STS/EACTS Latin America Cardiovascular Surgery Conference

November 15-17, 2018

Hilton Cartagena | Cartagena, Colombia

Mitral Valve Repair

Does Hospital Volume Matter?

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Disclosures

- Edwards Lifesciences – Consultant
- Abbott Mitraclip – Royalties
- Johnson & Johnson - Proctor

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The ***BIG*** Picture
Why Do We Need To Talk About This?

- Noncommunicable diseases account for 38 million deaths/year
- 17,5 million due to cardiovascular disease
- 75% of those occur in low- to middle-income countries

➢ Are there enough centers/doctors to care for this growing population?

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Dearani JA *et al*, Ann Thorac Surg 2016;102:1004

The Volume-Outcome Relationship "From Luft to Leapfrog"

- 1979 Luft *et al*.: Empirical correlation between surgical volume and mortality
- Birkmeyer – Review of MEDPAR files from 1994 to 1999 (>900.000 patients)
  - Real differences between high volume vs. low-volume programs in cardiovascular procedures
  - High volume vs. low-volume centers: ***20% reduction in 30-day mortality***

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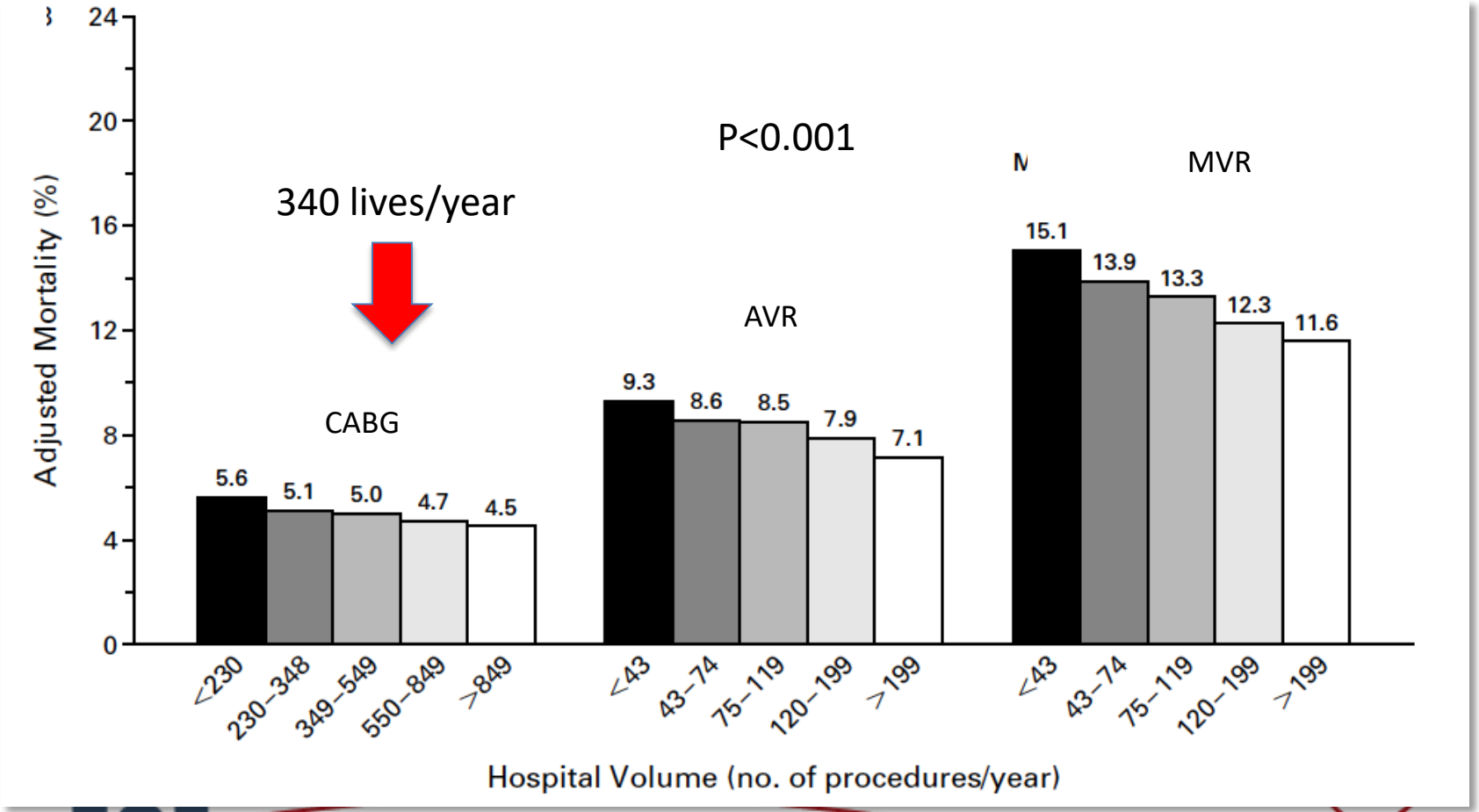
Birkmeyer JD *et al*. N Engl J Med 2002;346:1128

Hospital Volume *vs*. Mortality



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Birkmeyer JD *et al*. N Engl J Med 2002;346:1128

Do Hospitals and Surgeons With Higher Coronary Artery Bypass Graft Surgery Volumes Still Have Lower Risk-Adjusted Mortality Rates?

Edward L. Hannan, PhD; Chuntao Wu, PhD; Thomas J. Ryan, MD; Edward Bennett, MD; Alfred T. Culliford, MD; Jeffrey P. Gold, MD; Alan Hartman, MD; O. Wayne Isom, MD; Robert H. Jones, MD; Barbara McNeil, MD, PhD; Eric A. Rose, MD; Valavanur A. Subramanian, MD

(*Circulation*. 2003;108:795-801.)

(NNT=118). The risk-adjusted mortality rate (RAMR) for patients undergoing surgery performed by surgeons with volumes of ≥125 in hospitals with volumes of ≥600 was 1.89%. The RAMR was significantly higher (2.67%) for patients undergoing surgery performed by surgeons with volumes of <125 in hospitals with volumes of <600.

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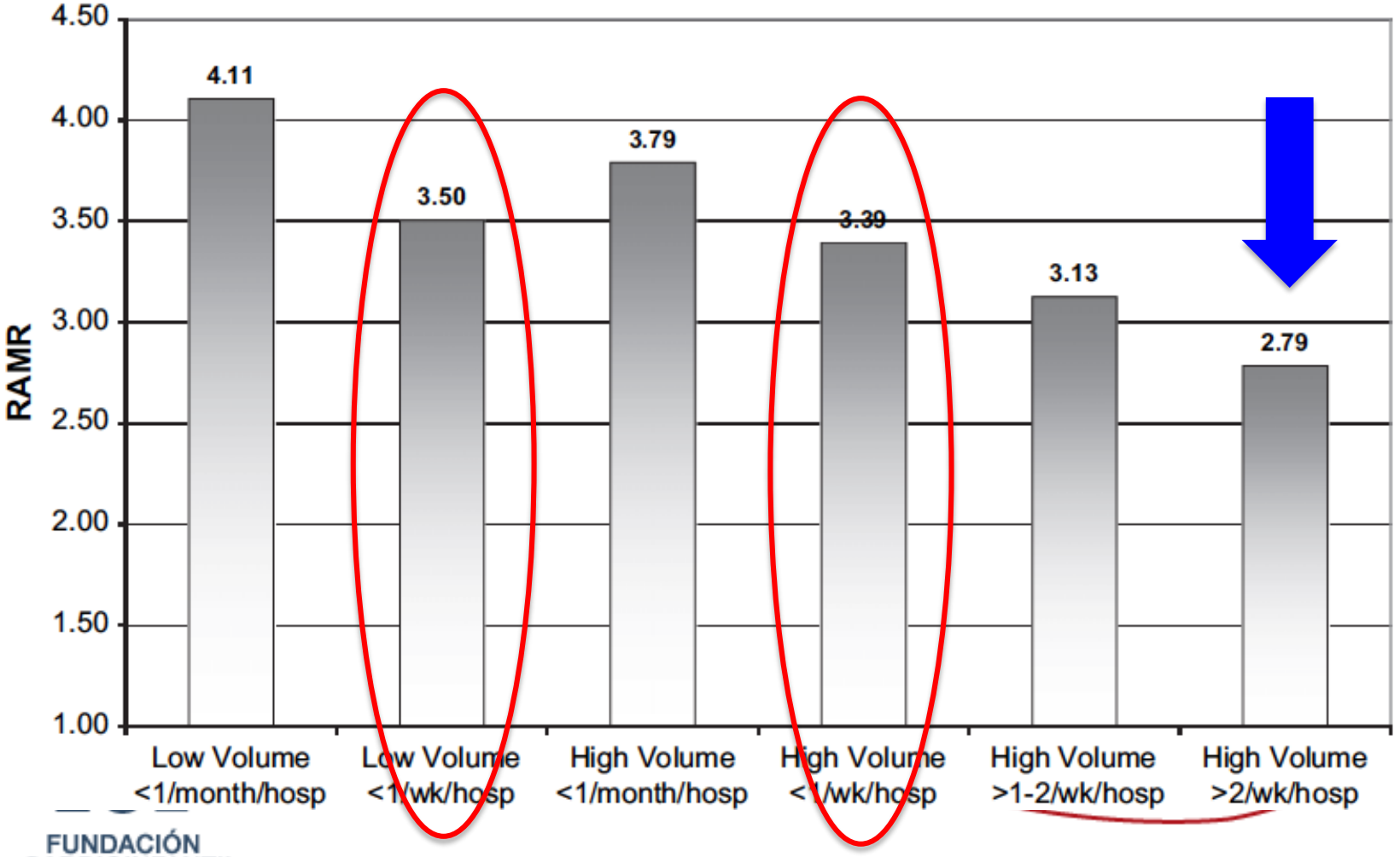
Surgeon Volume
The “Team Effect”



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Carey JS et al J Thorac Cardiovasc Surg 2008;135:1254

Surgeon Volume
The "Team Effect"

- Surgeon to hospital case volume relationship is important
- Hospital processes and team stability are critical determinants in CT surgery outcomes

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Carey JS et al J Thorac Cardiovasc Surg 2008;135:1254

Aortic Valve Operations
The Hospital Volume Effect

- 277,928 Medicare patients undergoing AVR between 1999-2009 at 1,255 hospitals
- 5 categories:≤10; >10-20; >20-40; >40-70; >70 cases/year
- *32% of hospitals (>40 cases/year) performed 62,5% of all AVRs*

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McNeely C et al Ann Thorac Surg 2016;101:585

Aortic Valve Operations
The Volume Effect
Use Of Mechanical Prosthesis

Table 2. Percent (95% CI) of Patients Receiving a Mechanical Valve by Age and Annual Hospital Medicare Aortic Valve Replacement Volumes

	Ages (y)					
Volume	Overall	65–69	70–74	75–79	80–84	85+
≤10	64.5 (63.6–65.5)	68.1 (65.8–70.4)	66.8 (65.0–68.7)	65.0 (63.3–66.7)	60.6 (58.6–62.6)	60.6 (57.6–63.7)
11–20	55.0 (54.5–55.6)	62.7 (61.2–64.2)	57.6 (56.5–58.8)	54.5 (53.5–55.6)	51.2 (50.0–52.3)	48.6 (46.8–50.4)
21–40	45.0 (44.6–45.4)	52.8 (51.7–53.9)	47.8 (47.0–48.6)	44.2 (43.4–44.9)	41.7 (40.9–42.5)	39.1 (38.0–40.3)
41–70	37.6 (37.2–38.0)	47.1 (46.0–48.2)	40.7 (39.9–41.4)	36.2 (35.6–36.9)	33.5 (32.8–34.3)	32.6 (31.5–33.7)
>70	25.4 (25.2–25.7)	34.2 (33.3–35.0)	28.1 (27.6–28.7)	24.8 (24.3–25.3)	22.0 (21.5–22.5)	20.3 (19.6–21.0)
Overall	37.5 (37.3–37.7)	46.3 (45.8–46.9)	40.6 (40.2–41.0)	36.7 (36.4–37.0)	33.6 (33.2–34.0)	31.2 (30.7–31.7)

CI = confidence interval.

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McNeely C et al Ann Thorac Surg 2016;101:585

Aortic Valve Operations
Operative Mortality

Volume	2000	2003	2006	2009
<10	9.9 (8.0–11.8)	9.5 (7.8–11.3)	10.1 (8.4–11.9)	10.0 (8.3–11.8)
11–20	9.0 (7.9–10.2)	9.2 (8.2–10.3)	7.7 (6.8–8.6)	7.9 (7.0–8.9)
21–40	8.4 (7.7–9.2)	8.8 (8.1–9.5)	7.4 (6.8–8.0)	6.2 (5.7–6.8)
41–70	8.1 (7.4–8.8)	8.2 (7.6–8.9)	7.0 (6.4–7.7)	6.0 (5.5–6.6)
>70	7.7 (7.2–8.2)	7.3 (6.8–7.8)	6.5 (6.0–6.9)	5.2 (4.8–5.6)
Overall	8.2 (7.8–8.5)	8.2 (7.8–8.5)	7.1 (6.8–7.4)	6.1 (5.8–6.4)

CI = confidence interval.

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McNeely C et al Ann Thorac Surg 2016;101:585

The Volume Effect on Aortic Valve Operations

- No change in mortality or practice patterns over time in *Low Volume* hospitals
- Lack of quality improvement processes leading to inability to learn as Organization?

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McNeely C et al Ann Thorac Surg 2016;101:585

Mitral Valve Surgery Outcomes
Surgeon and Hospital Effect

- 50,152 patients undergoing MV surgery from 2003 to 2008
- Hospital volume (by tertiles): low 1-41; intermediate 42-94; high >95 cases/year
- Surgeon volume: low 1-6; intermediate 6 -21; high >21 cases/year

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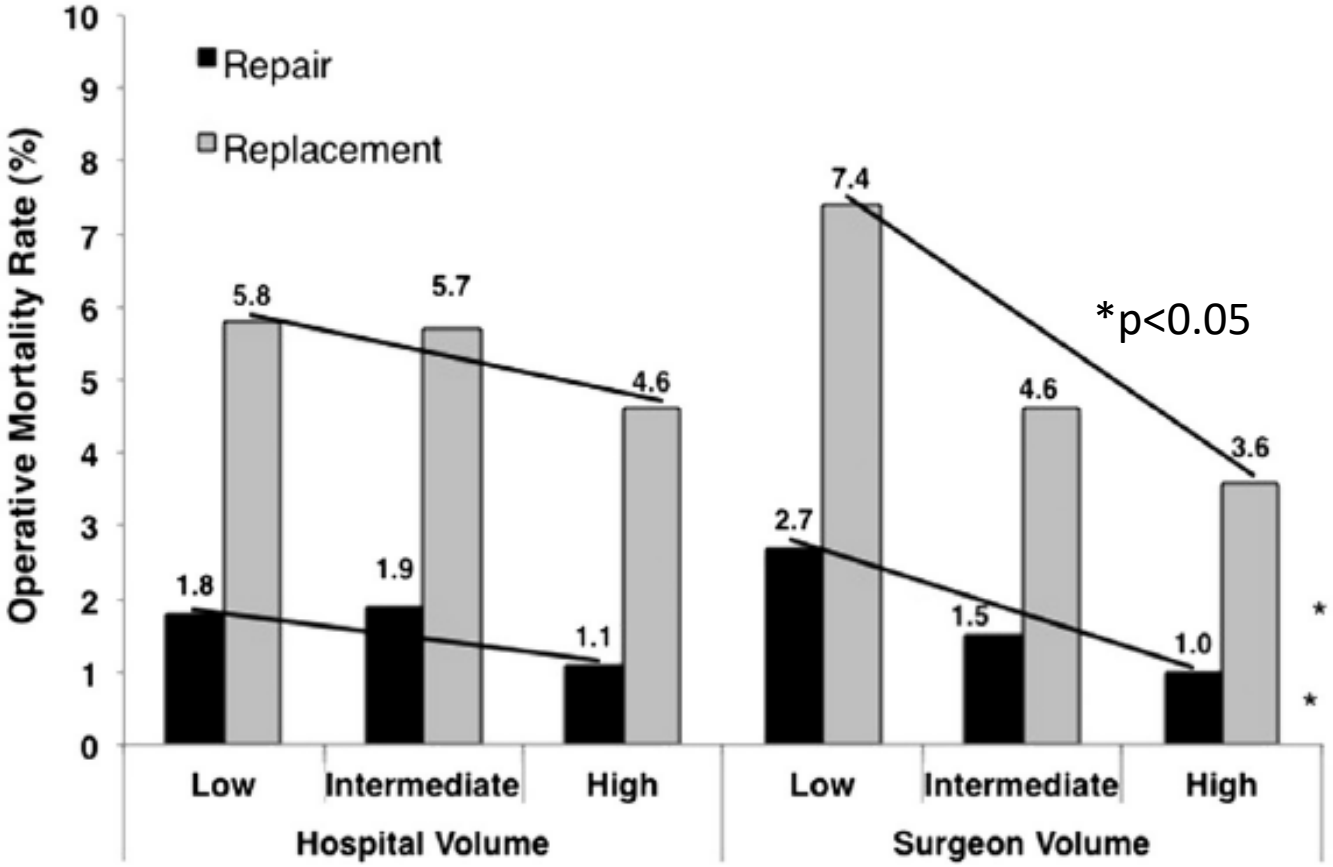
Kilic A. et al J Thorac Cardiovasc Surg 2013;146:638

Mitral Valve Surgery Outcomes
Surgeon and Hospital Effect



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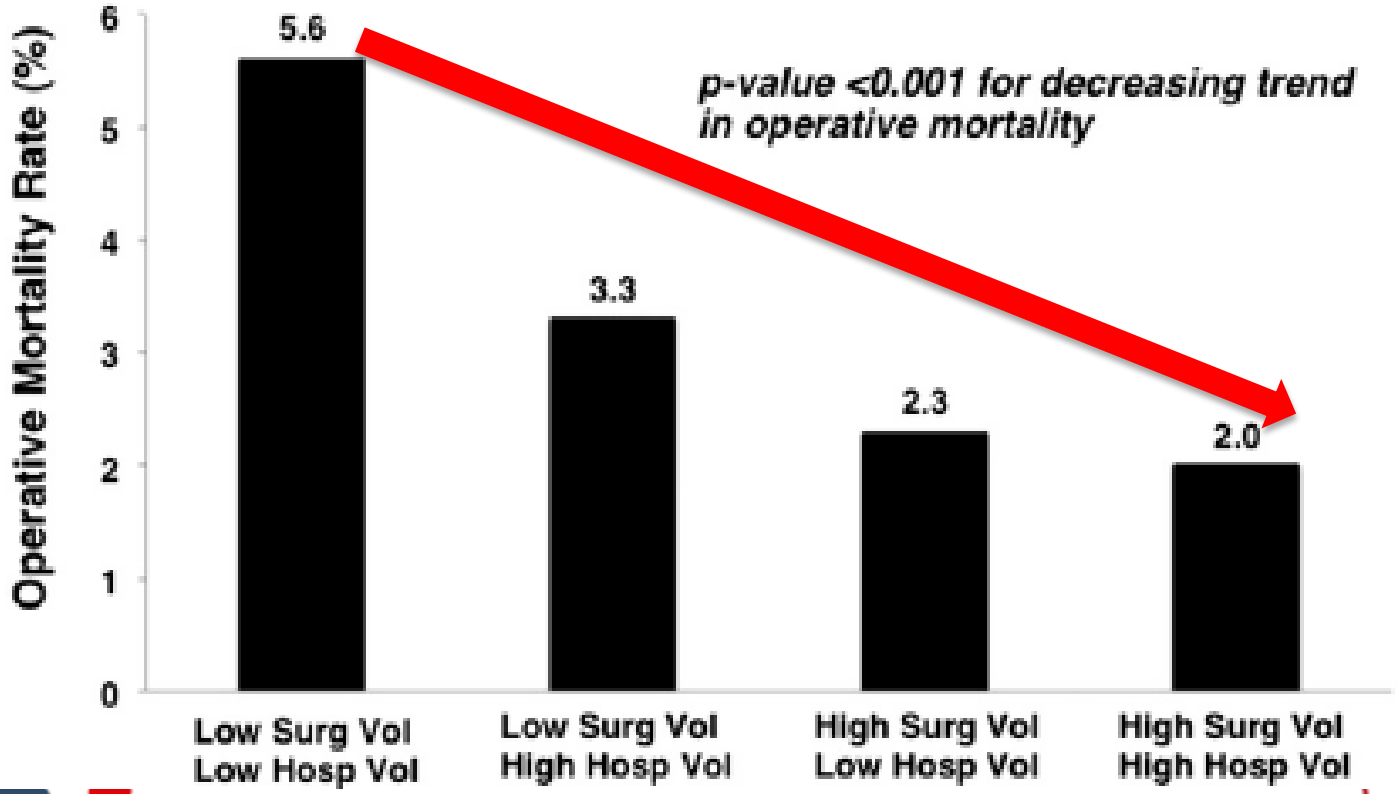
Surgeon and Hospital Effect



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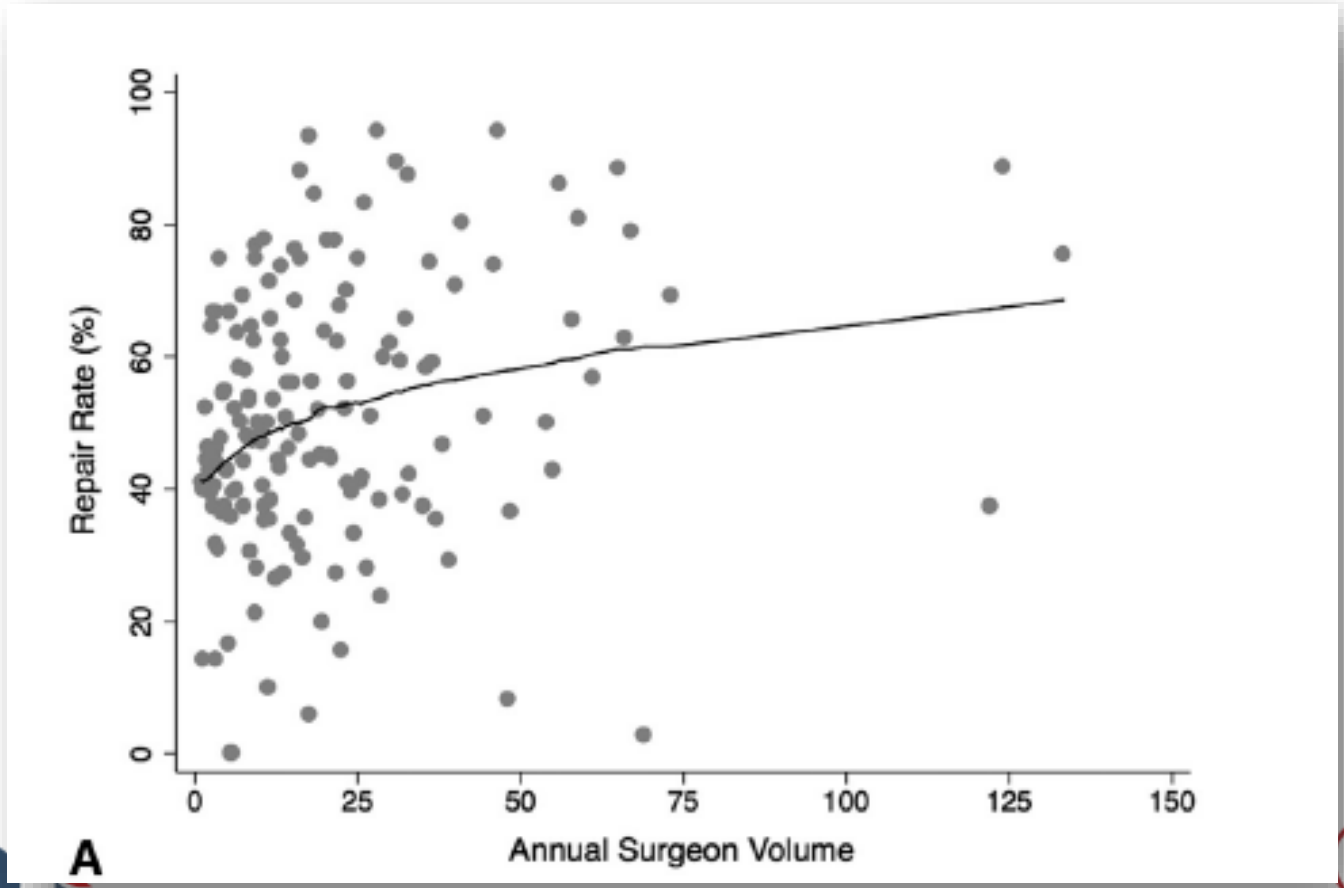
Mitral Valve Repair Rates
Surgeon Effect



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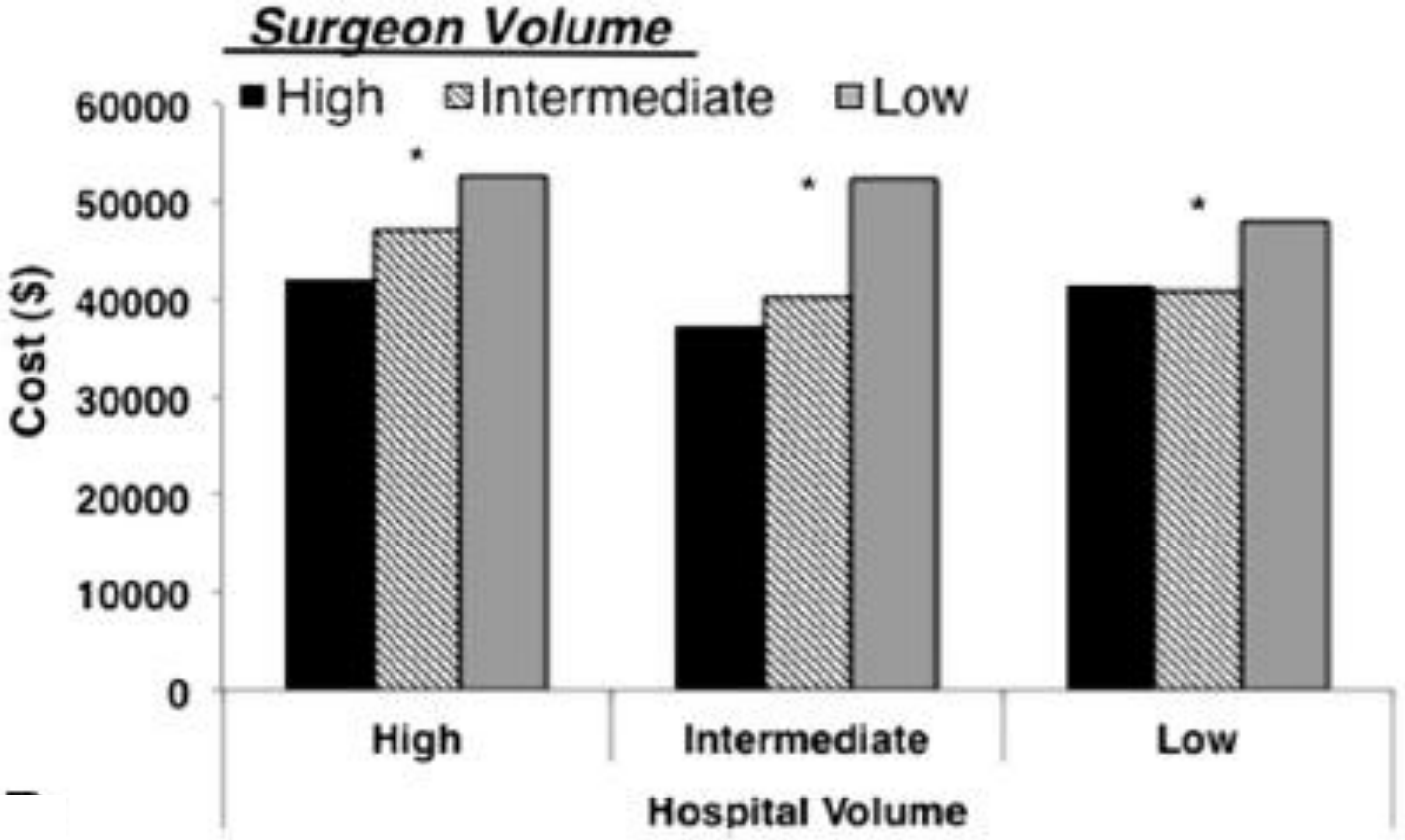
Kilic A. et al J Thorac Cardiovasc Surg 2013;146:638

Mitral Valve Surgery Outcomes
Surgeon and Hospital Effect On Cost



*p<0.05

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Kilic A. et al J Thorac Cardiovasc Surg 2013;146:638

Mitral Valve Surgery Outcomes
Surgeon and Hospital Effect

- Surgeon volume affects mortality, repair rates, and cost
- Contrary to CABG, hospital processes don't seem to mitigate the surgeon-volume effect
- What makes high volume surgeons better and how can we teach it?

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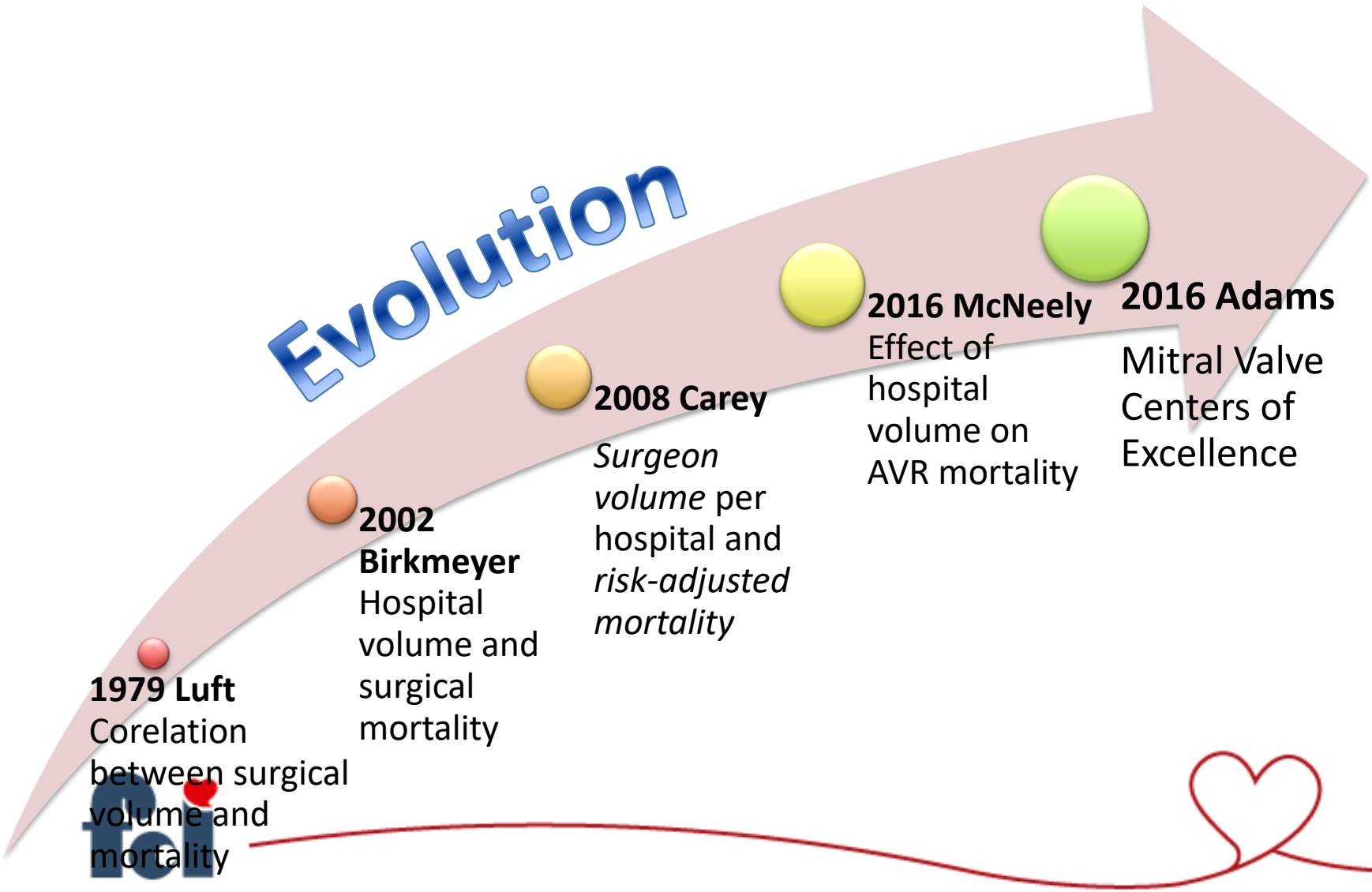
Kilic A. et al J Thorac Cardiovasc Surg 2013;146:638

The Volume-Outcome Relationship



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The LatAm Reality

- Referral centers are not widespread
- Patient volumes are not readily available to flatten learning curves

➢ How can we break the paradigm and achieve better results with less patients, ***to then become a referral center?***

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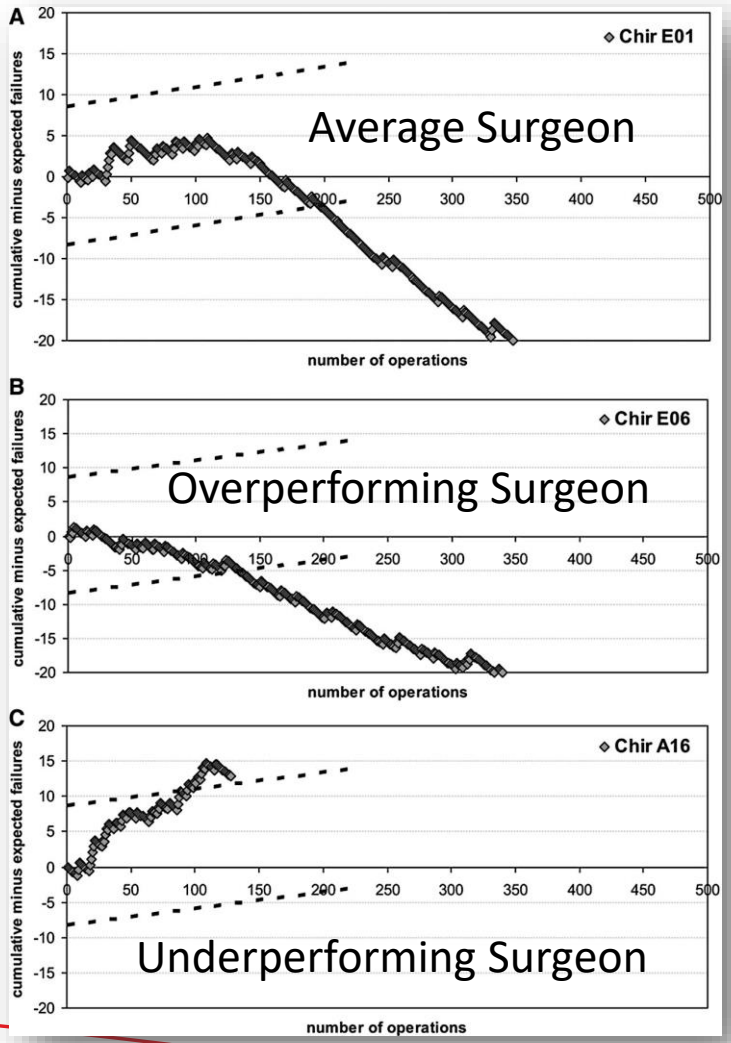
Dearani JA *et al*, Ann Thorac Surg 2016;102:1004

Minimally Invasive Mitral Valve Repair Learning Curves

75-125 Surgeries to overcome Learning Curve

>50 Surgeries/Year to mantain competence



TEAM WORK

Holzhey DM et al. Circulation. 2013;128:483-491

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The FCI Experience

- Dedicated Mitral Valve Surgery Team since 2004
  - Team training and continuing education
  - Established Clinical Pathways
  - Continued improvement processes

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The FCI Experience
Methods

- Mitral valve repairs performed at a single institution from January of 2004 to June 2017
- Patients were identified through an institutional cardiac surgery database
- Prospective harvest from July 2008
- Follow up was performed by telephone or in person (clinic visits)
  - End points were recurrent Mitral Regurgitation, reoperation or death
  - Echocardiograms were performed postoperatively before discharge, 30 to 90 days after surgery, and annually thereafter

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Giraldo-Grueso et al. Journal of Cardiothoracic Surgery (2018) 13:108

The FCI Experience
Preoperative Characteristics

Variable	No resection n=142	Resection n=58	P value
Male sex	83 (58.4)	39 (67.2)	0,247
Age years	58 (48-58)	56 (48-56)	0,969
Diabetes	9 (6.3)	1 (1.7)	0,174
Dyslipidemia	18 (12.7)	11 (18.9)	0,252
Dialysis	2 (1.4)	3 (5.2)	0,122
Hypertension	59 (41.5)	20 (34.5)	0,354
COPD	7 (4.9)	4 (6.9)	0,58
creatinina	1 (0.9-1.08)	0.95 (0.9 -1)	0,821
Previous myocardial infarction	0	3 (5.2)	**0,023**
Previous cardiac operation	4 (2.8)	1 (1.7)	0,548
NYHA functional class			0,217
I	12 (8.7)	9 (17.3)	
II	99 (72.3)	36 (69.2)	
III	26 (19)	7 813.5)	
Previous arrhythmia	48 (33.8)	19 (32.8)	0,512
LVEF	55 (50-60)	60 (51-65)	**0,013**

Categorical data are expressed as number (%) and continuous data as median (Interquartile range) COPD Chronic Obstructive Pulmonary Disease, ICU Intensive Care Unit, IQR Interquartile Range, LVEF Left Ventricular Ejection Fraction, NYHA New York Hear Association

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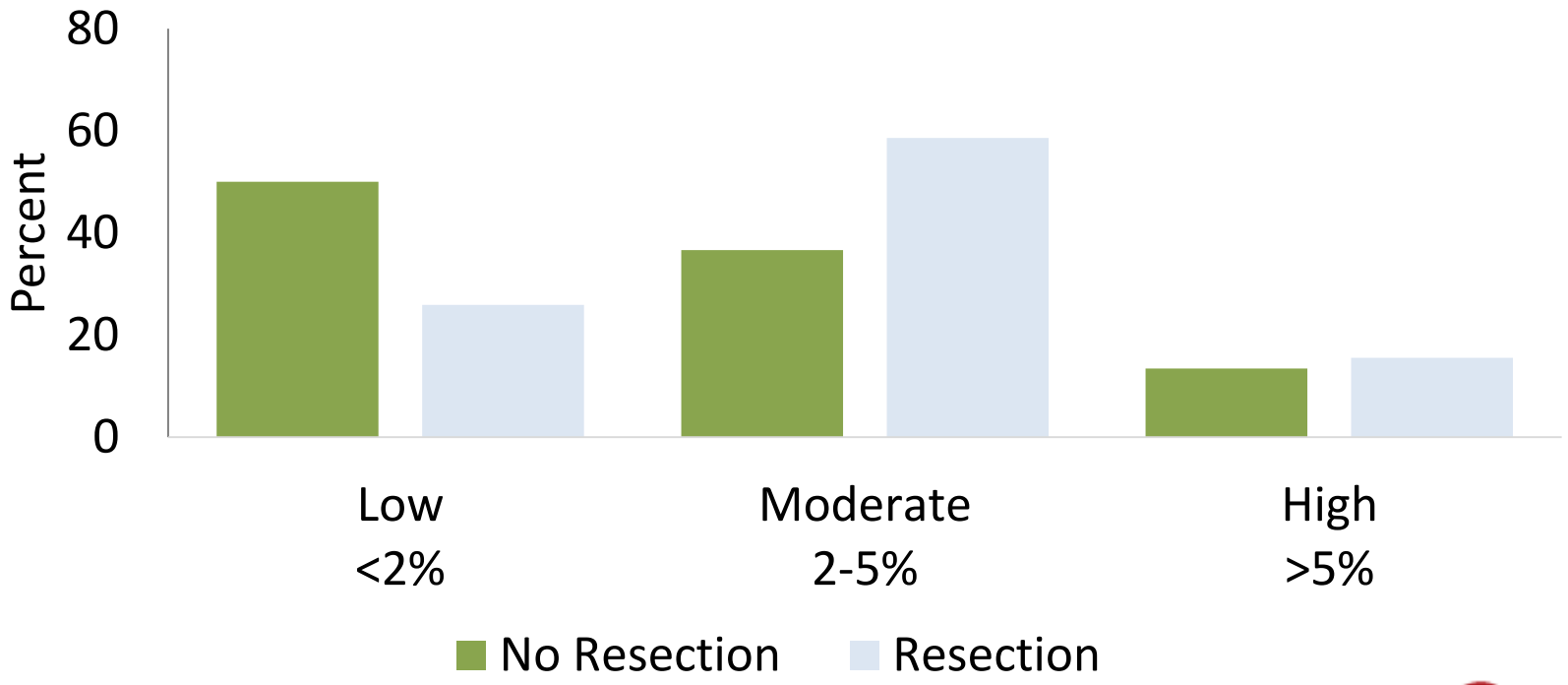
Giraldo-Grueso et al. Journal of Cardiothoracic Surgery (2018) 13:108

The FCI Experience
Preoperative EuroScore II



Giraldo-Grueso et al. Journal of Cardiothoracic Surgery (2018) 13:108

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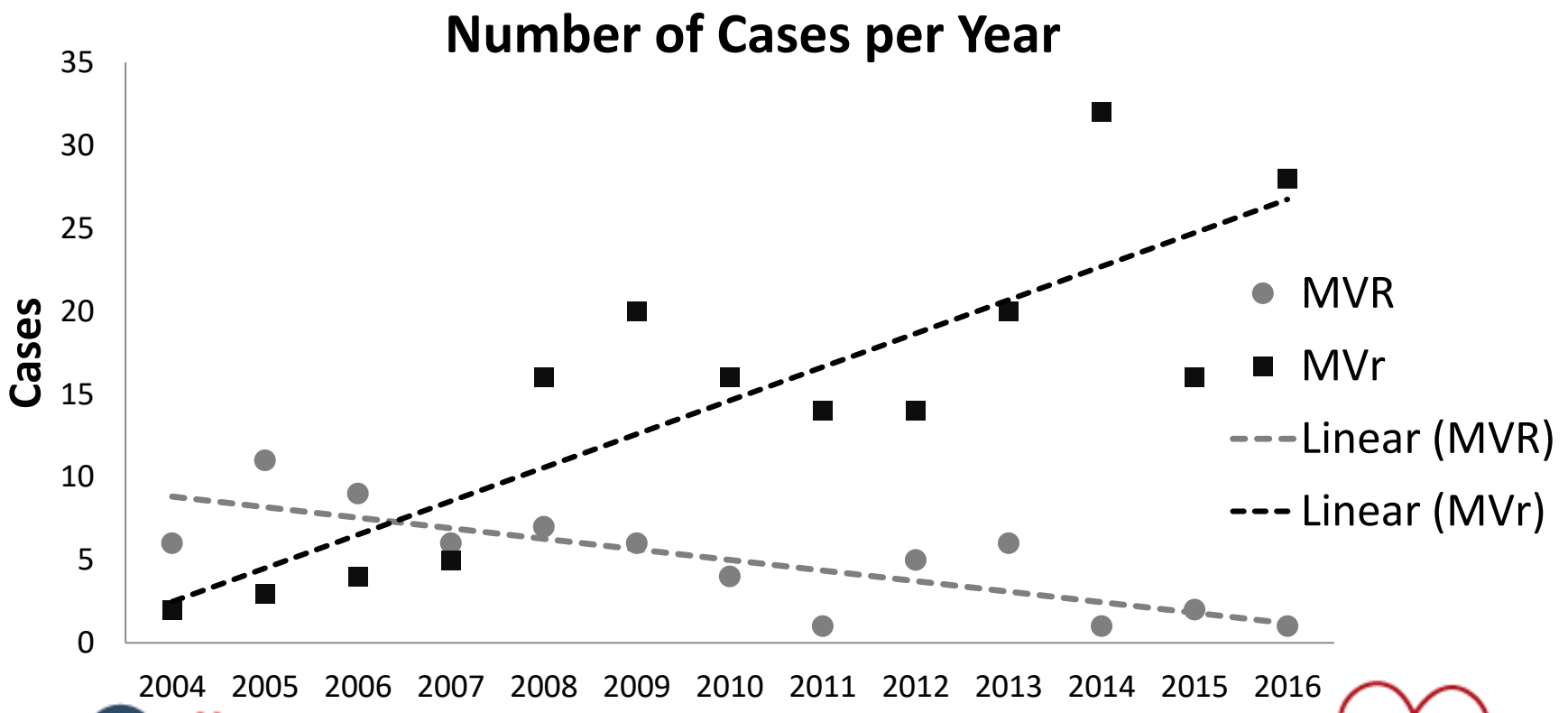
Trends Mitral Valve Repair vs Replacement



Giraldo-Grueso et al. Journal of Cardiothoracic Surgery (2018) 13:108

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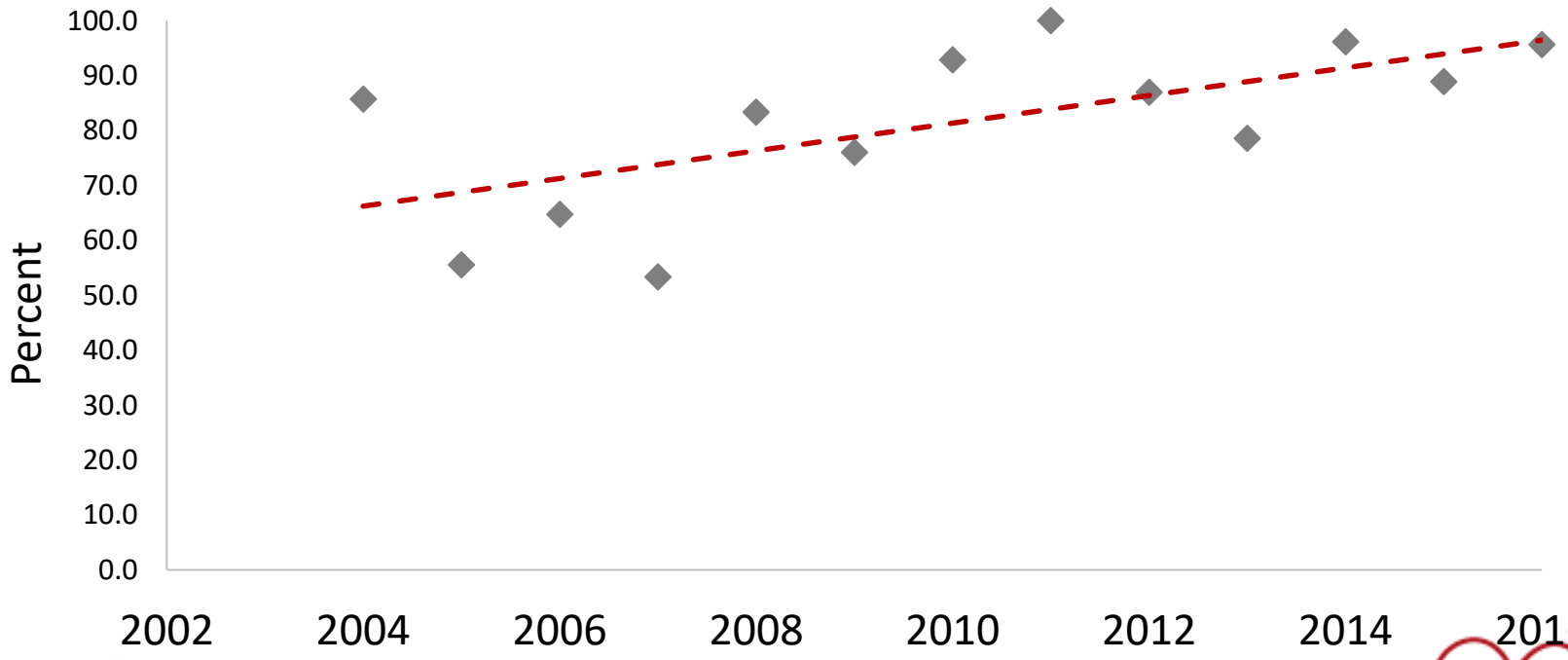
The FCI Experience
Mitral Valve Repair Rates



Giraldo-Grueso et al. Journal of Cardiothoracic Surgery (2018) 13:108

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The FCI Experience
Clinical Results

	No resection n=142	Resection n=58	P value
Reoperation for bleeding	0(0,0)	2 (3.4)	0,083
Renal impairment	2 (1.4)	0	0,503
In-hospital stay (days)	8 (5-15)	8 (5-14)	0,906
Mortality 30 days	0(0,0)	0(0,0)	

Categorical data are expressed as number (%) and continuous data as median (Interquartile range)

Giraldo-Grueso et al. Journal of Cardiothoracic Surgery (2018) 13:108

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The FCI Experience
Follow-up

	No resection n=142	Resection n=58	P value
NYHA functional class			0,797
I	109 (81.3)	41 (78.8)	
II	20 (14.9)	9 (17.3)	
III	3 (2.2)	2 (3.8)	
IV	2 (1.5)	0	
Mitral valve regurgitation			0,267
None /Trace	76(56,0)	22(42,3)	
Mild	48 (35.3)	22 (42.3)	
Moderate	9 (6.6)	6 (11.5)	
Severe	3 (2.2)	2 (3.8)	

Categorical data are expressed as number (%)

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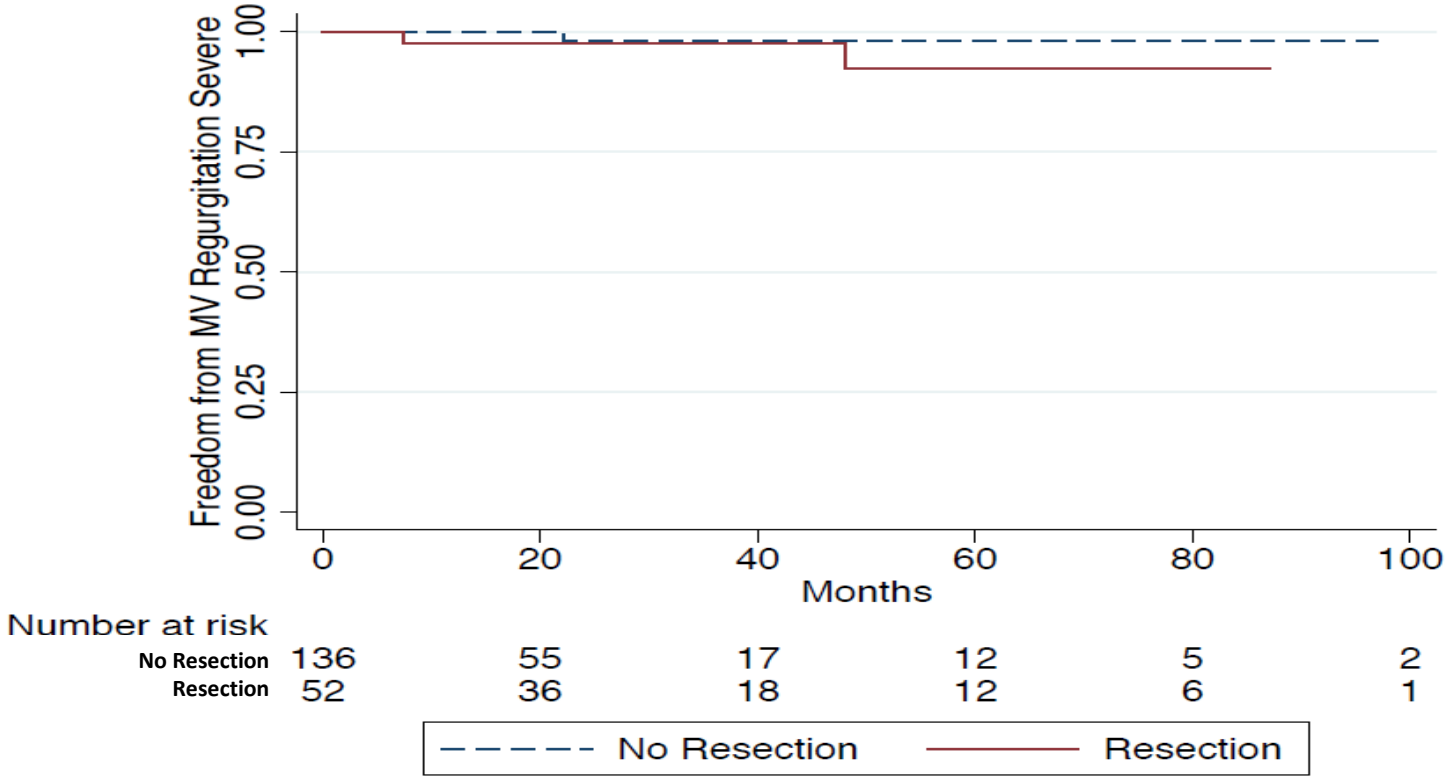
Giraldo-Grueso et al. Journal of Cardiothoracic Surgery (2018) 13:108

The FCI Experience
Freedom from MR >2+



Giraldo-Grueso et al. Journal of Cardiothoracic Surgery (2018) 13:108

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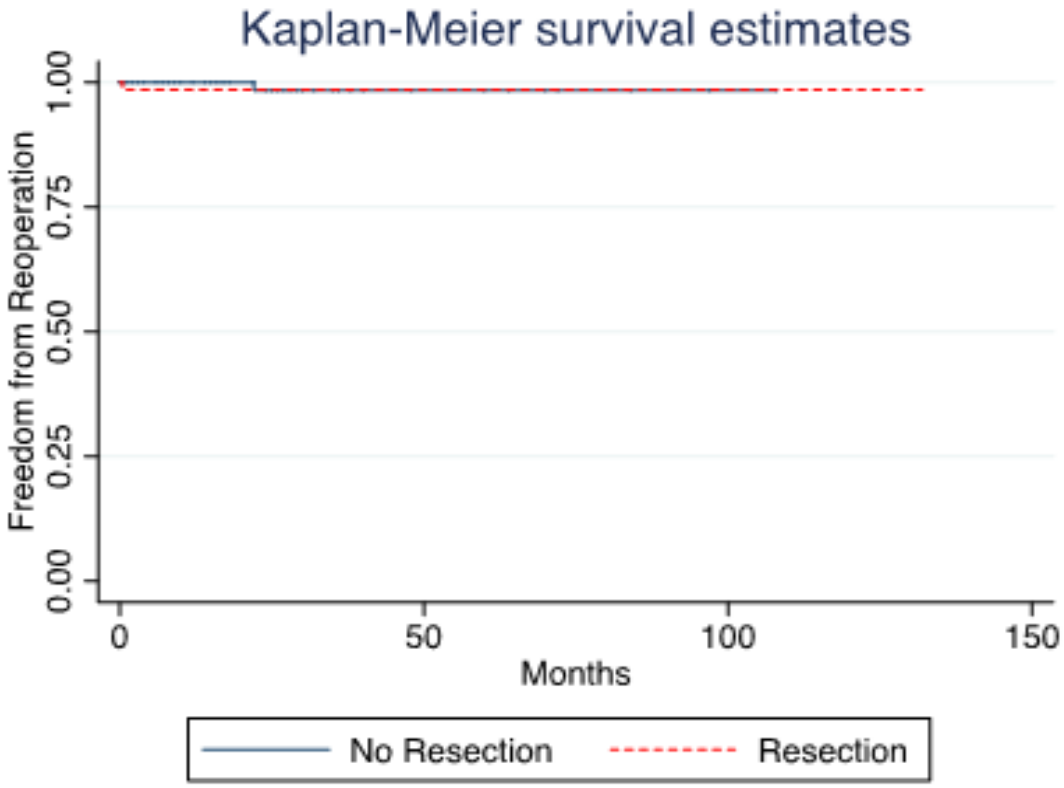
The FCI Experience
Freedom from Reoperation



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So….Is Bigger Really Better?

- ***YES***
- The more you do the better you get
- Earlier flattening of the learning curve
- BUT… The “Team Effect” appears to accelerate the process

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Danton MHD, Ped Card Surg Ann 2016;19:14,

Why Are High-Volume Centers Better?

- Correlation between program size and resource allocation
- Standardized processes of care
- Quality measures and continuous improvement programs
- Permanently dedicated teams that translate into better rescue options in case of complications

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Burki S, *et al*. Ped Card Surg Ann 2016; 19:14

Bigger Is Better
Healthcare Economics

- Costs are reduced in high volume centers through standardization of processes
- New payment models such as bundled-payments encourage the concentration of cardiovascular patients in high volume centers

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Vince Lombardi

- *“Gentlemen, we will chase perfection, and we will chase it relentlessly, knowing all the while we can never attain it. But along the way, we shall catch excellence”*

STS/EACTS Latin America Cardiovascular Surgery Conference

November 15-17, 2018

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THANK YOU

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How Do We Improve Results And Optimize Access?

- In association with high volume *centers of excellence:*
  - Clinical guidelines
  - Quality improvement projects
  - Provider education
  - Collaborative interactions
  - Consensus referral of high risk patients