The Young Blood Donor

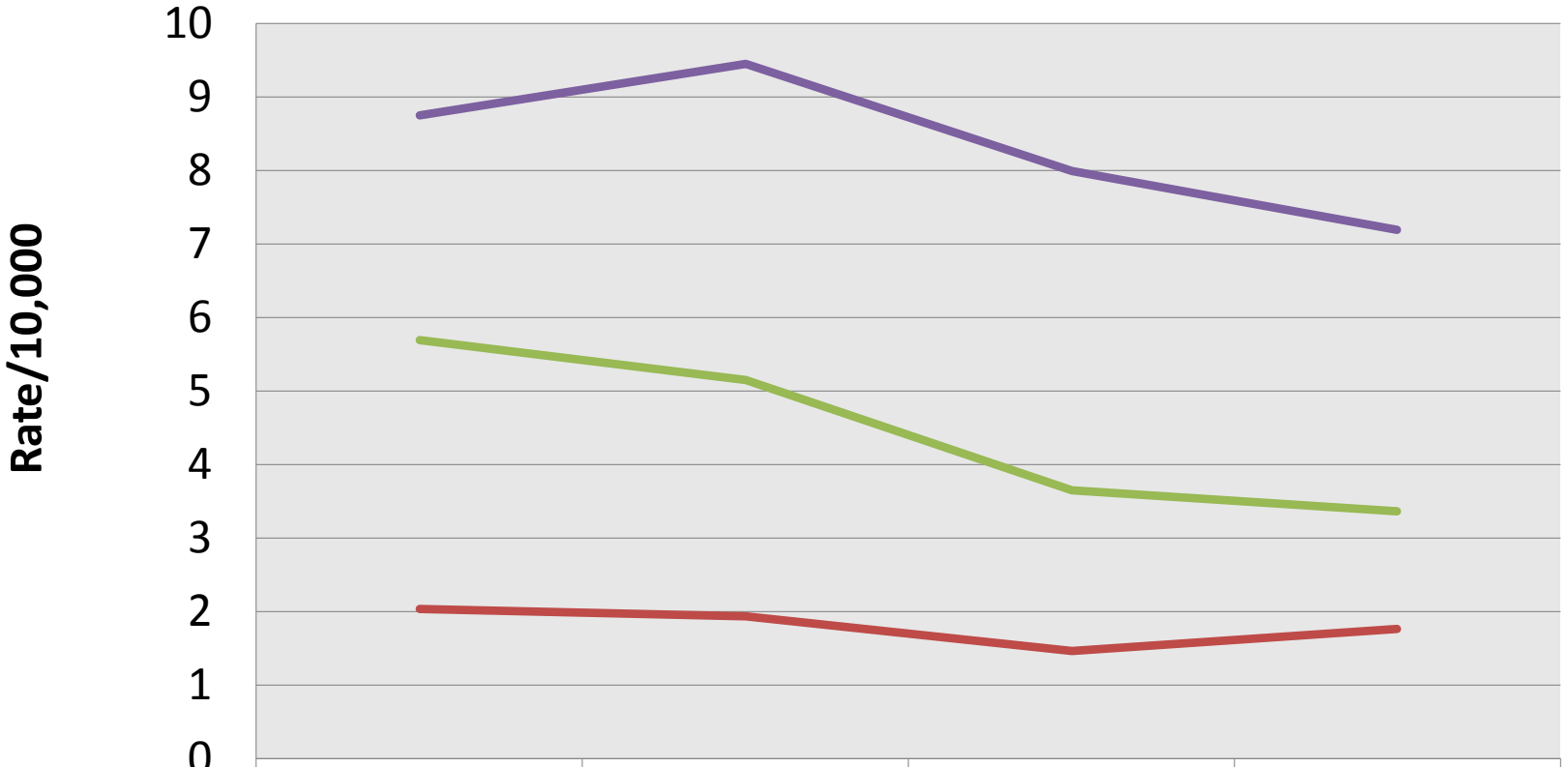
Safety and Long-Term Commitment to Blood Donation

Vasovagal Injury and Iron Deficiency

Peter Tomasulo MD

March 2016

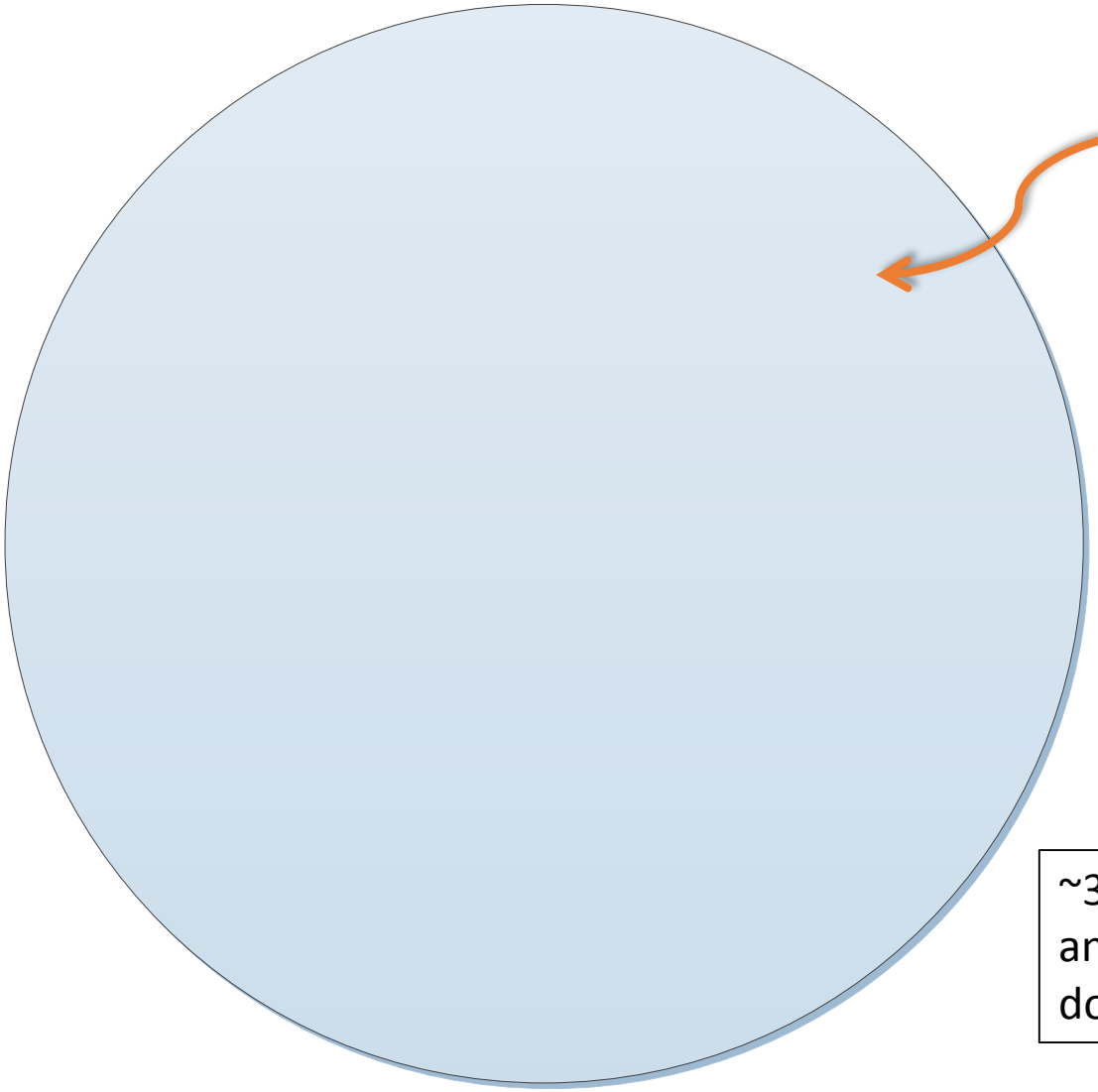
Rates (by year and age group) of vasovagal-related injuries in allogeneic, whole blood, needle in donations, 2008 - 2011



	2008	2009	2010	2011
16 y/o	8.75	9.46	7.99	7.20
17-22 y/o	5.69	5.14	3.65	3.36
All Ages	2.03	1.94	1.46	1.76

BSI Operational Data,
Provided with Permission

Vasovagal Reactions, 2010 to 2014



134 VVR per 10,000 donations

~3.7 million complete and incomplete allogeneic donations

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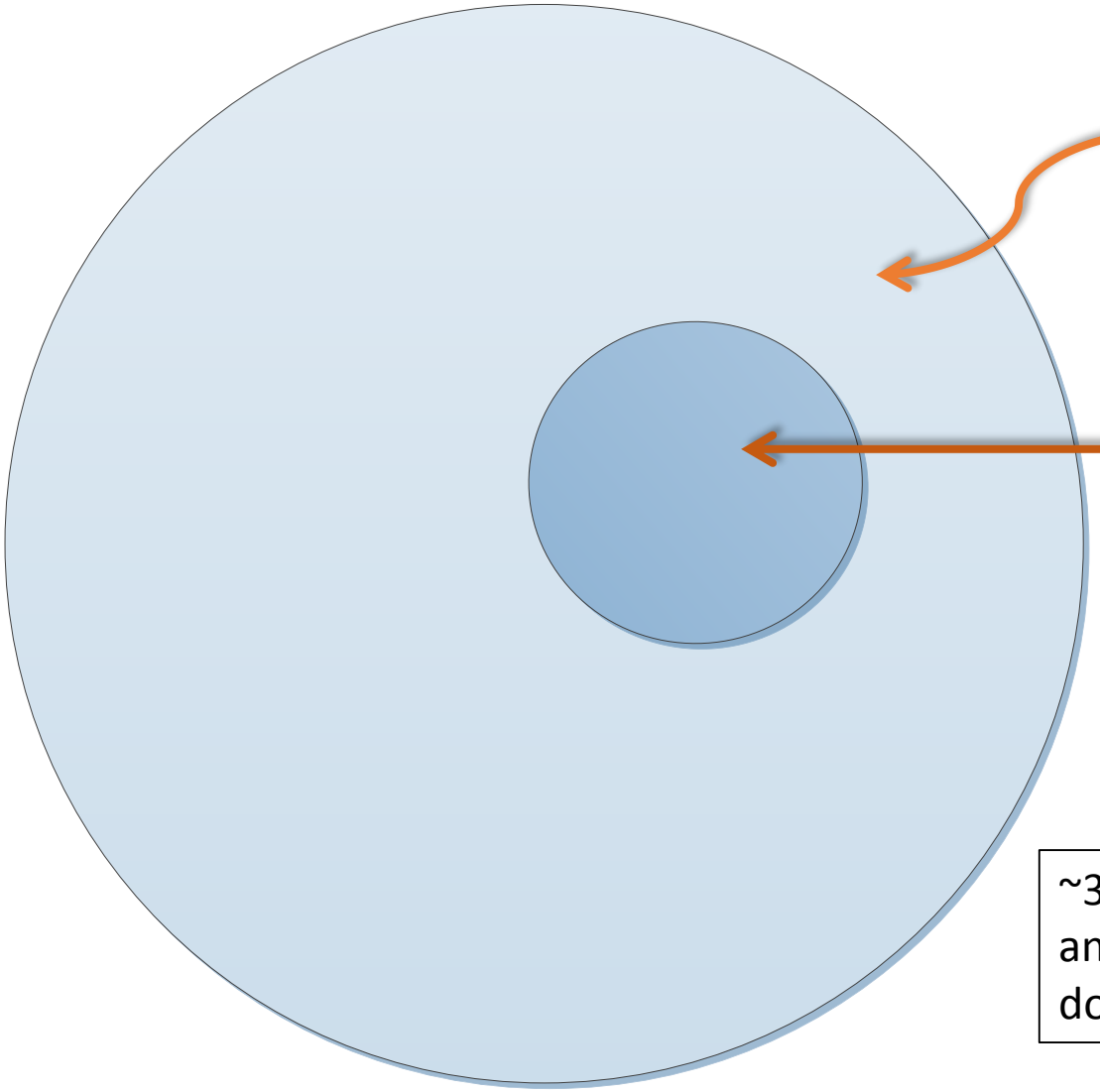
Vasovagal and LOC Reactions, 2010 to 2014



~3.7 million complete and incomplete allogeneic donations

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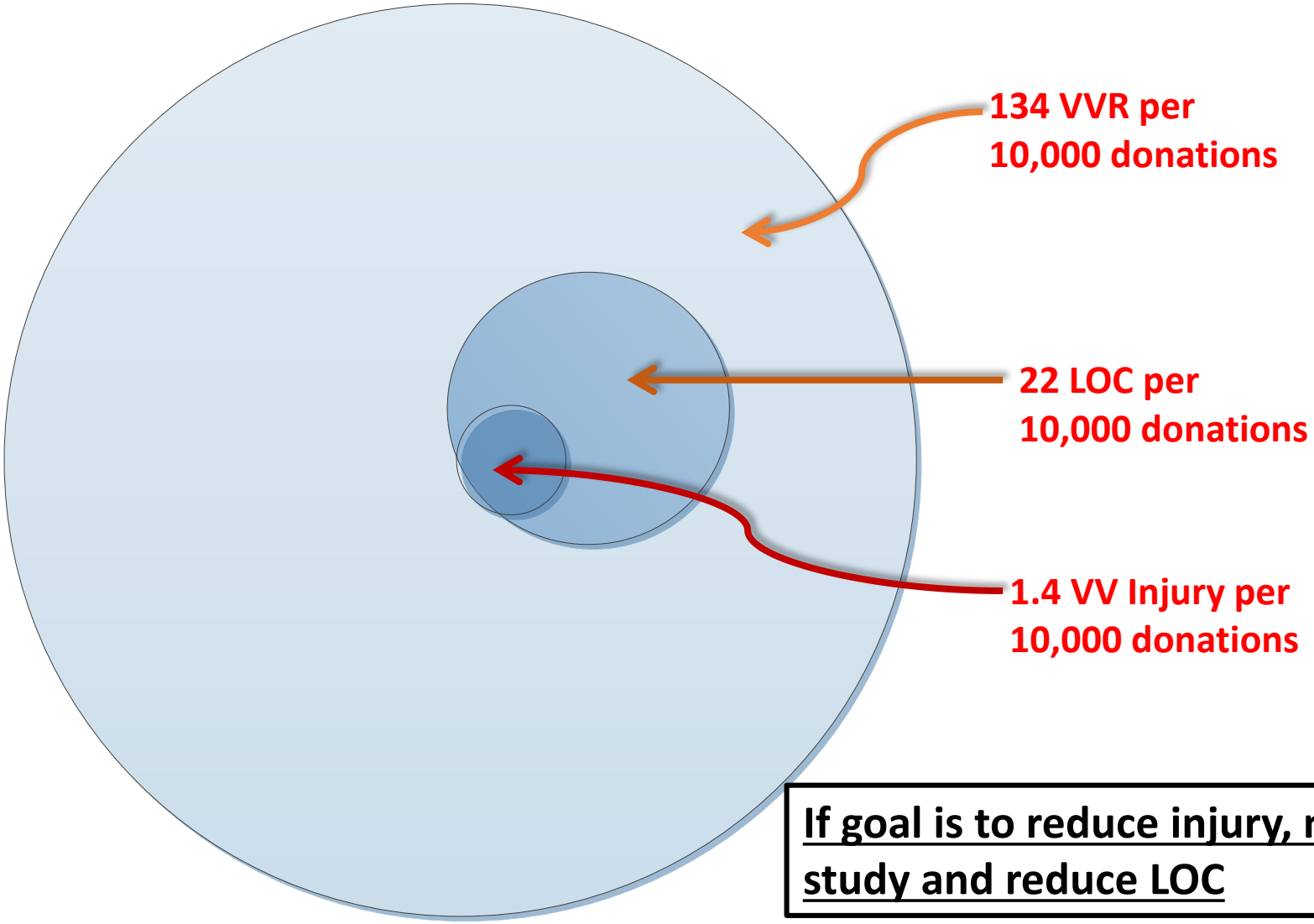
Injuries from Vasovagal Reactions, 2010 to 2014



If goal is to reduce injury, must study and reduce LOC

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Multivariate Analysis
(Allogeneic, WB, Complete and Incomplete)

- Using 2008-2011 dataset on allogeneic, WB, complete and incomplete donations (~ 3.7 million donations)
- Multivariate analysis was performed with the following indicator variables used in parallel models:
    - Vasovagal-related injury (N= 416 records)
    - LOC (N= 6137 records)
- Both MV models included:
    - Sex, **Age,** Donor Status, Ethnicity, Race, EBV, Pulse, Hemoglobin, Blood Pressure Classification,, Donation Status, Donation Site and Center
- MV analyses can detect which are independent predictors of the selected outcomes (injury and LOC).

Multivariate analysis (allogeneic, WB, needle in) on factors associated with vasovagal-related injuries and loss of consciousness

Donor and Donation Characteristics			Vasovagal-related injury	Loss of Consciousness
			n=416	n=6137
Sex	Male	Female	1.1(0.7-1.7)	1(0.9-1.2)
Age (years)	23-49	16-18	3.5(2.4-5.1)	2.6(2.3-2.8)
		19-22	1.9(1.2-3.2)	2.1(1.9-2.4)
		50-64	0.9(0.6-1.5)	0.8(0.7-0.9)
		=>65	0.9(0.4-1.8)	1.1(0.9-1.3)
Donor Status	Repeat	First-time	2.1(1.6-2.9)	2.3(2.1-2.5)

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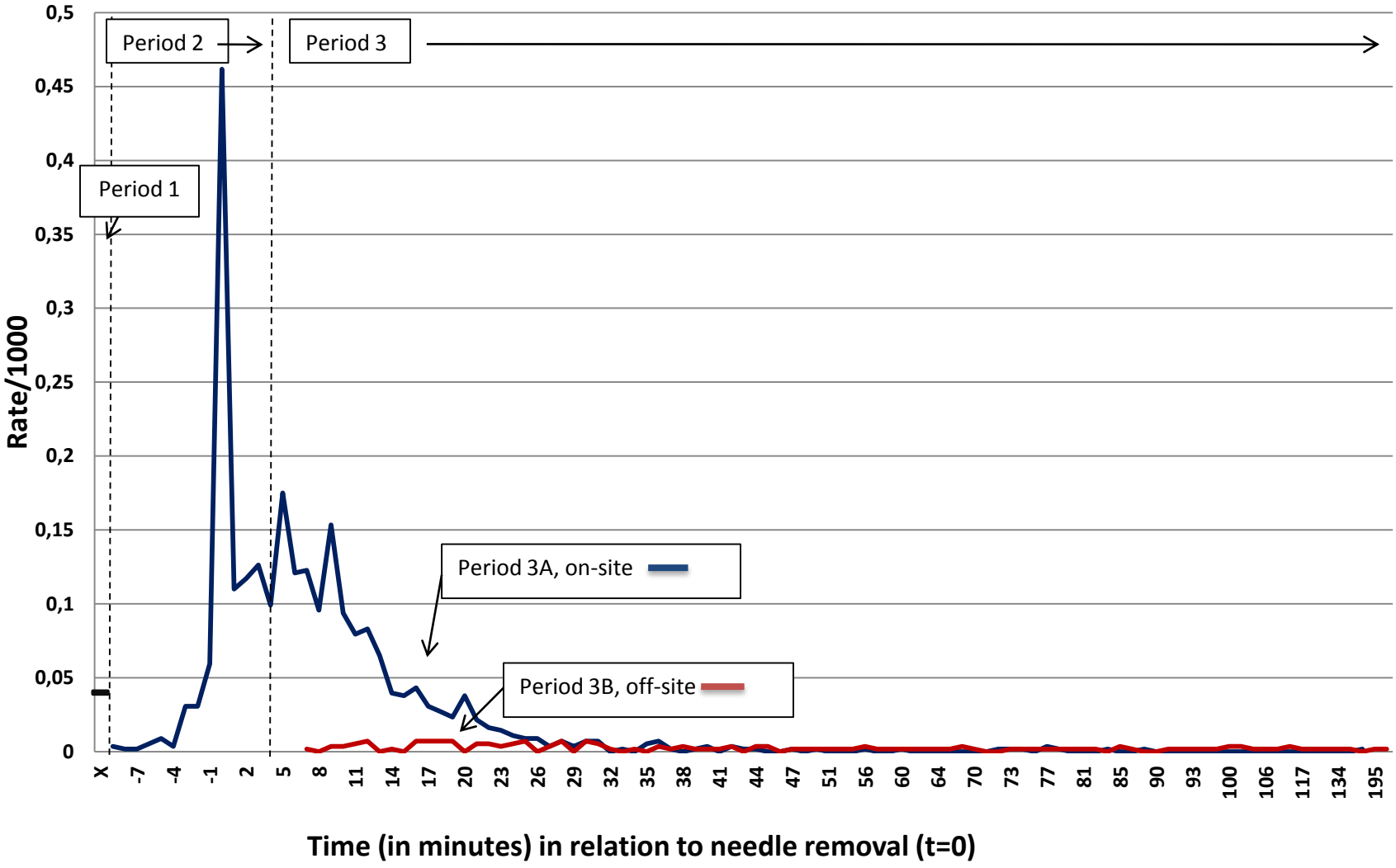
Multivariate Analysis of ~3.7 Million Donations (Allogeneic, WB, Complete and Incomplete)

Donor and Donation Characteristics			Vasovagal-related injury	Loss of Consciousness
			n=416	n=6137
Estimated Blood Volume (EBV)	=>5000	<3500	6.5(3-14.1)	4.1(3.4-5)
		3500-3999	3.8(2.2-6.7)	3.2(2.8-3.7)
		4000-4499	2.5(1.5-4.2)	2.1(1.9-2.4)
		4500-4999	1.6(0.94-2.8)	1.6(1.4-1.8)

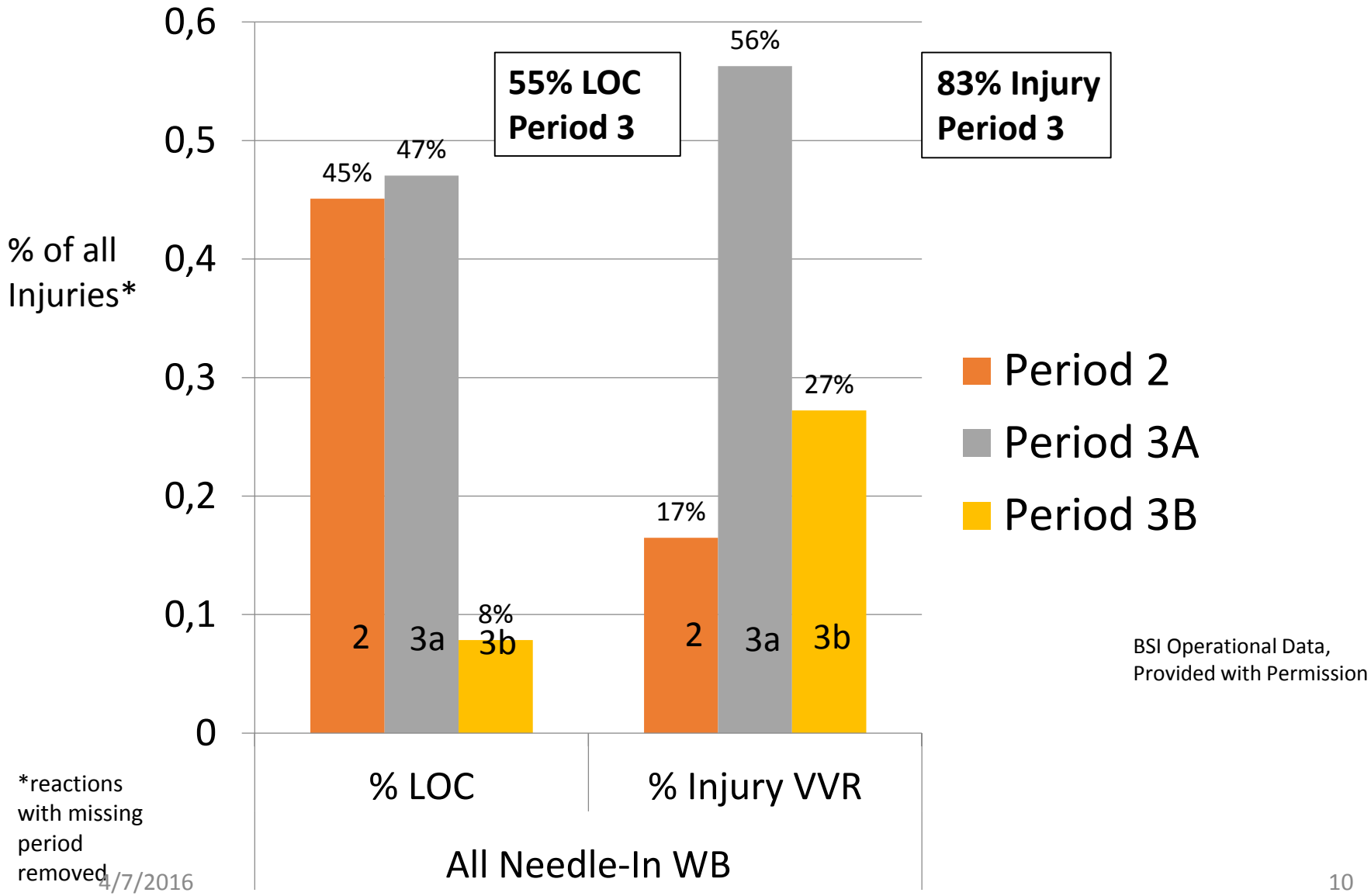
BSI Operational Data, Provided with Permission

Fainting Rates Across Time Course of Blood Donation, 2007 data



Bravo, et al Vox Sanguinis (2011) 101, 303–312

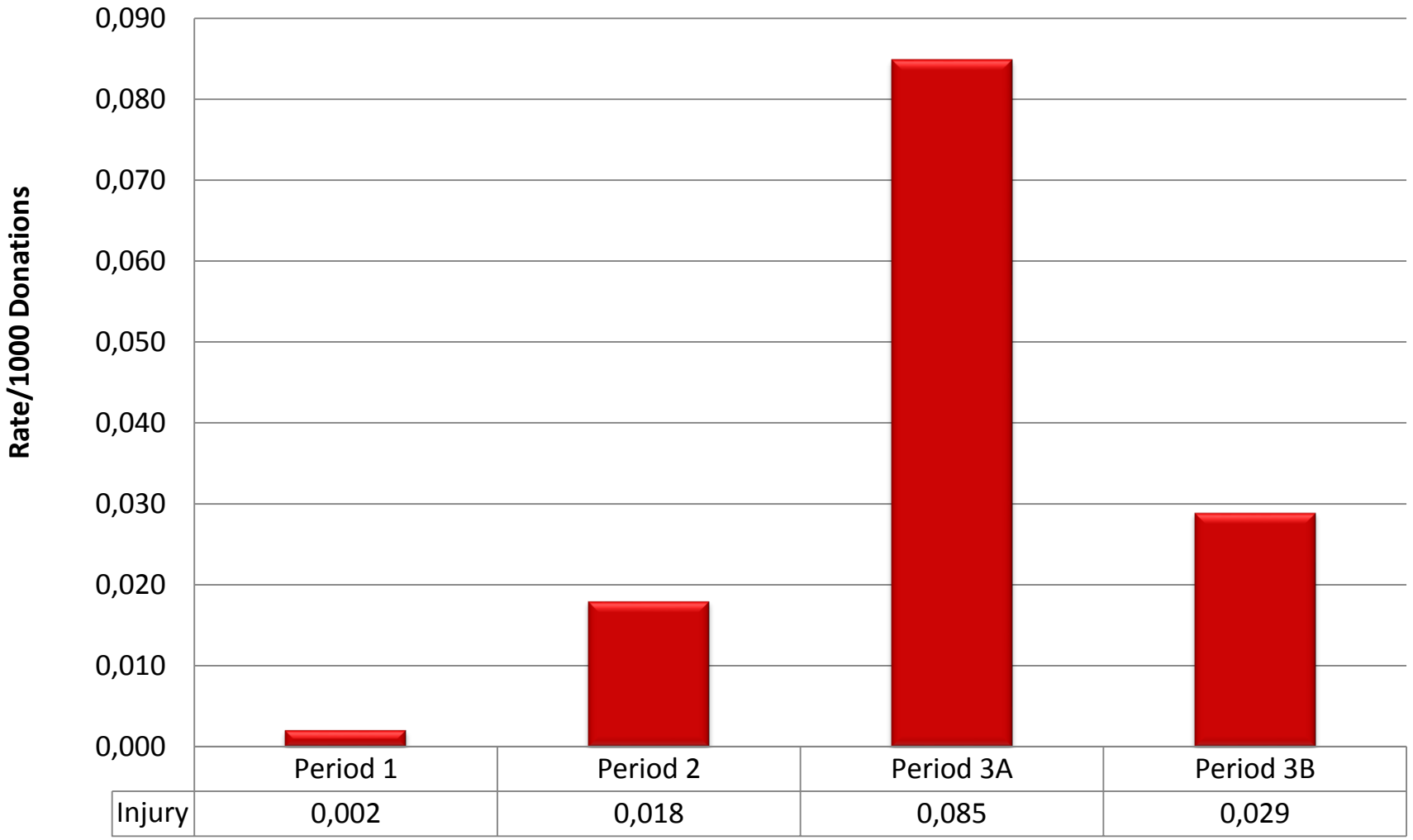
Injuries; Recumbent vs. Ambulatory



BSI Operational Data, Provided with Permission

*reactions with missing period removed

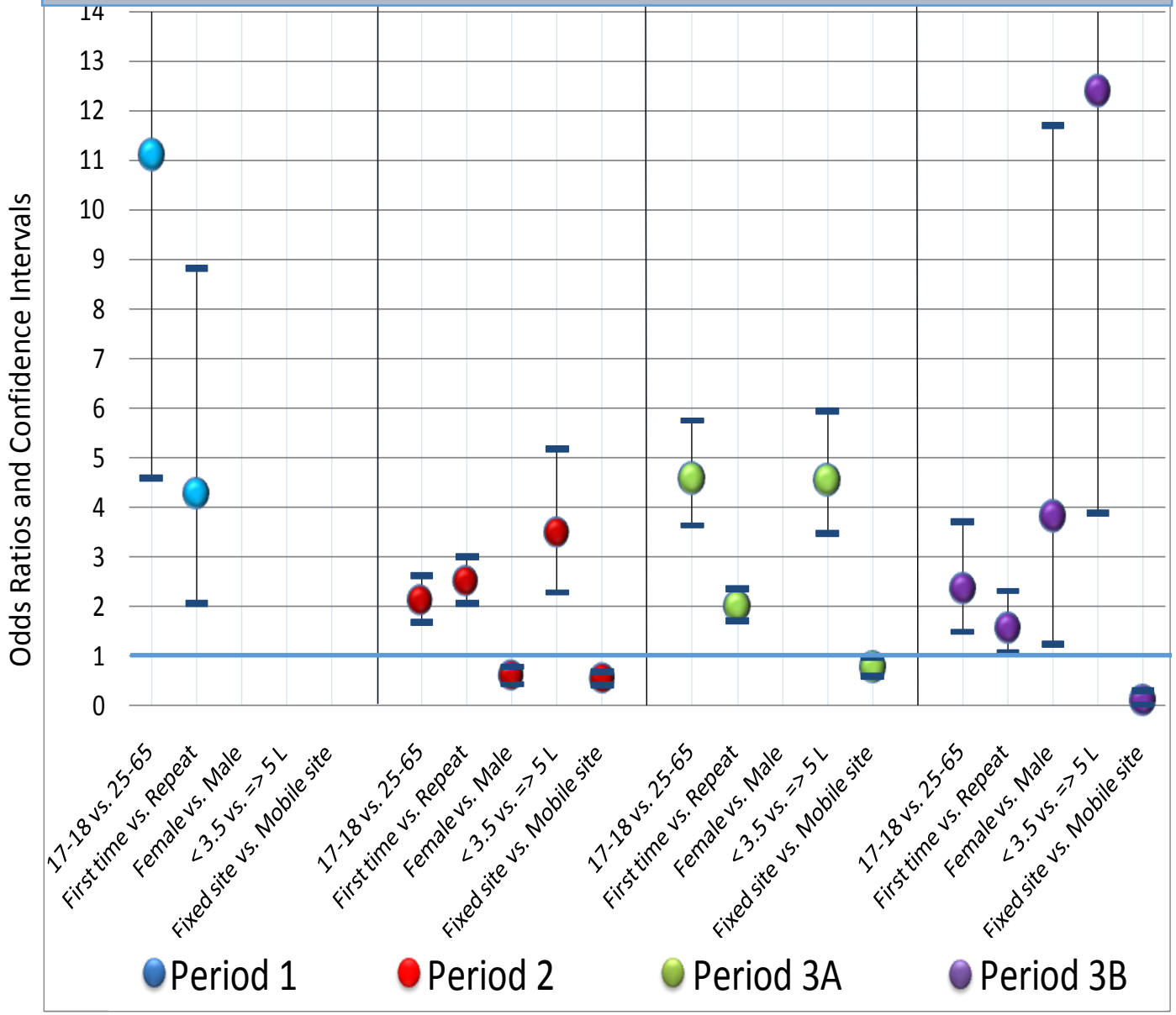
Injury/1000 Donations
(Males and Females)



	Period 1	Period 2	Period 3A	Period 3B
Injury	0,002	0,018	0,085	0,029

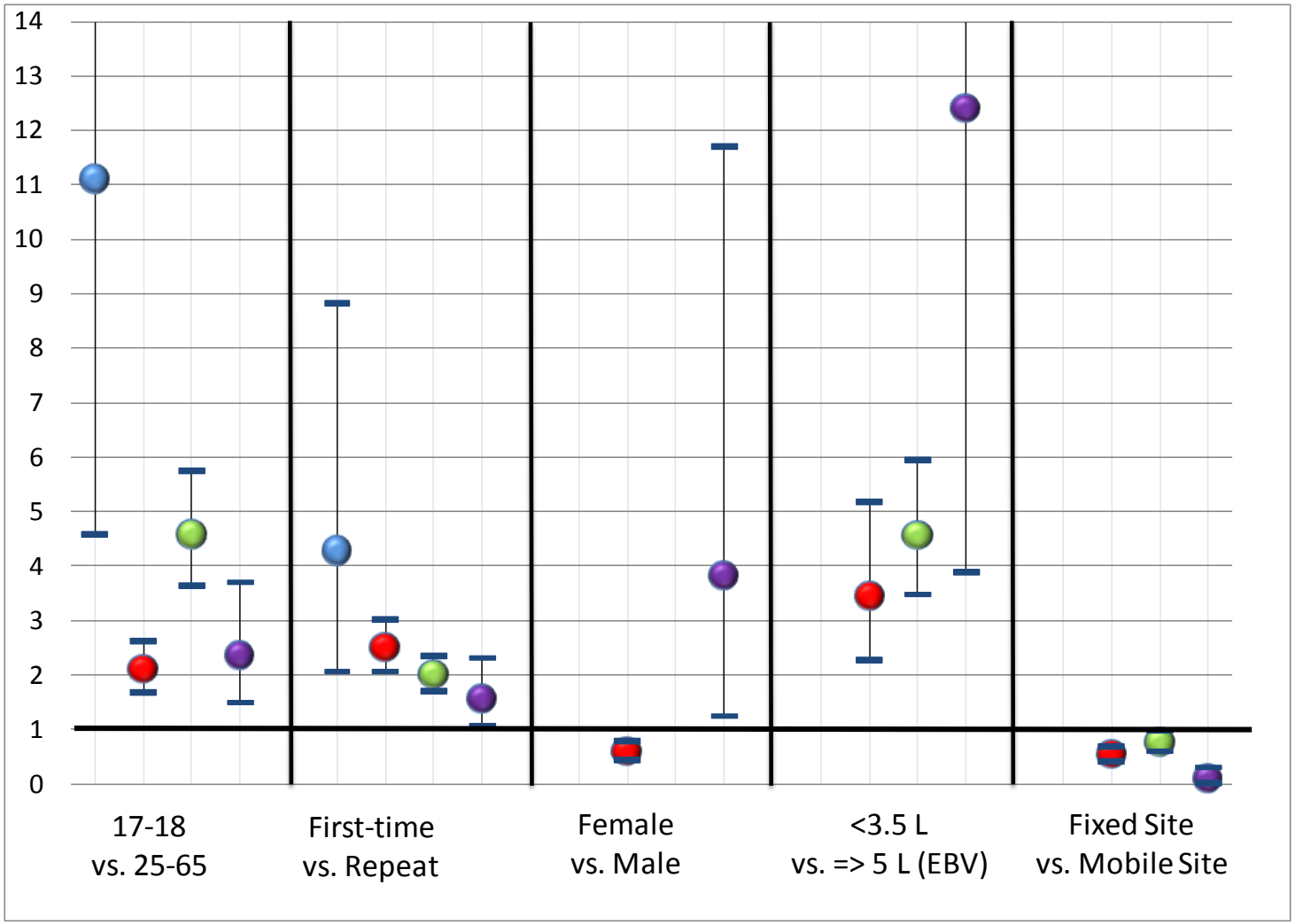
BSI Operational Data; Provided with Permission

Fainting: Summary of Multivariable Model By Period Adjusted Odds Ratios Across Time Course of Blood Donation



Bravo, Vox Sang, 2011

Fainting: Summary of Multivariable Model (Donor / Donation Characteristics) Adjusted Odds Ratios Across Time Course of Blood Donation



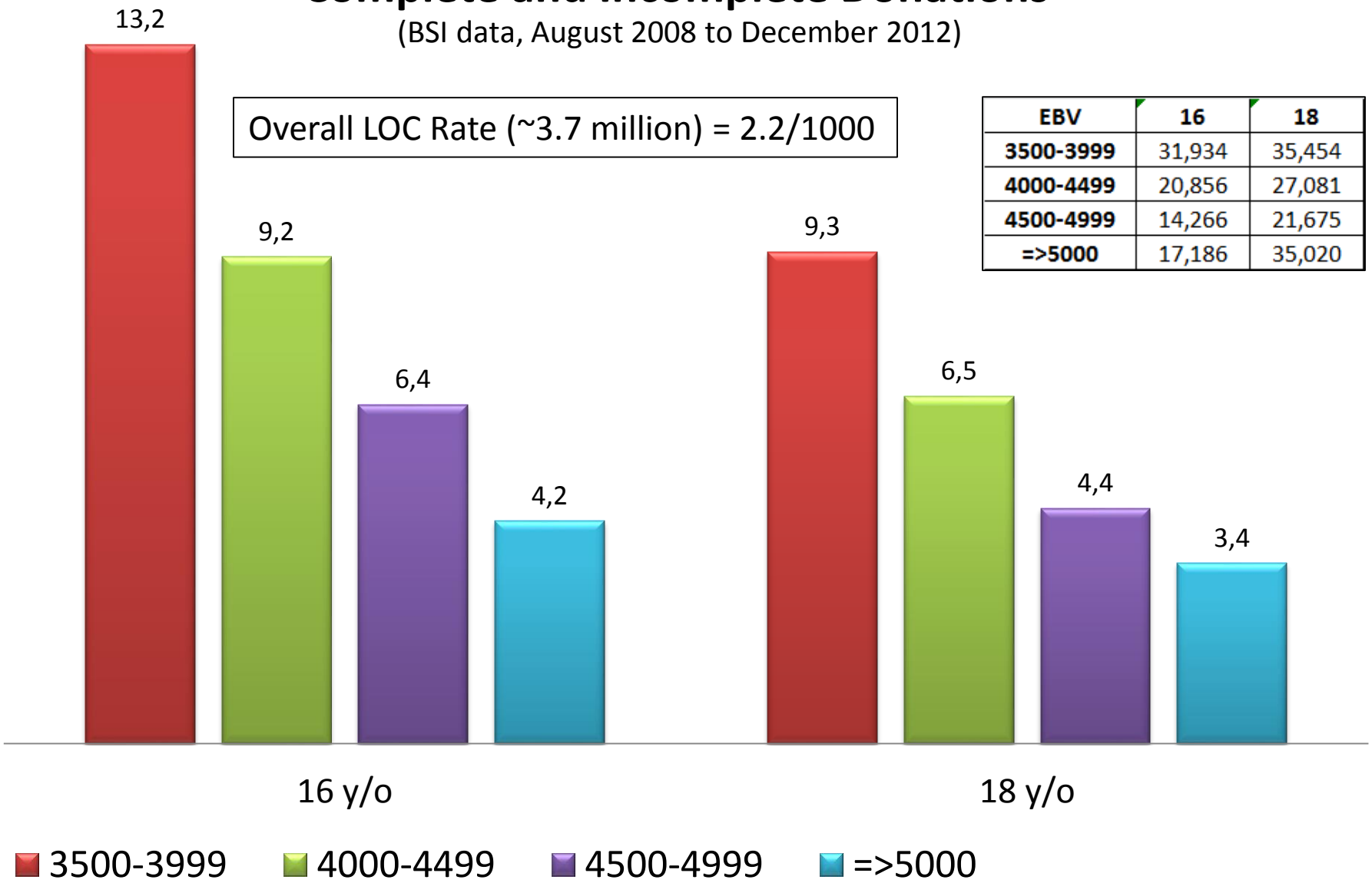
Bravo
Vox Sang
2011

LOC rate/1000 by EBV in 16 vs. 18 y/o WB Allogeneic Complete and Incomplete Donations

(BSI data, August 2008 to December 2012)

Overall LOC Rate (~3.7 million) = 2.2/1000

EBV	16	18
3500-3999	31,934	35,454
4000-4499	20,856	27,081
4500-4999	14,266	21,675
=>5000	17,186	35,020



Vasovagal-related Injuries in WB donations

	Total	Injury VVR (n)	% of all VVRinjuries from WB donations	% of all WB donations
Donations	2705440	467		
Donors <3500	87934	23	4.9	3
3501-3999	559,506	210	45.0	21
Donors <4000	647,440	233	49.9	24
Donors < 23	582,204	284	60.8	22
Donors < 18	250,808	174	37.3	9
Male Donors	1,169,405	118	25.3	43
1st time donors	503,002	199	42.6	19
Donors < 23 with <4L	180,468	155	33.2	7
Donors < 18 with <4L	89,426	111	23.8	3
1st time donors with < 4L	137,100	101	21.6	5

BSI Operational Data; Provided with Permission

Studying Predictors of Donor AEs

- First time, youth, low EBV, tachycardia:These are associated with LOC and injury. *(gender? fear?):* But VVR ≠ LOC.
- Objective definition of AE (LOC) (survey? VVR)
- Large sample size
- Time of AE in relation to needle withdrawal
- Donor position (upright, recumbent) at onset of AE
- *Location of donor at onset of AE*

Ferritin testing in Canadian Blood Donors

M Goldman, S Uzicanin, V Scalia, SF O'Brien

AABB Annual Meeting
October 26, 2015
Anaheim, California

Canadian Blood Services
it's in you to give

Ferritin levels by gender, donation frequency N = 9,783

Donation frequency past 12 months	N	Ferritin (µg/L) (%)		
		< 12	12-24	25-336
Females				
First time	569	58 (10)	145 (26)	364 (64)
Reactivated*	956	68 (7)	220 (23)	668 (70)
1-3	2,307	664 (29)	756 (33)	887 (38)
≥ 4	601	242 (40)	231 (39)	128 (21)
Males†				
First time	426	2 (0.5)	7 (1.6)	384 (90)
Reactivated*	775	3 (0.4)	19 (2.5)	729 (94)
1-3	2,529	173 (7)	511 (20)	1,822 (72)
≥ 4	1,620	450 (28)	579 (36)	588 (36)

* No donation in > 12 months

† 83 males (1.5%) had ferritin > 336 µg/L

Canadian Blood Services
it's in you to give

Female donors, ferritin levels by age and donations in last 12 months

Gender	Age	Donations last 12 months	Number of donors	Ferritin (µg/L), (%)		
				< 12	12-24	25-336
Female	17-24	FT or RA	139	12 (9)	54 (39)	73 (52)
		1 or 2	108	50 (46)	30 (28)	28 (26)
		≥ 3	27	18 (67)	6 (22)	3 (11)
	25-45	FT or RA	295	24 (8)	79 (27)	192 (65)
		1 or 2	215	77 (36)	65 (30)	73 (34)
		≥ 3	106	47 (44)	36 (34)	23 (22)
	≥ 46	FT or RA	138	12 (9)	22 (16)	104 (75)
		1 or 2	205	39 (19)	64 (31)	102 (50)
		≥ 3	204	86 (42)	77 (38)	41 (20)

FT = first time
RA = no donation in last 12 months

Male donors, ferritin levels by age and donations in last 12 months

Gender	Age	Donations last 12 months	Number of donors	Ferritin (µg/L), (%)			
				< 12	12-24	25-336	>336
Male	≥ 17	FT or RA	446	2 (0.4)	11 (2)	417 (94)	16 (4)
		1, 2 or 3	776	52 (7)	165 (21)	552 (71)	7 (1)
		4 or 5	477	161 (34)	162 (34)	153 (32)	1 (0.2)
		6+	36	16 (44)	15 (42)	5 (14)	0 (0)

FT = first time
RA = no donation in last 12 months

Multivariable logistic regression analysis of factors associated with absent iron stores

Donor and Donation Characteristics		MALE (n=1,155) OR (95% CI)	FEMALE (n=1,079) OR (95%CI)
Hemoglobin (g/dL) (Reference: 15.5-26)	12.5-13.4	80.8 (31.1-209.7)	65.3 (15.6-273.3)
	13.5-14.4	12.6 (6.5-24.4)	15.4 (3.7-64.4)
	14.5-15.4	4.2 (2.2-8)	8.1 (1.9-34.3)
Age (years) (Reference: 50-64)	16-18	3.2 (1.1-9.6)	2.8 (1.2-6.4)
	19-22	1.6 (0.5-5)	3.3 (1.7-6.6)
	23-49	1.4 (0.8-2.5)	2.4 (1.5-3.6)
	≥65	*0.4 (0.2-0.98)*	1.5 (0.8-2.7)
# of Prior RBC Donations in the Past 2 Years (Reference: 0)	1	0.4 (0.04-3.7)	1 (0.4-2.1)
	2-3	4.2 (1.4-13.1)	3.1 (1.6-5.7)
	4-5	4.6 (1.5-13.9)	4.5 (2.4-8.5)
	6-9	7.8 (2.7-22.3)	5.5 (2.9-10.6)
	10+	12 (3.6-40.7)	13 (3.2-52.8)

Bravo, et al, AABB Annual Meeting, 2015

Questions About Donors Under 19 Years of Age

- Should 19 be minimum age for blood donation?
- Requirement that donors under 19 yo have saline infusion to match the volume removed to ensure a normal EBV at procedure end?
- Should the only donation type permitted be 2 units of red cells by apheresis?
- Should donors have an assessment of iron stores with their first donation to be used to manage subsequent blood donation?

Summary

- Age
  - Individuals under 19 yo should receive specific education about the physiology of blood donation to include instruction on the prevention of fainting and iron deficiency before their first donation.
- First Donation
  - The first donation of individuals under 19 years of age should be monitored to ensure that prophylactic interventions are understood and implemented. Verbal instruction should be available concerning muscle tension, blood volume replacement, iron metabolism, etc.

Summary

- Age and Blood Volume
  - Individuals under 19 yo should not be permitted to donate whole blood unless they have an estimated blood volume ≥ 4 liters and they meet all the other pertinent donor suitability criteria.
- Age and Iron
  - Individuals (under 19 yo) whose hemoglobin is within 1 gm above the minimum acceptable level should have a laboratory iron assessment with their first blood donation. Subsequent donation activity should be managed with attention to maintaining normal iron metabolism.

Young and First Time Donors Need Attention

Thank you