

Pediatric RDCR

Lessons Learned from the DODTR

I have no financial disclosures

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Why PEDIATRIC RDCR?

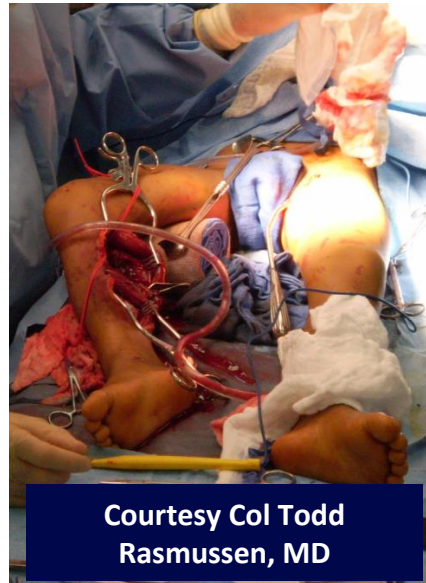
ORIGINAL ARTICLE

Ten years of military pediatric care in Afghanistan and Iraq

Matthew Borgman, MD, Renée I. Matos, MD, Lorne H. Blackbourne, MD, and Philip C. Spinella, MD

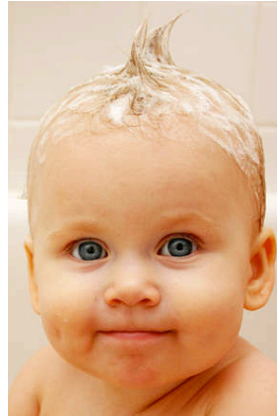
JTrauma ACS; 2012. 73:S509

7,500+ pediatric patients (over 2/day)
1 in 17 admissions; 11% bed days

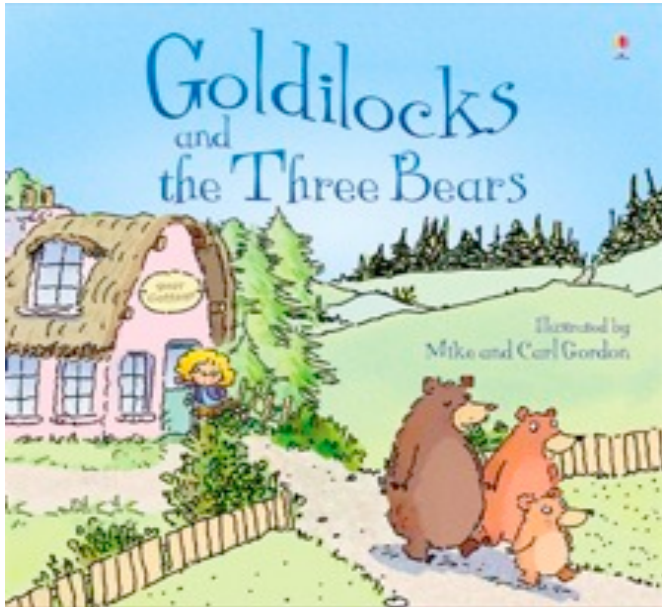


What makes it so hard?

- 1) Vascular access
- 2) Relative blood volume
- 3) Weight-based therapy
- 4) Syringe pumps? Aliquots?
- 5) A little goes a long way



1 yo = 70 mL/kg
7 kg = **490 mL**



13 yo = 70 mL/kg
40 kg = **2800 mL**



Pediatric RDCR is like a black box.

Which components?

How much?

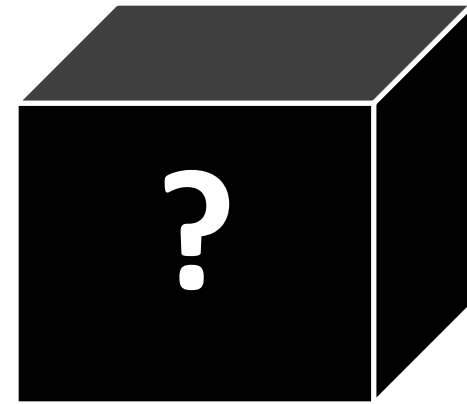
Outcomes?

Adjuncts?

When?

What is a MT?

Extrapolate ADULT data?



Top Questions

- 1) What is a pediatric MT?
- 2) How has pedi DCR practice evolved?
- 3) Blood product ratios important?

Patients

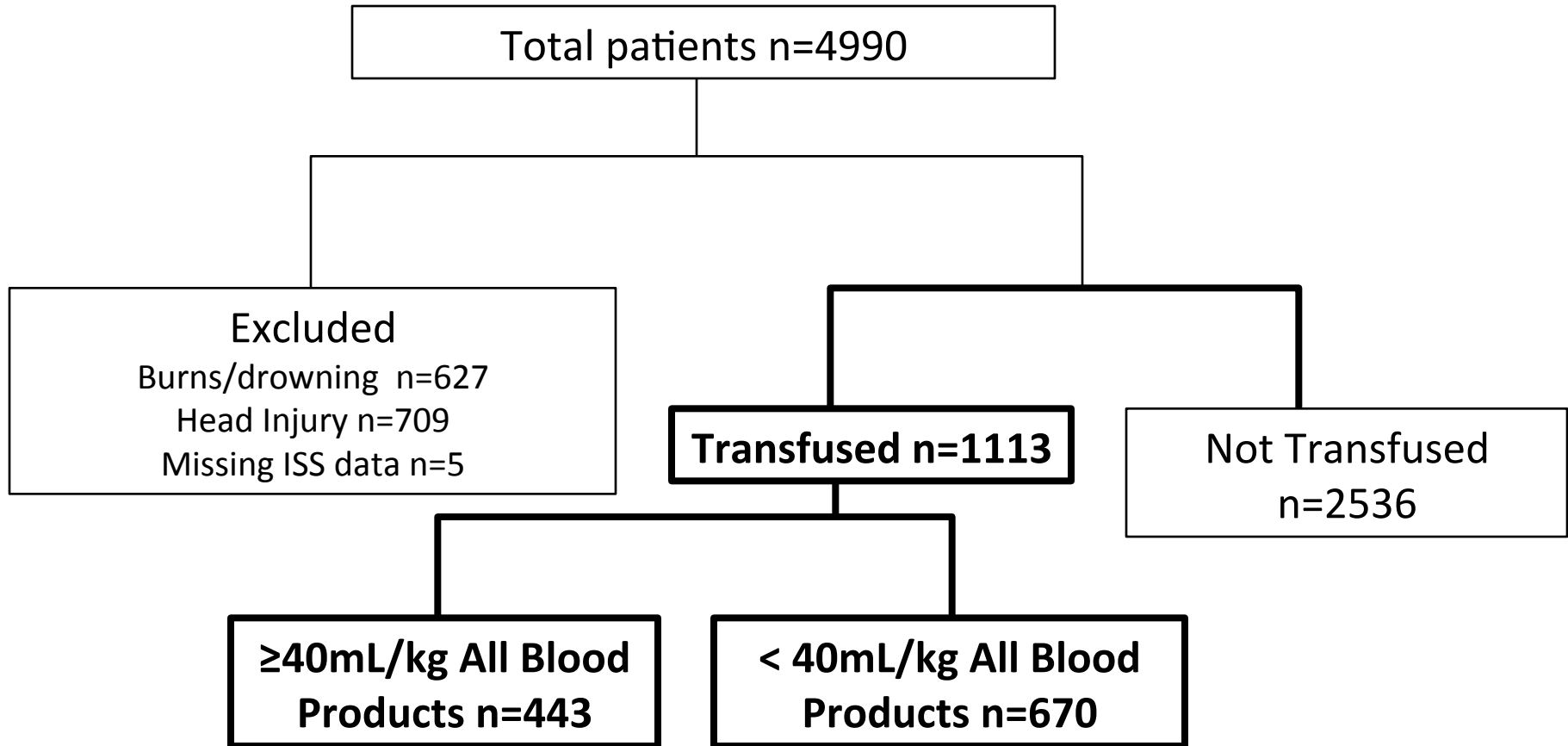


- 1) OCT 2001-SEP 2013
- 2) < 18 years old (ratios < 14)
- 3) TX=Any Blood Product
- 4) Early=2001-2005, LATE=2006+
- 5) Volumes calculated as mL/kg
- 6) Missing weights imputed
- 7) Stats included univariate and MVLR

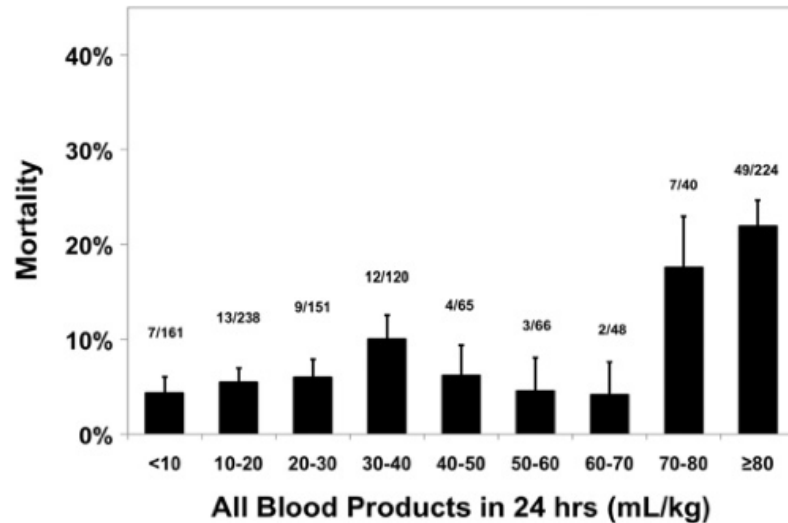
What is a pediatric MT?

- ◆ **Consistency across studies**
- ◆ **Identify a critically injured cohort**
- ◆ **Quantify resuscitation practices**
- ◆ **Limitation = survival bias**

Results: MT Definition

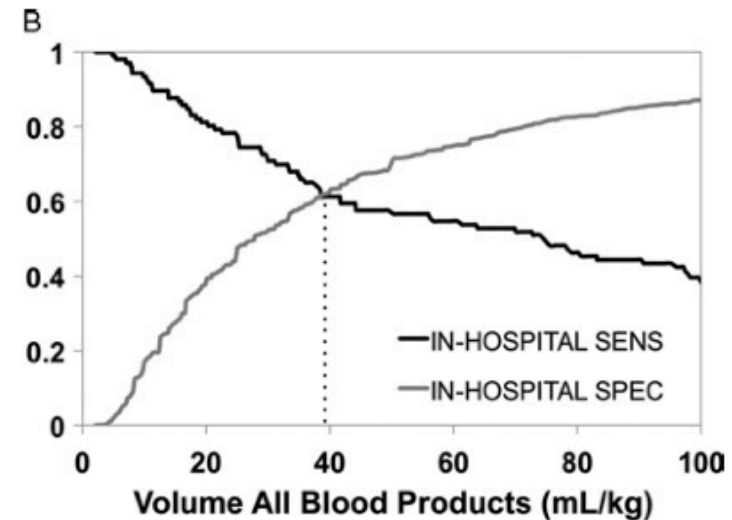
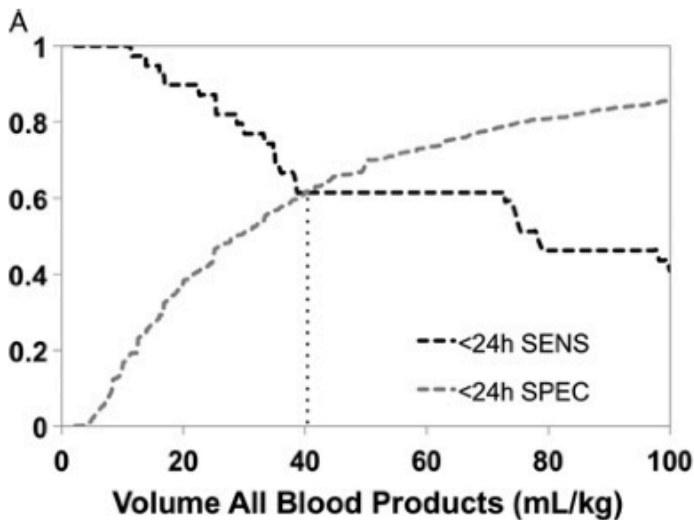


Results: MT Definition



◆ MT+ worse outcomes

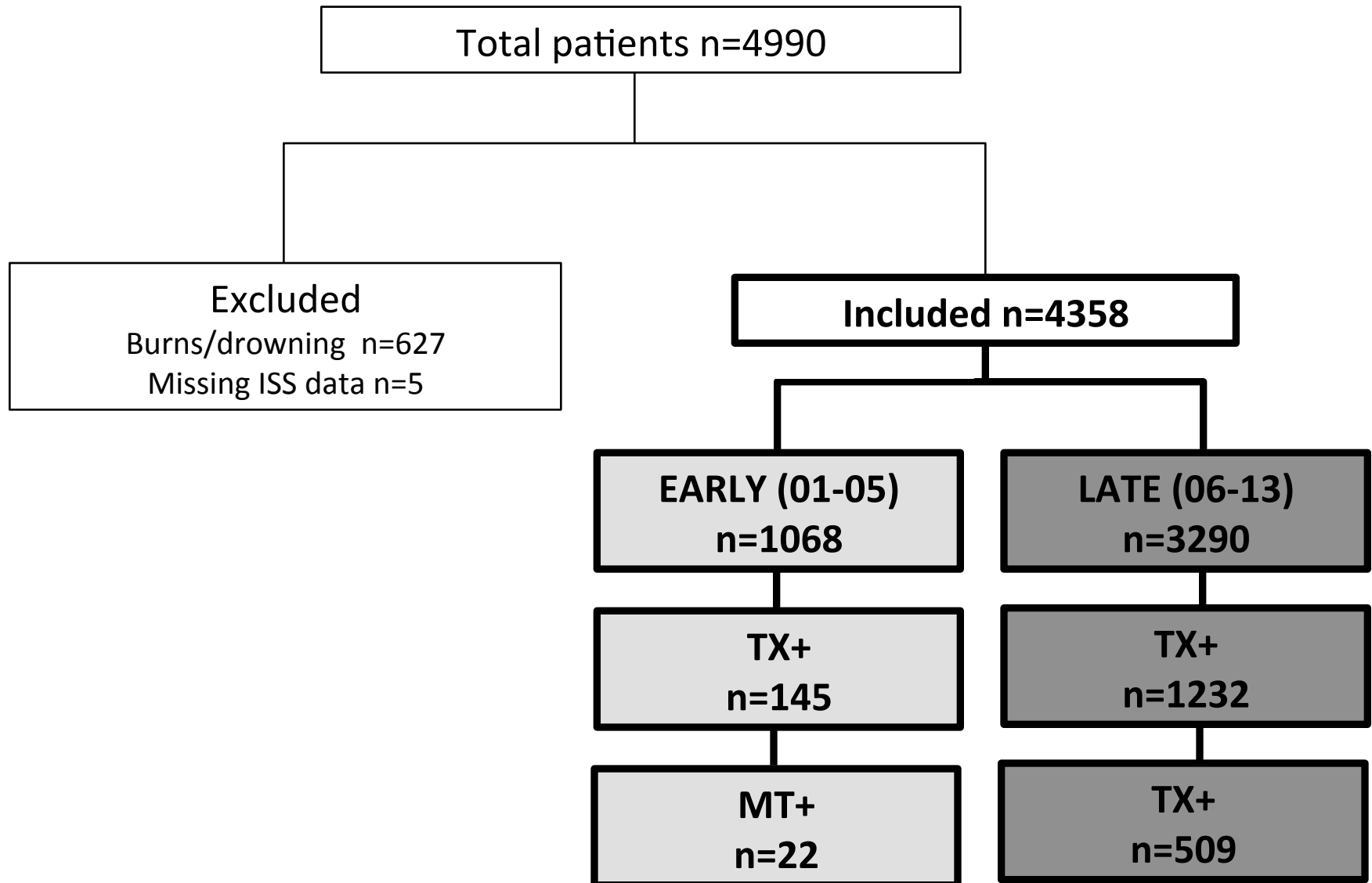
- Need for vent (85% v 56%)
- ICU LOS (4d v 2d)
- Hospital LOS (8d v 5d)
- 24h mortality (5% v 2%)
- Hosp mortality (15% v 6%)



Summary

- 1) Largest reported pediatric transfusion experience
- 2) MT Definition 40 mL/kg all blood products

How has pedi DCR practice evolved?



Results

◆ Demographics

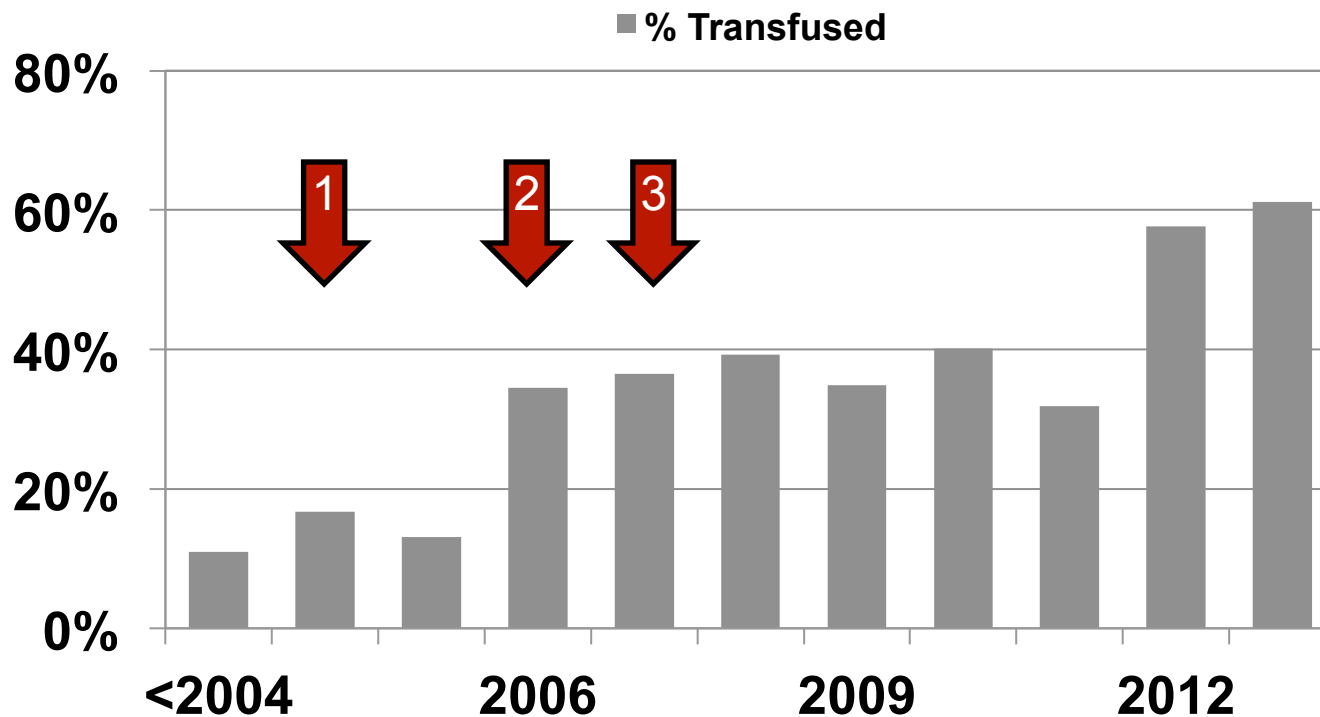
- Median age 9, wt 30 kg
- 78% Male

◆ Injuries

- Blunt 25%, Explosion 44%, Penetrating 31%
- Head Injury 16.3%
- Median ISS 9

Results

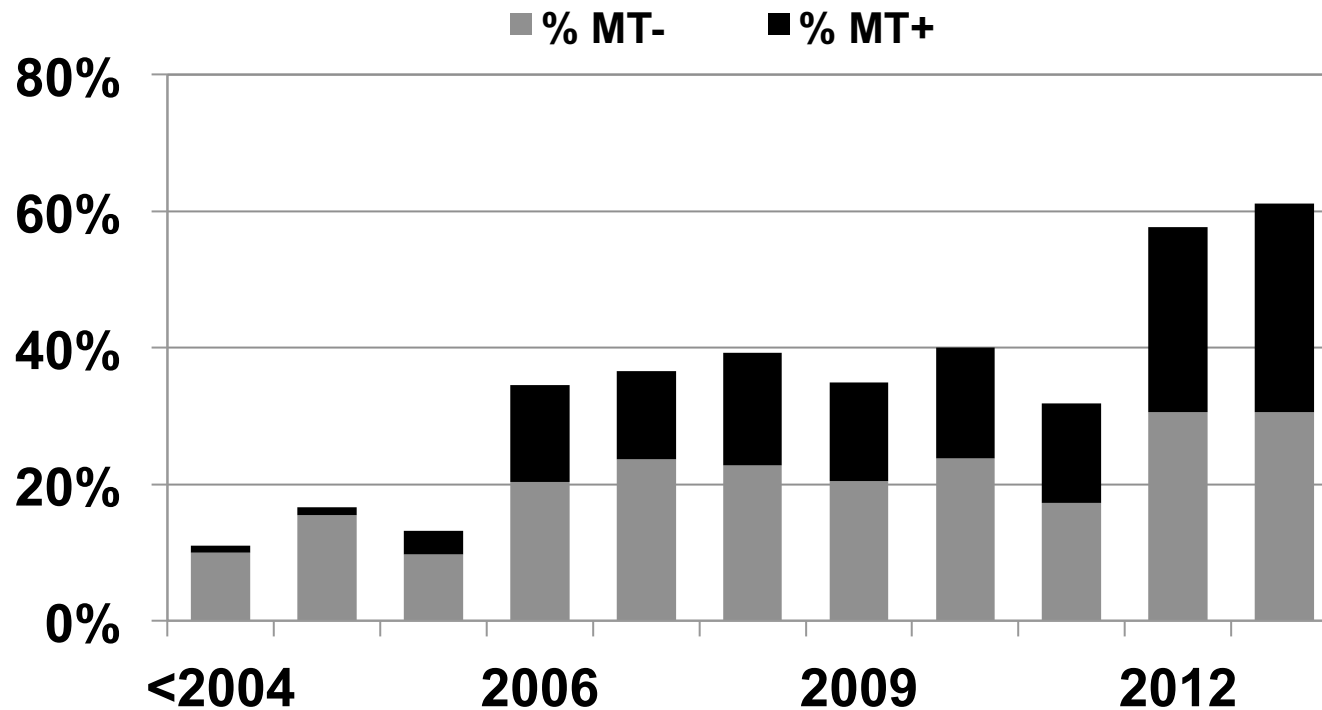
- 1 DCR CPG
- 2 EAST, AAST, ATACCC, SGA
- 3 Borgman paper in JTrauma



	All 01-13 n=4358	Early 01-05 n=1068	LATE 06-13 n=3290	<i>p</i>
Transfused	1377 (31.6)	145 (13.6)	1232 (37.4)	<0.001

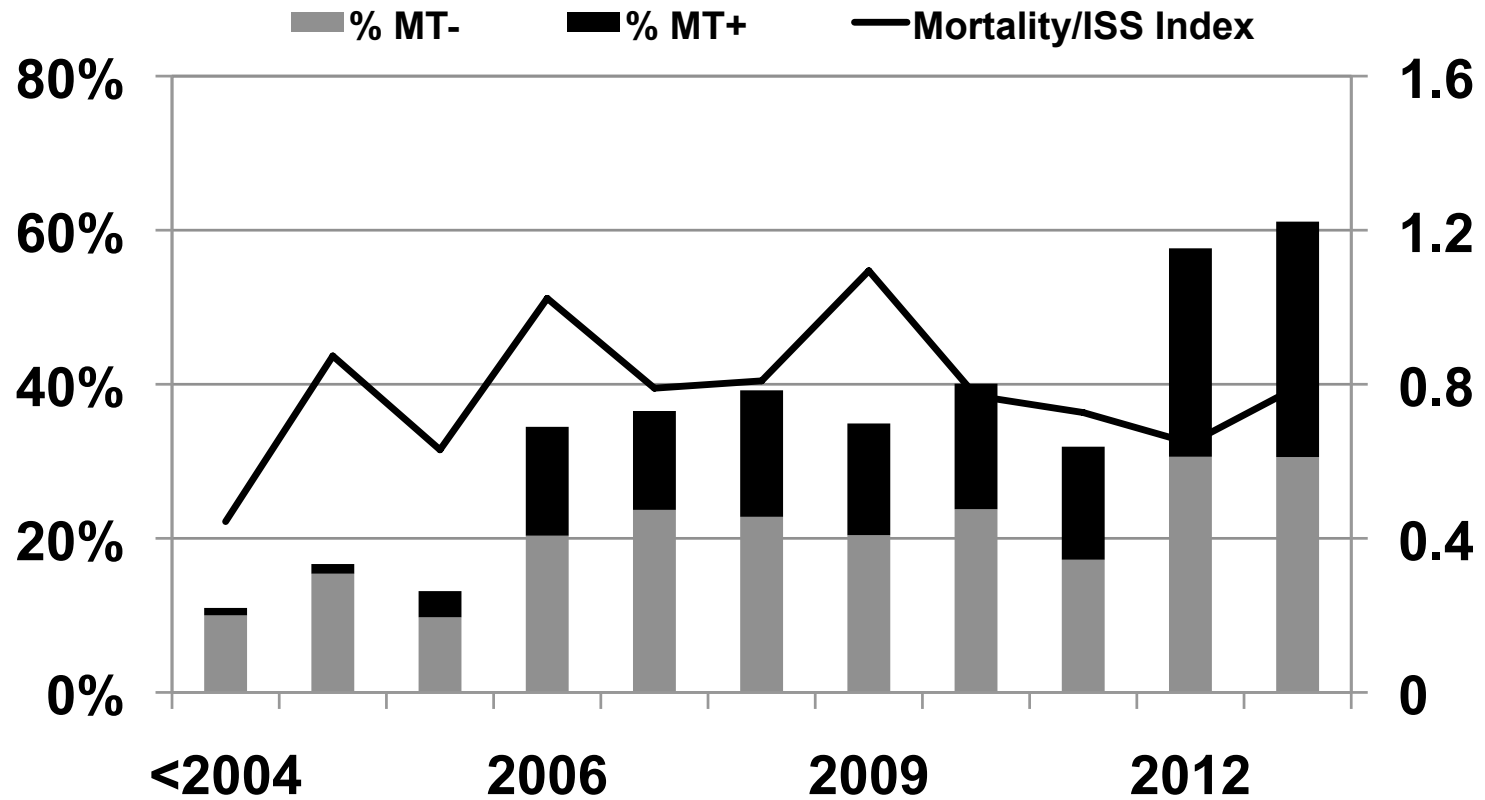
Results: MT+

12% of all patients
39% of all transfused patients

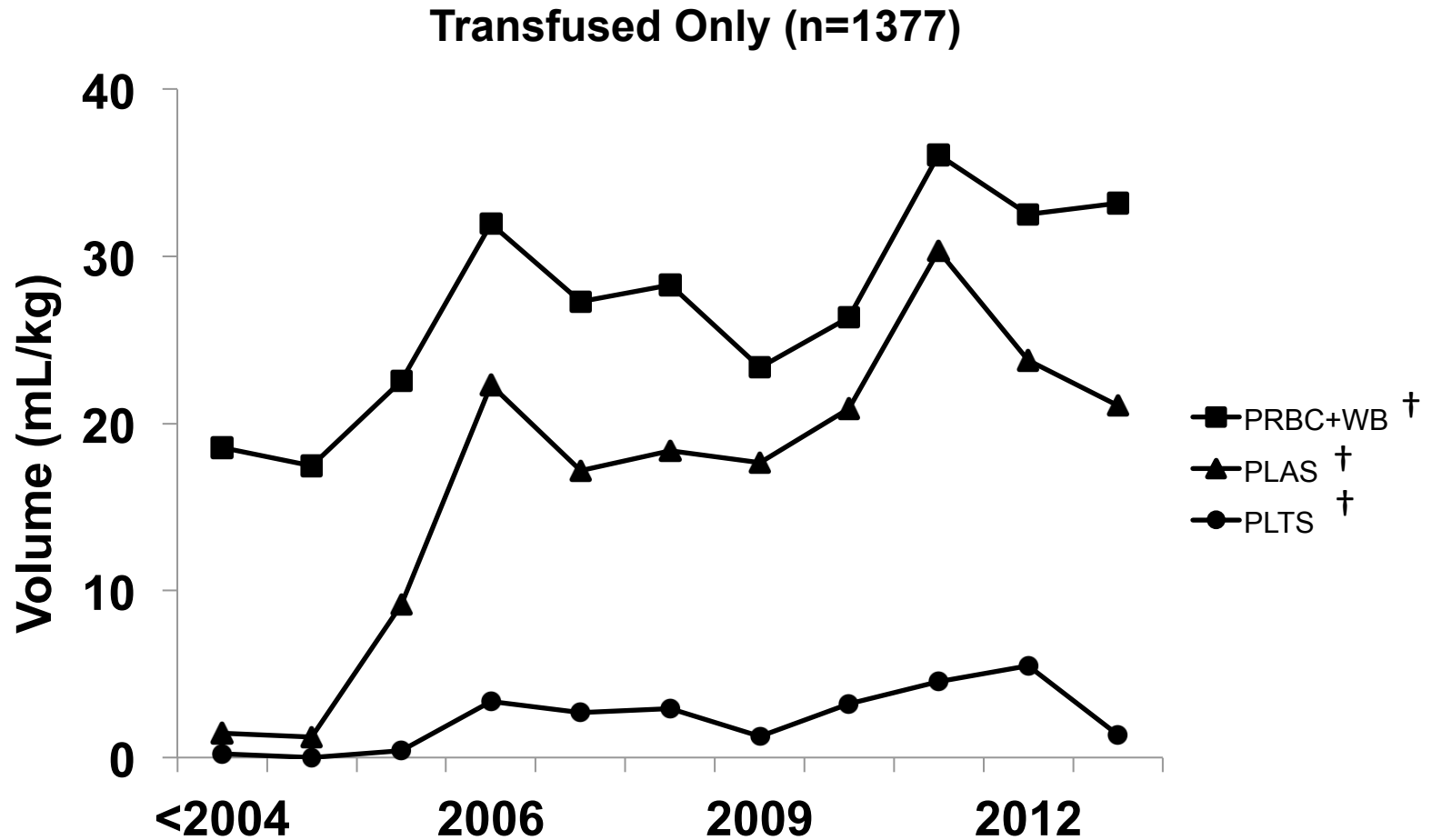


	All 01-13 n=4358	Early 01-05 n=1068	LATE 06-13 n=3290	<i>p</i>
MT+	531 (12.2)	22 (2.1)	509 (15.5)	<0.001

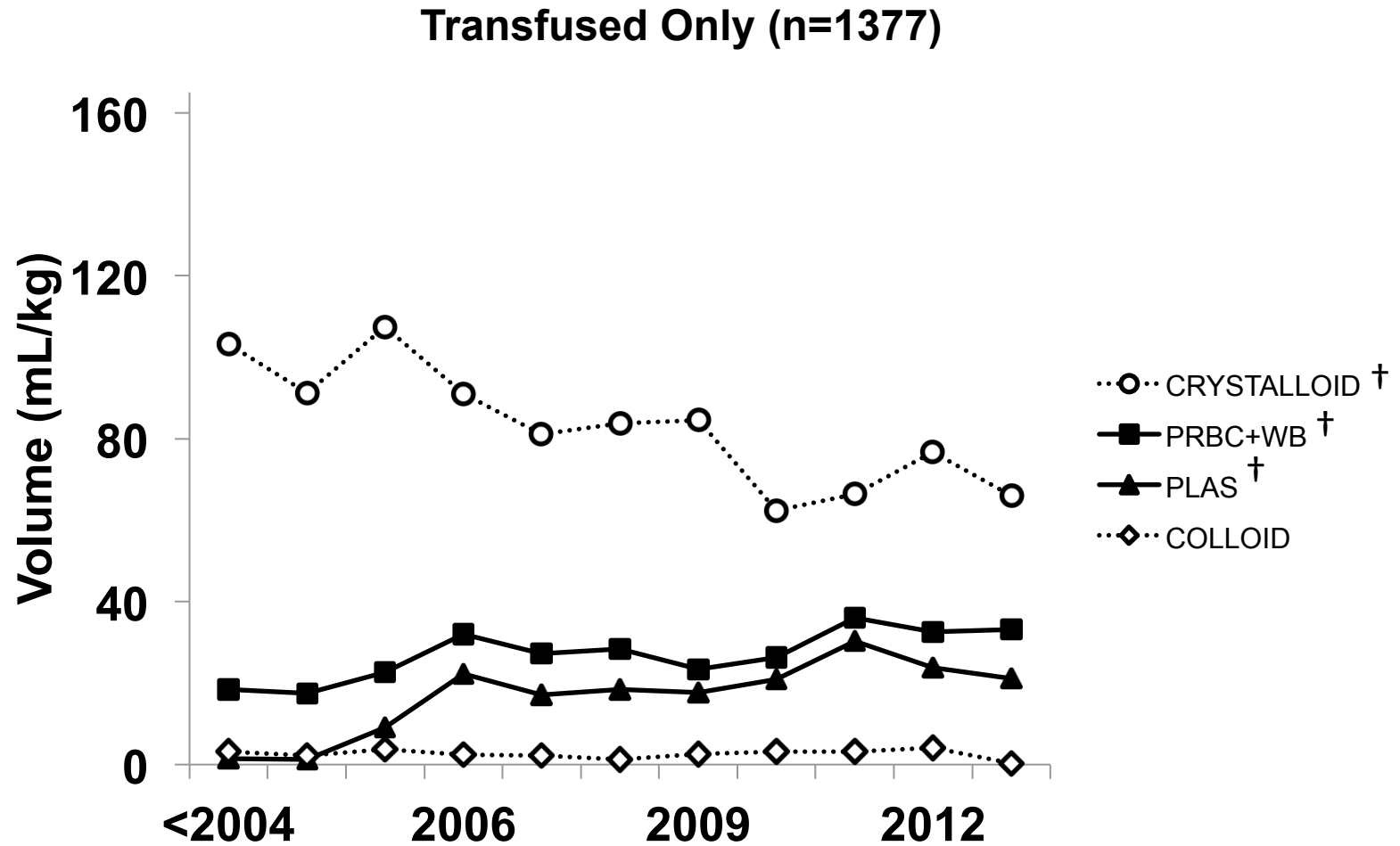
Results: ISS, Mortality



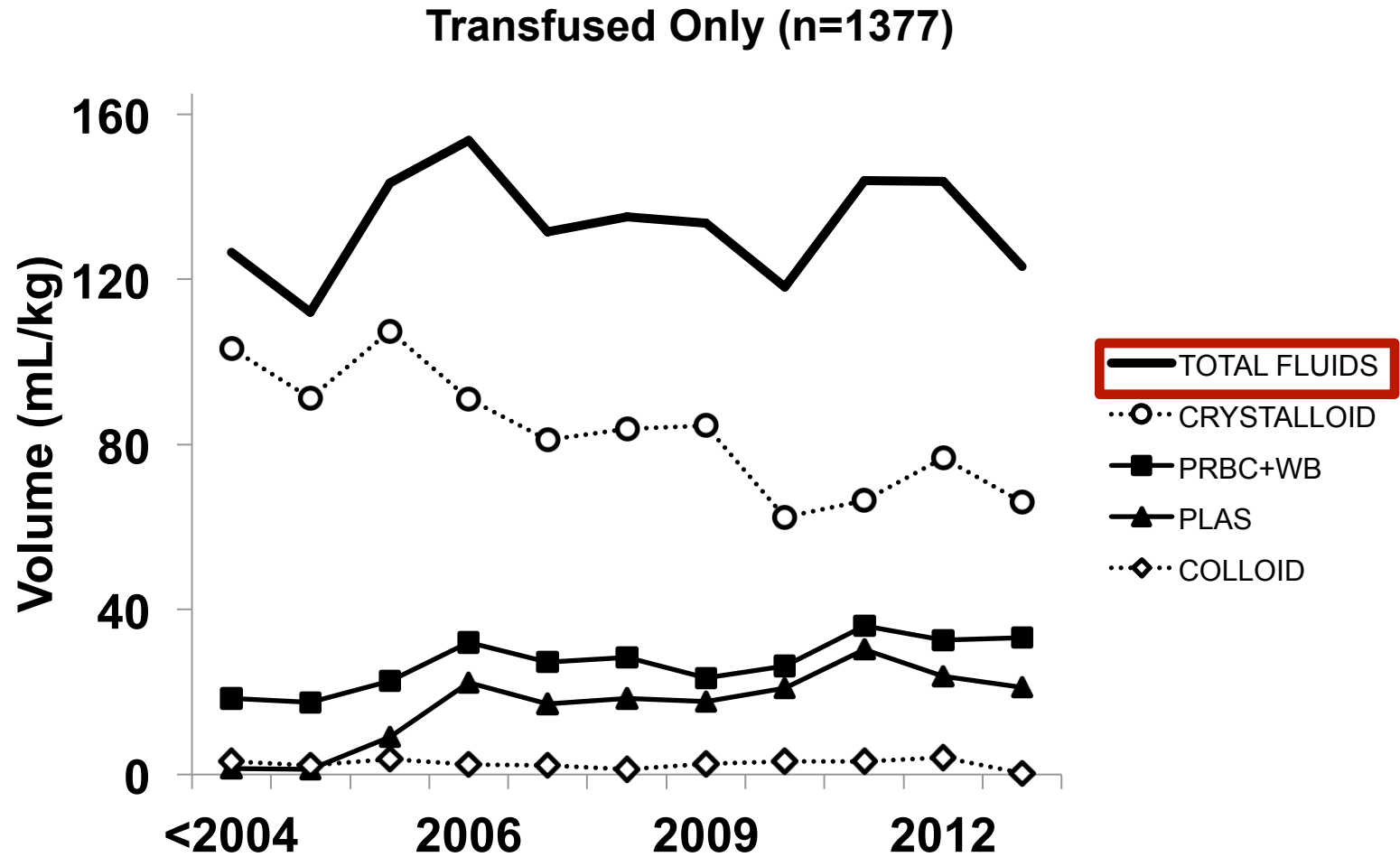
Results: Components



Results: Crystalloid, Colloid

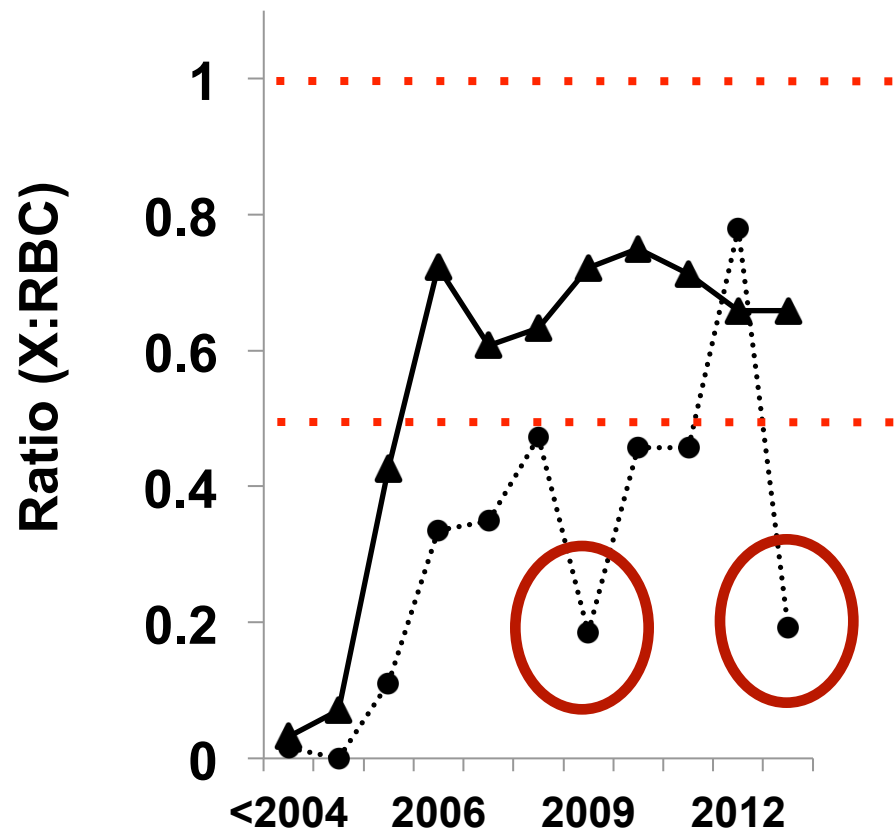


Results: Total Fluid

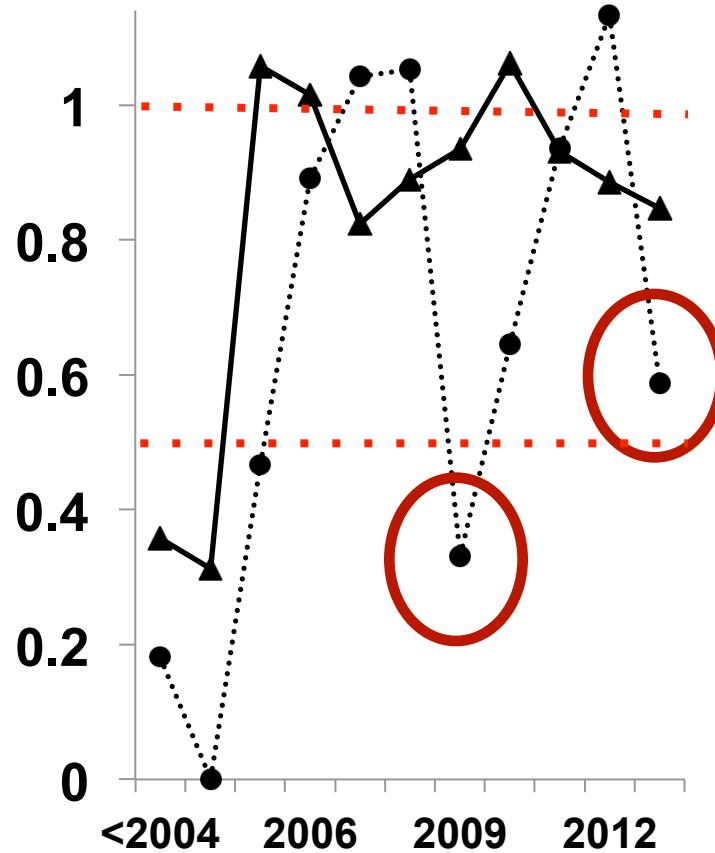


Results: Ratios

TX+ (n=1377)



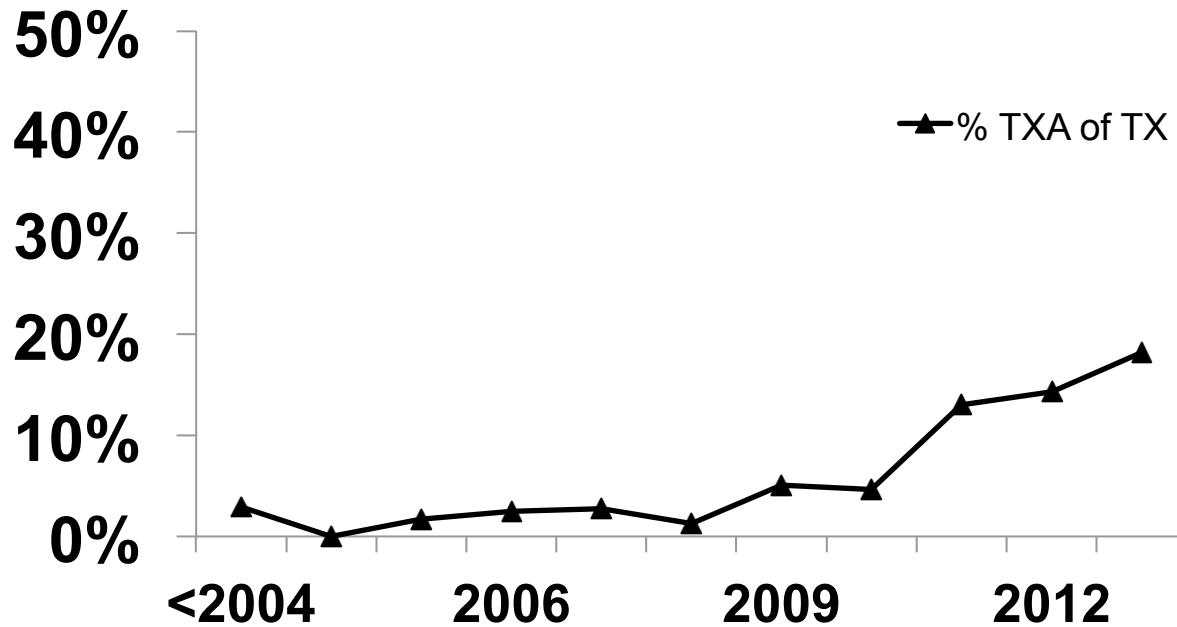
MT+ (n=531)



▲ FFP:RBC

● PLT:RBC

Results: TXA use



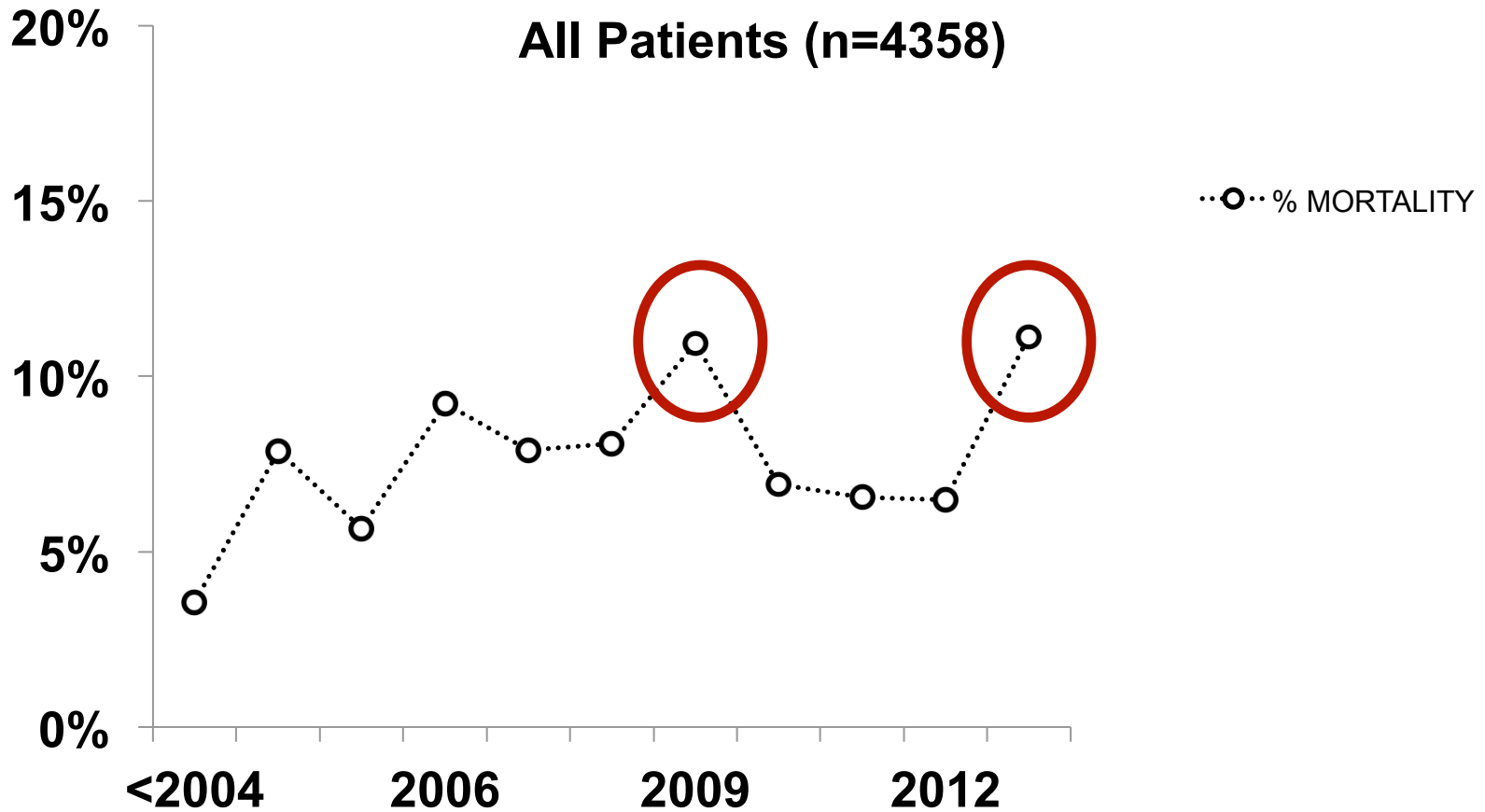
	TX 01-13 n=1377	TX EARLY 01-05 n=145	TX LATE 06-13 n=1232	<i>p</i>
TXA	75 (5.4)	2 (1.4)	73 (5.9)	0.023

Results: Mortality

	n	Dead	Early 01-05	LATE 06-13	<i>p</i>
ALL	4358	323 (7.4)	61 (5.7)	262 (8.0)	0.015
TX +	1377	176 (12.8)	14 (9.7)	162 (13.1)	0.233
MT+	531	93 (17.5)	3 (13.6)	90 (17.7)	0.6250

MVLR for Early v. Late
OR 0.869 [0.232-3.265], *p*=NS

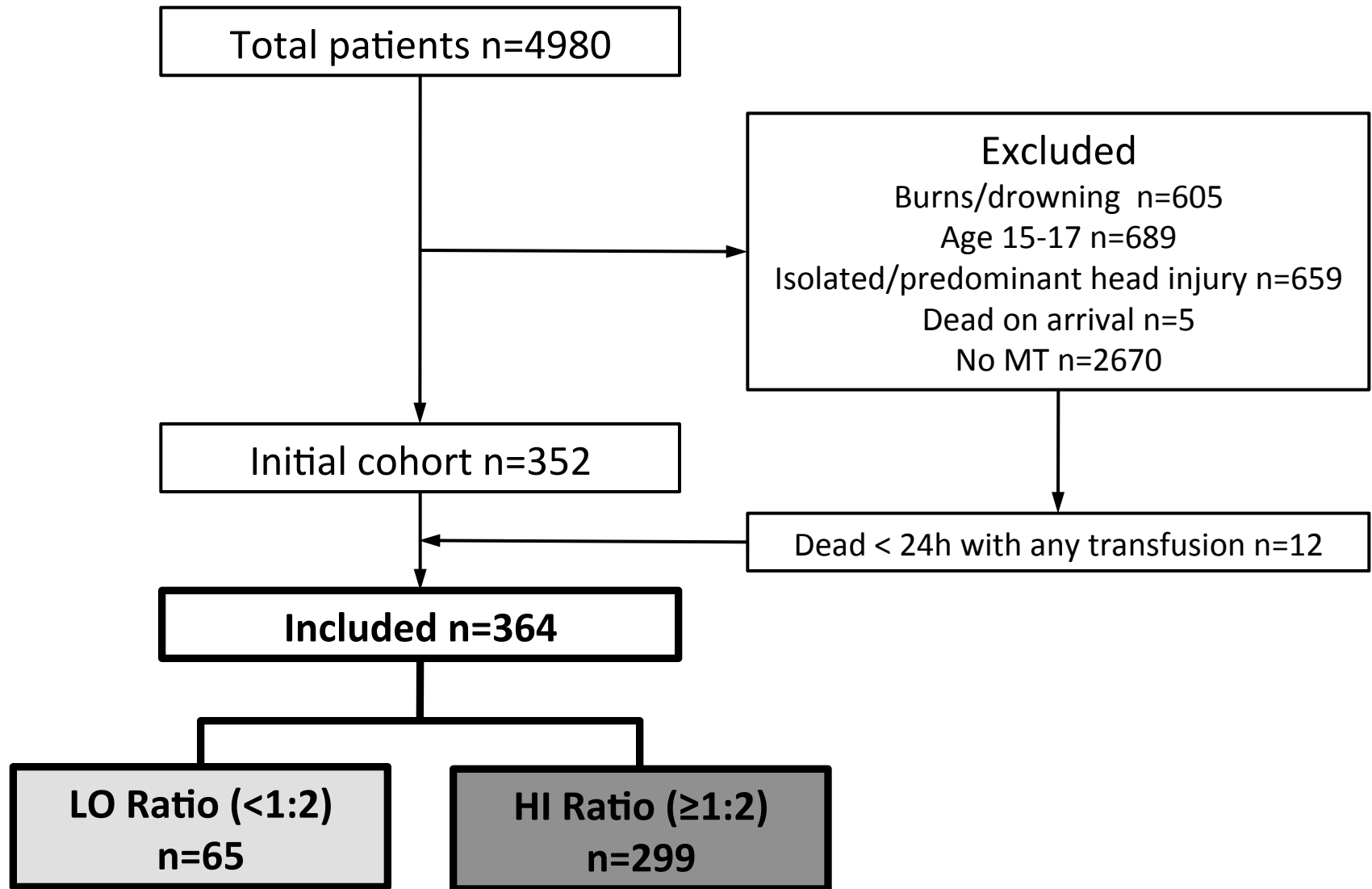
Results: Mortality



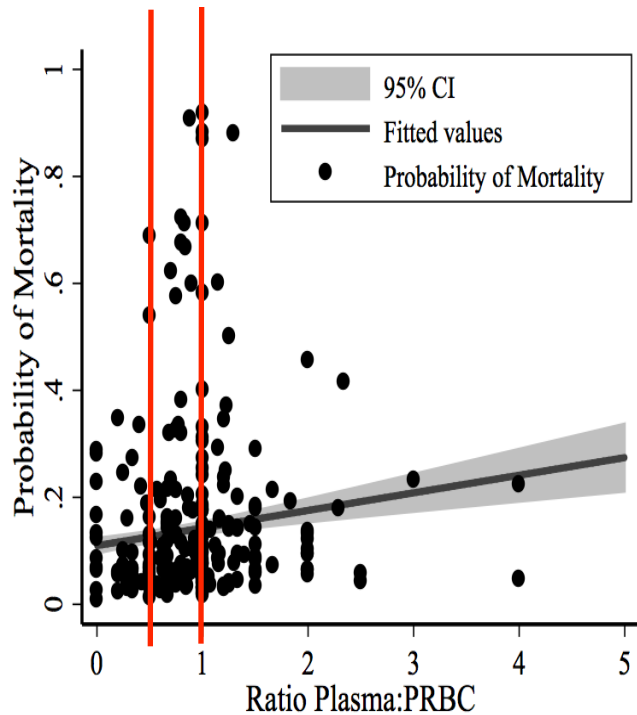
Summary

- 1) Largest reported pediatric transfusion experience
- 2) MT Definition 40 mL/kg all blood products
- 3) Proportion of transfusions and MT increased significantly over time
- 4) Ratios increased for PLAS>PLT in TX+ pts
- 5) PLT utilization (?availability) variable
- 6) Mortality remained unchanged EARLY v. LATE. Just treading water, though?

Results: Ratios



Results: Ratios



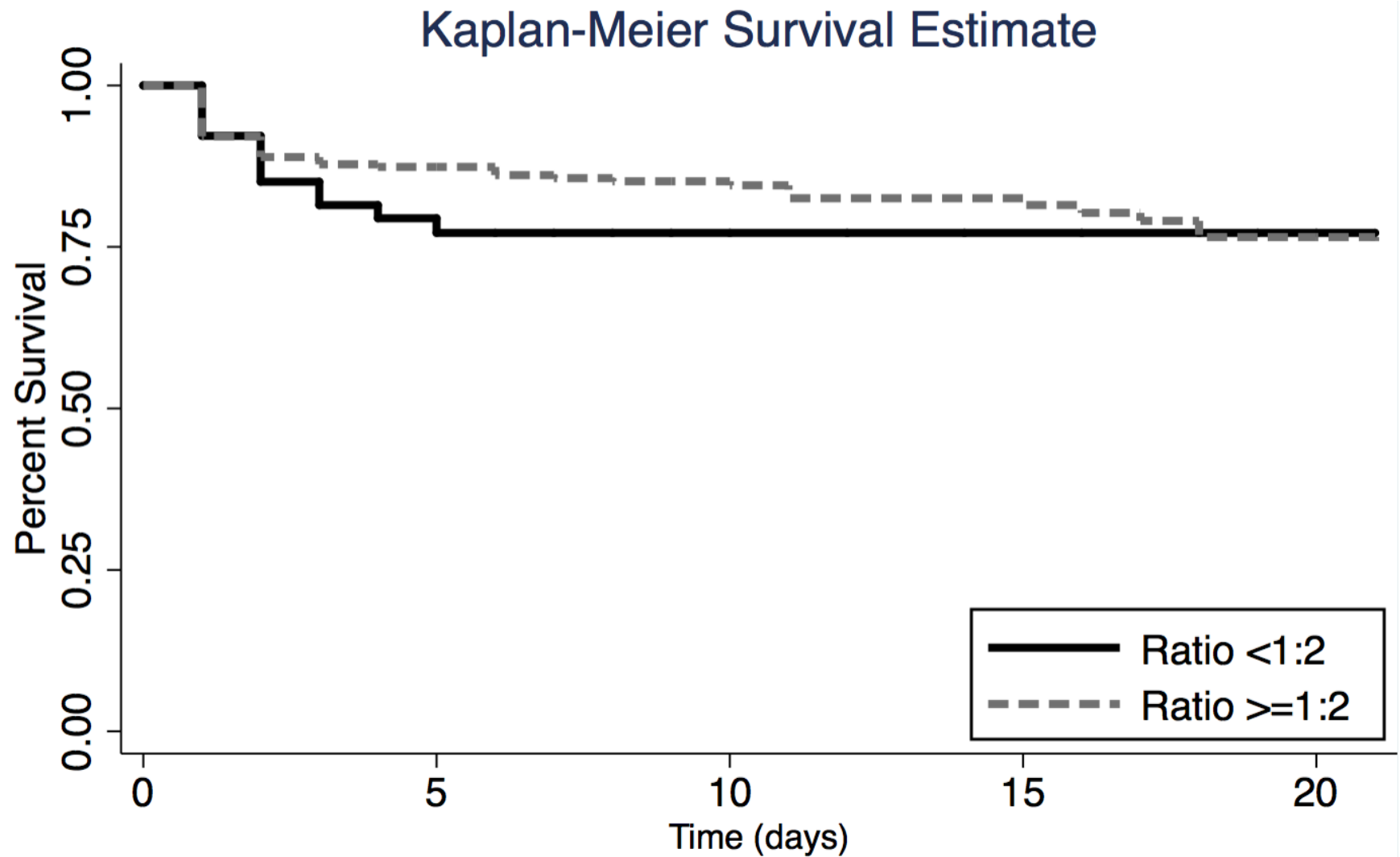
	LO Ratio (<1:2) n=65	HI Ratio (≥1:2) n=299	<i>p</i>
MV	54 (83.1%)	257 (85.6%)	0.55
Vent-Free Days	26 [22, 27]	24 [18, 26]	0.05
ICU-Free Days	24 [16, 26]	22 [14, 26]	0.16
Hospital LOS	5 [2, 12]	8 [3, 15]	0.01
Died<24 hrs	6 (9.2%)	24 (8.0%)	0.75
Died in Hospital	14 (21.5%)	52 (17.1%)	0.39

♦ 364 MT patients (≥40 mL/kg all products)

- Regression analysis
- Ratio v. p(Mortality)
- No clear breakpoint

Mortality	OR	95% CI	<i>p</i>
Age	0.98	0.9-1.09	0.84
INR	1.73	1.3-2.31	<0.01
ISS	1.05	1.03-1.07	<0.01
Ratio ≥1:2*	2.04	0.48-8.73	0.34

Results: Ratios



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- 7) High PLAS:PRBC not associated with a survival benefit in pediatric patients with combat injuries**

Limitations

Retrospective

“Missing-ness” of the DoDTR

Granularity of the DoDTR

Applicability to general pedi trauma

Future Directions

- ◆ **Collect pre-hospital, Level 1 and Level 2 data**
- ◆ **Increase granularity to include 4 hour ratios at a minimum**
- ◆ **Maintain pediatric supplies**
- ◆ **Train for pediatric resuscitation**
 - **IV Access**
 - **Syringe pump use**
 - **Resuscitation targets**
- ◆ **Avoid over-transfusion**

Final Thoughts



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