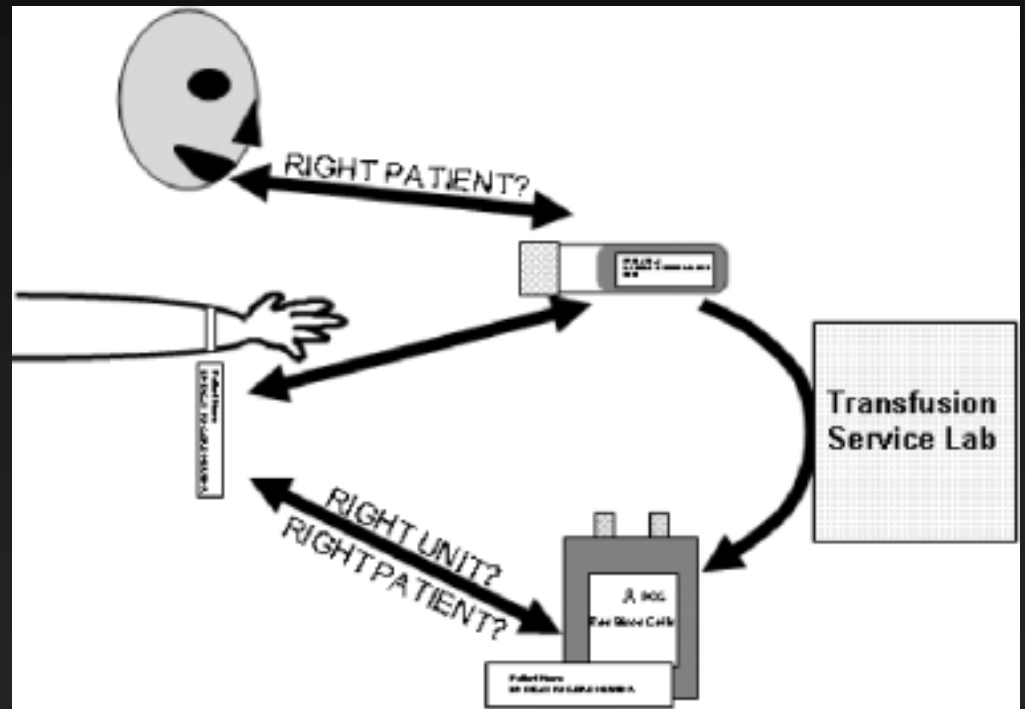
- Clerical check not done in OR
- No wristband on patient
- No written orders for blood
- Specimens unlabeled & mislabeled
- Transfusion tag removed from bag
- Anesthesiologists pressured BB to release blood based on unlabeled specimens

# Case 2: Trauma S Outcome

- Hospitalized for 32 days
  - Multiple operations
  - Pneumonia and wound infection
  - Paraspinal abscess
- Discharged
  - Ambulatory with crutches
  - Neurologic deficit left leg
  - Antibiotics
- Expended 8 of 9 lives!

# Risk of ABO Hemolytic Reactions

- Incidence 1 in 38,000
  - 33% due to transfusion service error
  - 67% due to patient identification error
  - 10% are fatal



# Prevention of Mistransfusion

- Meticulous attention to patient ID protocol
- Positive ID of all blood samples drawn for pretransfusion testing
- 2 ABO blood types on file before type specific units are issued
- Two people verify ID of patient & blood component at bedside
- People held accountable

# Case 3: Doc I Have a Black Cloud Over My Head

# Case 3: History

- 80year old male
- Heterozygous FV Leiden
- Multiple DVT & PE
- Inferior vena cava filter
- Coumadin therapy
- Multiple GI bleeds
  - Nov 2007 - 2 RBC, 5 FFP
  - Dec 2007 – 15 RBC, 10 plasma, 2 platelet

# Case 3: History

- Coumadin discontinued in April 2008
- Admit for recurrent DVT in May 2008
- Incidental finding
  - New onset transaminitis
  - ↑ AST & ALT

# Case 3: Hepatic Function Tests

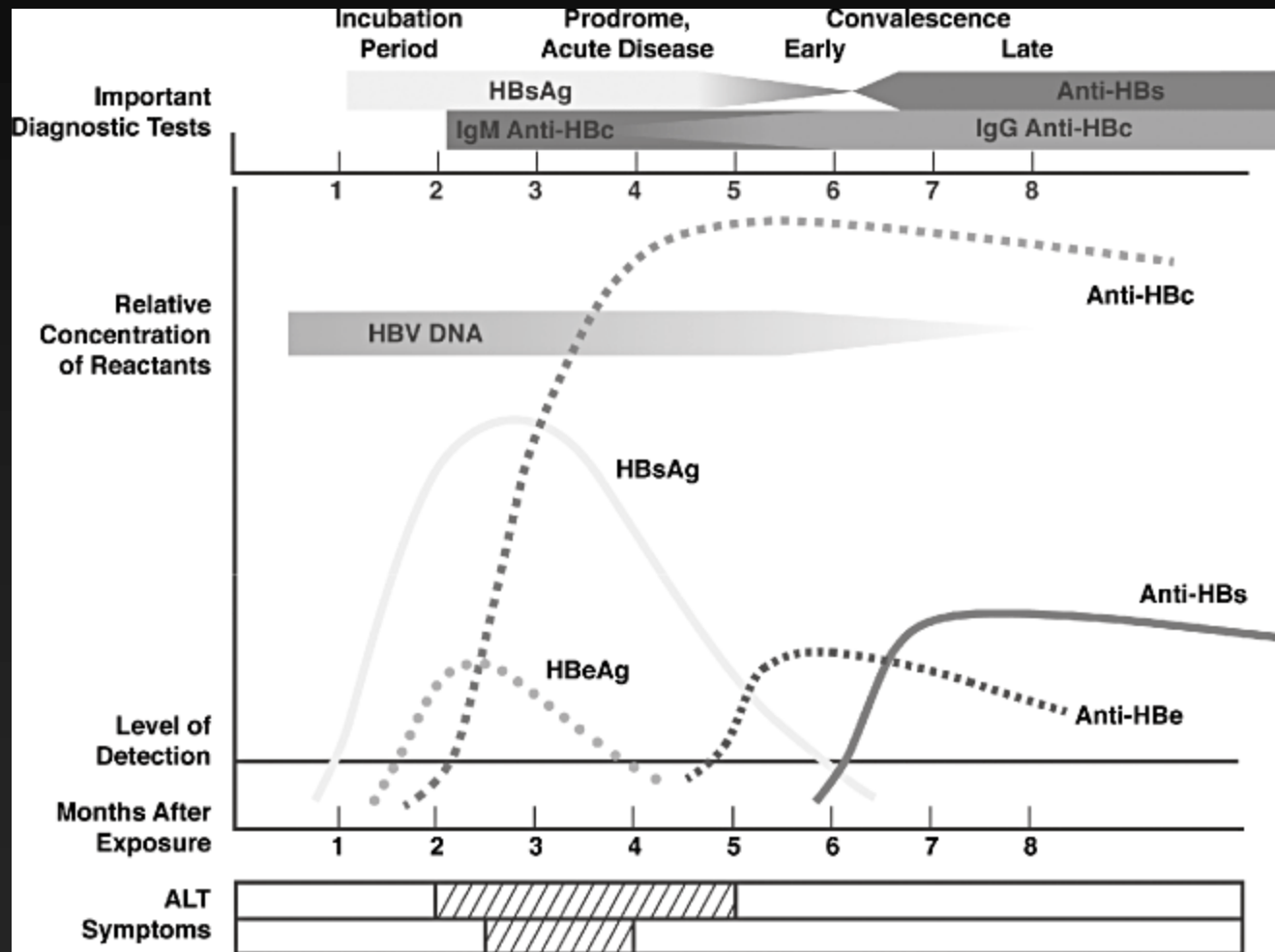
	May 6	May 13	May 20	Jun 2	Sep 8
AST 14-41	206	152	245	187	68
ALT 14-63	260	221	348	248	70
ALP 42-128	130	124	170	144	85
T Bili 0.3-1.4	1.0	1.1	0.7	0.7	1.0
D Bili 0.1-0.5	0.4	0.3	1.0		0.3

# Case 3: Viral Hepatitis Serology

	May 6	July 21
HBs Ag	Reactive	Reactive
HBs Ab		Nonreactive
HBc IgM	Reactive	
HAV IgM	NonReactive	
HCV Ab	NonReactive	
HBV Qnt	17,857,143	

# Case 3

## Hepatitis B Serology



Transfusion was only risk factor

Reported to CBC

HBV incubation period is 6 weeks to 6 months

Investigated donors from Nov 2007

# Case 3: Post-transfusion Workup

- 7 different donors - 2 RBC & 5 plasma
- 3 of 7 had donated in interim with nonreactive HBs Ag and anti-HBc
- 4 donors recalled for follow-up testing
  - 1 donor had seroconverted for anti-HBc
- Original sample from Nov 2007
  - HBV DNA negative at 1:24 dilution
  - HBV DNA positive undiluted
- Follow-up sample
  - HBV DNA negative

# Case 3: Risk of Post-transfusion Hepatitis B

- Findings consistent with post-transfusion hepatitis B involving seroconverting donor
- Risk of receiving unit from repeat donor in HBV pre-seroconversion window
  - 1 in 29,000 to 1 in 63,000 before NAT
  - 1 in 352,451 to 1 in 610,488 with NAT & more sensitive HBs Ag
  - ~21 patients per year will be symptomatic
  - ~15 patients per year will be hospitalized
  - ~4% develop chronic hepatitis B
  - ~1% die from fulminant hepatitis

Hollinger, FB & Dodd RY. Transfusion 2009;49;176-84

# Case 4: Self Destruction

- 70y female with multiple sclerosis x 40y, MV prolapse & DVT
- Dizziness, SOA, palpitations, N&V, UTI
- Hb 7.7 (13.3 two mo ago)
- Hb 6.3 day after admit
- 2U RBC ordered

# Case 4: Compatibility Testing

- Blood group – A positive
- Antibody screen positive
- DAT – IgG positive & C<sub>3</sub> negative
- Plasma & eluate reactive with all cells
  - Consistent with warm reactive autoantibody
- Autologous adsorptions
  - Anti-c and anti-E present
- Patient RBC – C+, E-, c-, e+

# Case 4: Transfusion

- Crossmatched 2U of LR RBC, E- & c-
  - Nonreactive with adsorbed plasma
- Transfused first unit at 01:36
- Transfused second unit at 04:45
  - Hematuria in Foley bag
  - Code blue called at 06:04 for asystole
  - Resuscitated & coded two more times
  - Patient died after 3<sup>rd</sup> code

# Case 4: Transfusion Reaction Workup

	Pre -Tx	Post-Tx
DAT	Positive	Positive
Ab Screen	Positive	Positive
Crossmatch	Compatible	Compatible
ABO/Rh	A positive	A positive
Hemolysis	Present	Present
Hematuria	Small	Large

# Case 4: Transfusion Reaction Workup

	Pre -Tx	Post-Tx
Hemoglobin	7.7	4.2
Haptoglobin	<7	
LD	1699	8029
Bilirubin	3.4	2.4
Troponin I		1.16
Potassium	4.0	3.9

# Case 4: Conclusion

- Temporal association of transfusion with cardiac arrest
  - Transfusion reaction immediately assumed
- Transfusion reaction workup documented transfusion of compatible units
- Accelerated autoimmune hemolysis
- Very low Hb precipitated cardiac arrest

# Case 4: Warm Autoimmune Hemolytic Anemia

- Incidence is ~1 in 80,000 individuals
  - Women > men
  - Peak incidence 40 – 60y
- Primary vs secondary
  - Lymphoproliferative & autoimmune disorders
- DAT – 60% IgG & 30% complement
  - Strength of DAT not predictive of severity

# Case 4: WAIHA Transfusion Risk

- Difficult to detect underlying alloantibodies
  - Present in ~30% of patients with AIHA
- Autoantibody destroys transfused RBC
  - Transfusion based on symptoms and severity of hemolysis
- Over-transfusion should be avoided
  - ↑ RBC mass → ↑ hemolysis

# Case 5: Retirement May Be Hazardous to Your Health

- 63y male who was previously healthy and recently retired
- Acute onset of pain in right thigh & left calf after stretching exercises
- Pain worsened after mowing grass
  - Right forearm involvement
  - Right upper arm ecchymosis
  - Hematuria

# Case 5: History

- Admitted with initial diagnosis of thrombophlebitis
- Hematology consult noted diffuse swelling of extremities, ecchymoses & hematuria
  - Suspected bleeding disorder
  - Ordered coagulation screen
- Family history negative for bleeding

# Case 5: Laboratory Results

Test	Result
Hb	11.3
PT/INR	11.6/1.0
APTT	48
Fibrinogen	563
Platelet	273
D-Dimer	1.2

# Case 5: Coagulation Workup

Test	Result
APTT	48
1:1 mix immediate	35
1:1 mix incubated	47
Normal Pool	29
Interpretation	Delayed inhibitor

# Case 5: Inhibitor Workup

Test	Result
Factor VIII	4%
Factor VIII inhibitor	54 BU
vWF Antigen	101%

# Case 5: Other Lab Findings

- Serum protein electrophoresis
  - Total protein = 7.7 g/dL
  - Gamma = 2.0 g/dL
  - IFE → 1.1 g/dL of monoclonal IgM Kappa
- Cold agglutinin titer = 1:1024

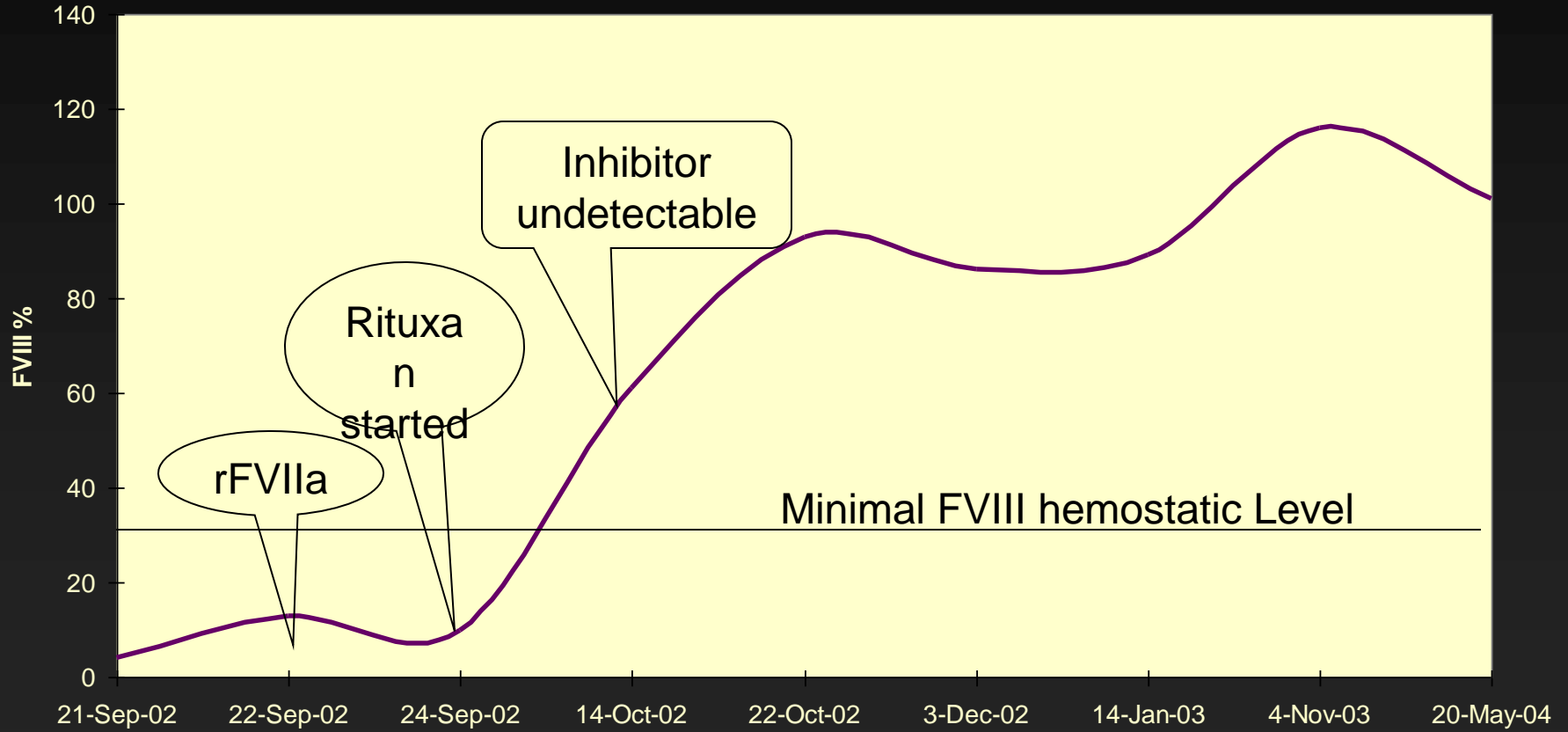
# Case 5: Diagnosis & Treatment

- Acquired FVIII inhibitor
- Initial Rx with high dose FVIII
  - 100 U/kg loading dose
  - 10 U/kg/hour maintenance dose
- rF7a ordered

# Case 5: Hospital Course

- Second hospital day
  - ICH right frontal lobe
  - Elected not to operate
- rF7a therapy started
  - $90 \text{ ug/kg} \times 66 \text{ kg} = 6000 \text{ ug}$  q 2-3 hours
  - Treated for 17 days
  - Total rF7a cost of \$484,026 (2002 \$)
- Rituxan (anti-CD20) started on day 4

# Case 5: FVIII Levels



# Case 5: Outcome

- ICH resolved w/o surgery
- Patient discharged
- 6 months later developed recurrent focal seizure disorder
- Monoclonal IgG K and inhibitor resolved
- Currently alive

# Acquired Factor VIII Inhibitors

- Autoantibody to FVIII
- Primary or Secondary
  - Healthy elderly, postpartum, AI, cancer
- Soft tissue & mucosal bleeding
- Treatment options
  - rFVIII, DDAVP, rFVIIa, immunosuppression
- Spontaneous remission in 30%

# Restful Nights

- Appropriate transfusion orders
- Universal human blood
- Antigens inactivated or patients desensitized
- Pathogen inactivation
- Refrigerated or frozen platelets
- Fail-safe blood administration system
- National transfusion database