Incidence and treatment of chylothorax after cardiac surgery in children: analysis of a large multi-institutional database

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No disclosures

Postoperative chylothorax

- Known complication after pediatric cardiac surgery
- Significant morbidity
- Mechanisms
  - Injury to the thoracic duct or lymphatic vessels
  - Increased venous pressure
  - SVC / subclavian vein thrombosis
- Great variability in management
- Real incidence and risk factors remain unclear

Surgical series

Study	N	Incidence	Most common procedures
Higgins, 1971	1,118	0.5%	Coarctation repair
Allen, 1991	1,713	0.9%	BTS, TGA repair (atrial switch)
Nguyen, 1995	1,605	1.5%	Complex repairs, PDA ligation, BTS
Beghetti, 2000	1,842	2.5%	TOF repair, atrial switch, Fontan, BTS
Cormack, 2004	535	4.7%	Neonatal surgery, TOF, Glenn, Fontan
Chan, 2005	1,257	3.8%	TOF repair, **Fontan**, heart transplant, Norwood, AVR, AVSD repair, **Glenn**
Cannizzaro, 2006	1,130	6.6%	
Milonakis, 2009	1,341	1.4%	TOF repair, Fontan
Biewer, 2010	282	9.2%	TGA repair, AVSD repair, Norwood

Goal

To determine the incidence, risk factors, current treatment strategies, and outcomes of children developing chylothorax after cardiac surgery

Methods

- Retrospective study
- PHIS Database
  - Administrative database
  - 43 not-profit pediatric hospitals
- 77,777 patients <18 yrs (2004-2011)
  - RACHS procedure
  - Heart transplantation

Child Health Corporation of America

Methods

- Data collected
  - Demographics
  - Procedure details
  - Treatment strategies (TPN, MCT, octreotide, surgery)
  - Outcomes (length of stay, in-hospital mortality)
  - Cost
- Median annual hospital volume
- Median annual surgeon volume

Results – effect of age group

Overall incidence of chylothorax: 2.8%

Age group	Incidence	OR (95% CI)*
Neonates (n=18,419)	4.2%	7.27 (4.78 – 11.08)
Infants (n=27,514)	3.2%	8.17 (5.39 – 12.39)
Young children (n=19,187)	2.4%	8.17 (5.39 – 12.39)
Older children (n=6,376)	0.9%	5.97 (3.92 – 9.09)
Teenagers (n=6,281)	0.5%	**Reference**

* Adjusted for gender, race/ethnicity, type of procedure, hospital and surgeon annual volume, and year

Results – effect of type of procedure

Procedure (RACHS)	Incidence	OR (95% CI)*
1 (n=9,066)	1%	**Reference**
2 (n=27,006)	2.1%	1.80 (1.43-2.26)
3 (n=27,496)	2.9%	2.77 (2.22-3.47)
4 (n=8,354)	4.5%	3.70 (2.91-4.71)
5-6 (n=2,613)	5.2%	4.27 (3.19-5.71)
Heart transplant (n=1,329)	4%	5.85 (2.28-15.06)
Multiple (n=1,913)	9.6%	8.44 (6.44-11.04)

* Adjusted for age group, gender, race/ethnicity, hospital and surgeon annual volume, and year

Results – incidence by procedure

Procedure	N (%)
Cavopulmonary anastomosis / Fontan	430/7,589 (5.7%)
Total correction of TGA	125/2,887 (4.3%)
Heart transplant	53/1,329 (4%)
Repair of aortic arch anomalies	241/6,515 (3.7%)
Repair of tetralogy of Fallot	182/5,322 (3.4%)
Systemic-pulmonary arterial shunt	64/3,396 (1.9%)
Repair of VSD	150/9,299 (1.6%)
Repair of ASD	59/6,660 (0.9%)

Results – effect of hospital volume

Hospital annual volume	Incidence	OR (95% CI)*
First quartile (n=19,849)	3%	**Reference**
Second quartile (n=20,542)	2.7%	0.86 (0.75-0.98)
Third quartile (n=17,262)	4.1%	1.27 (1.13-1.43)
Fourth quartile (n=20,124)	1.7%	0.49 (0.42-0.57)

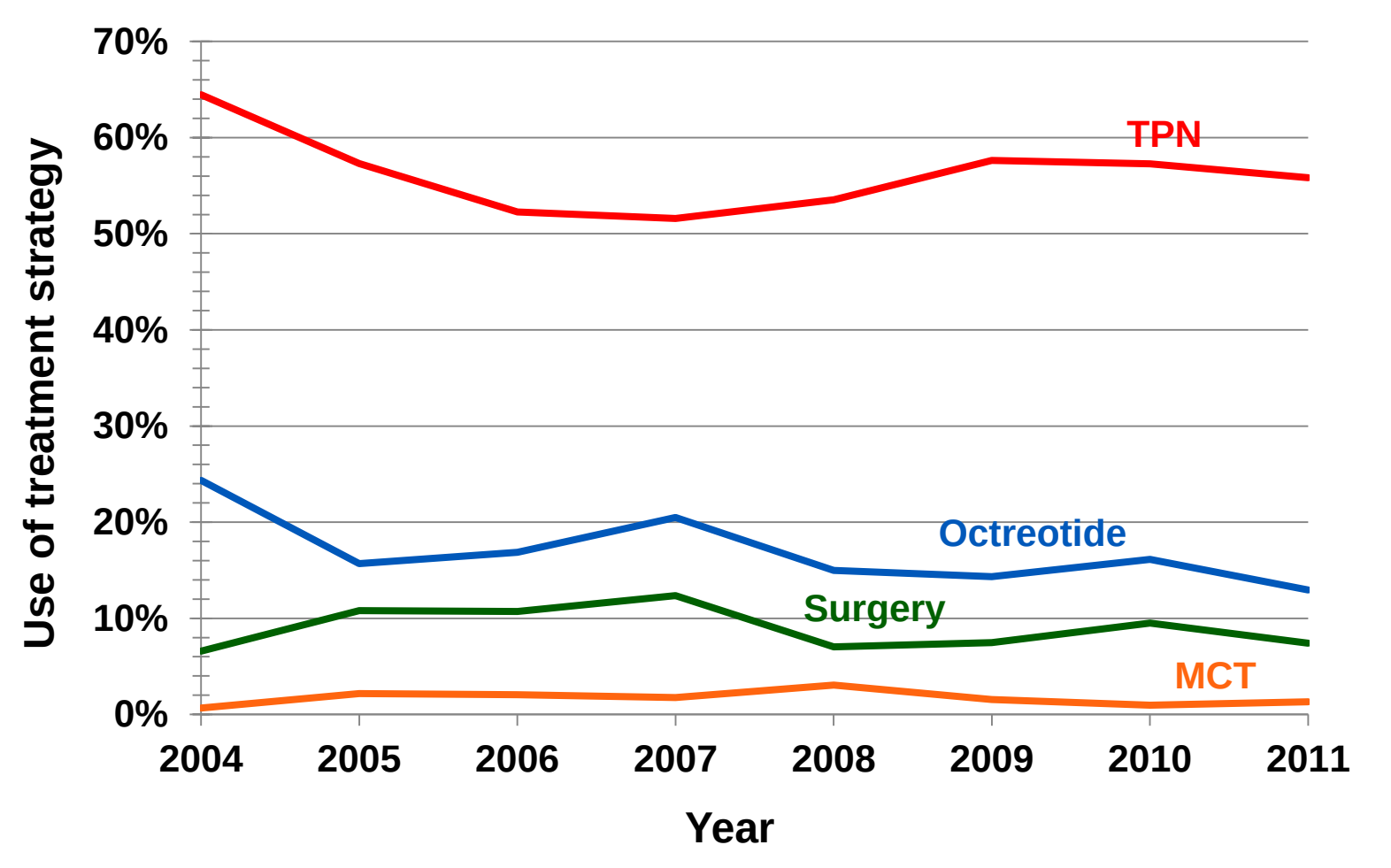
* Adjusted for gender, race/ethnicity, age group, type of procedure, surgeon annual volume, and year

Results – effect of year

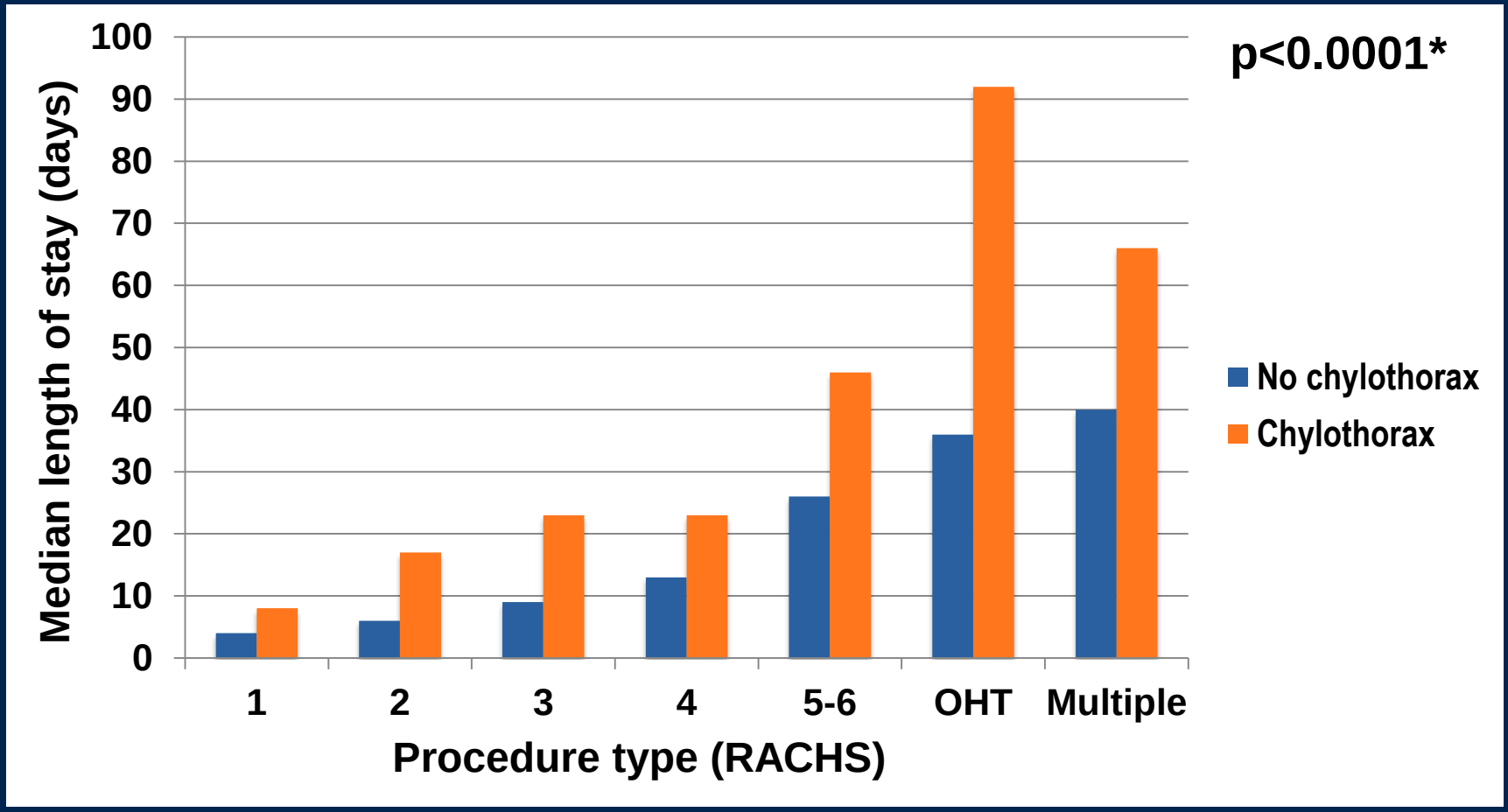
Year	Incidence	OR (95% CI)*
2004 (n=7,766)	2%	**Reference**
2005 (n=8,910)	2.1%	1.09 (0.87-1.37)
2006 (n=9,740)	2.5%	1.29 (1.04-1.60)
2007 (n=10,378)	2.7%	1.46 (1.18-1.80)
2008 (n=10,502)	3.1%	1.64 (1.34-2.02)
2009 (n=10,255)	3.1%	1.71 (1.39-2.10)
2010 (n=10,074)	3.1%	1.64 (1.33-2.02)
2011 (n=10,152)	3.7%	2.07 (1.69-2.54)

* Adjusted for gender, race/ethnicity, age group, type of procedure, and hospital and surgeon annual volume

Results – use of treatment strategies

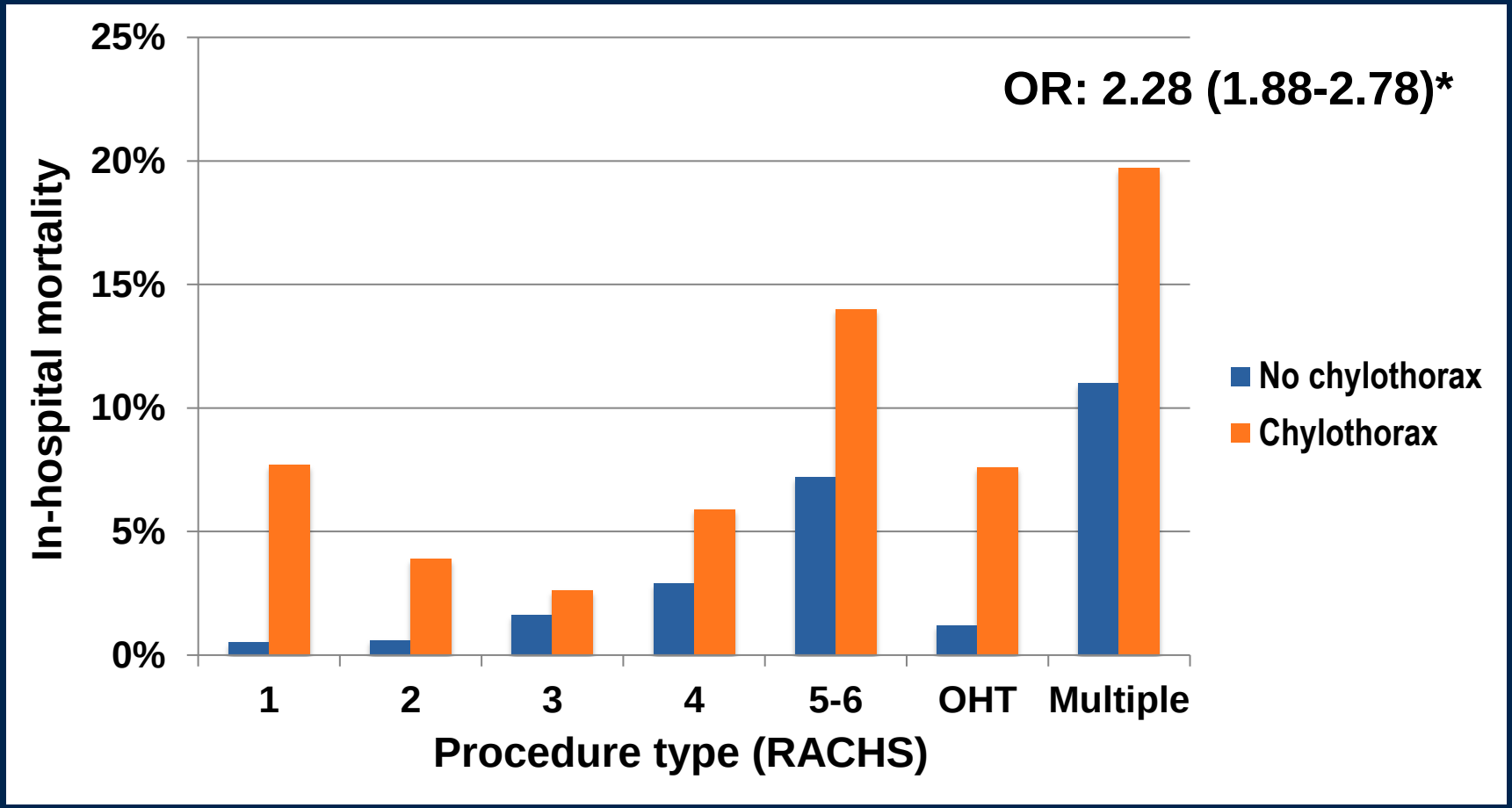


Results – median length of stay



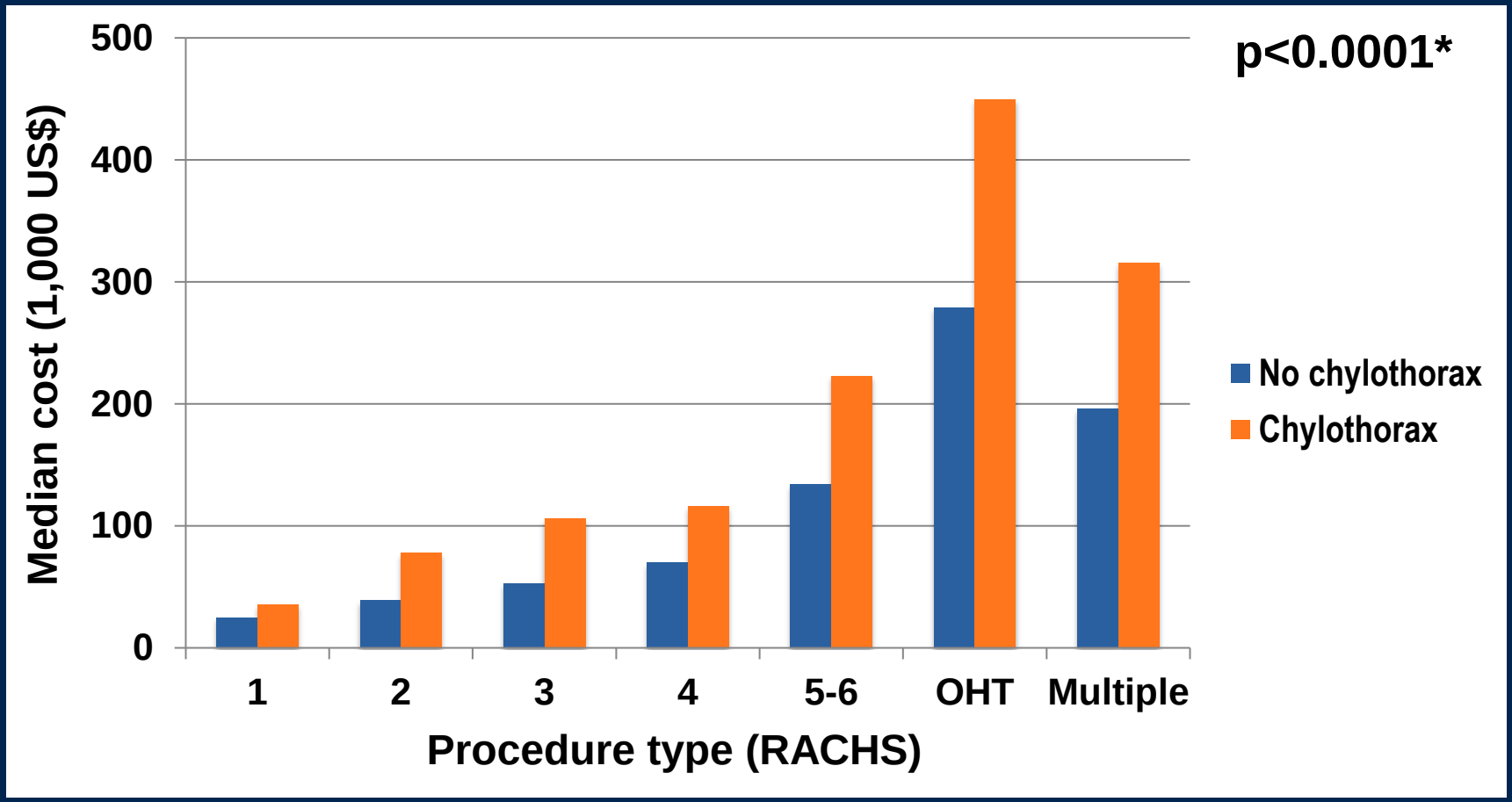
* Adjusting for age, type of procedure, and hospital volume

Results – in-hospital mortality



* Adjusting for age, type of procedure, and hospital volume

Results – median cost



* Adjusting for age, type of procedure, and hospital volume

Limitations

- Retrospective administrative database
- Robust clinical information not available
- Limited risk stratification
- Diagnosis based on reporting
- Lack of information re: timing of chylothorax
- Procedure definition based on codes

Conclusions

- Chylothorax is a significant problem after pediatric cardiac surgery, with major increases in length of stay, overall cost, and in-hospital mortality
- The incidence has increased with time
- Related to decreasing age, increasing procedure complexity, and decreasing hospital volume
- Treatment has not varied significantly with time
- Attention should be placed on strategies for prevention and treatment

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