

Does minimally invasive mitral valve repair compromise the results?

Khalil Fattouch, MD, PhD.

Department of Cardiothoracic Surgery

Maria Eleonora Hospital – GVM Care & Research

Palermo



The banner features a teal background with a white cloud on the right. On the left, there are two circular images: one showing a cross-section of a heart valve and another showing a 3D reconstruction of a heart. The text 'EuroValve' is written in a large, white, serif font. Below it, 'October 24-25, 2014' is written in a smaller, yellow, sans-serif font. At the bottom, 'Roma Eventi Fontana Di Trevi, Rome, Italy' is written in a white, sans-serif font. The website 'www.eurovalvecongress.com' is at the bottom center. In the bottom right corner, there is a small logo for 'EACVI' (European Association of Cardiothoracic Valvular Intervention) featuring a heart and a stethoscope.

EuroValve
October 24-25, 2014
Roma Eventi Fontana Di Trevi, Rome, Italy
www.eurovalvecongress.com

“Did we really think we’d be doing surgery the same way we learned in medical school over 20 years ago?”

Bruce Lytle, STS 2004

Minimally Invasive Procedure:

Minimally invasive surgical procedures avoid open invasive approaches in favor of closed or local surgery with less trauma.

wikipedia



Minimally Invasive

Reference Centre

Volume

Repair Rate

Team

CPB

incision

Minimally Invasive Port-Access Mitral Valve Surgery
 F. W. Mohr, MD, PhD, V. Falk, MD, A. Diegeler, MD, T. Walther, MD, J. A. M. van Son, MD, PhD, R. Autschbach, MD, PhD, Hans G. Borst, MD

1998;115:567-571

Table 3. Perioperative complications

| Complications | Cause | n |
|---|------------------------------|---|
| Cardiac | | |
| Prolonged catecholamine support (<3 days) | | 9 |
| Rhythm disorders | Supraventricular tachycardia | 8 |
| Other | | |
| Aortic dissection | Perforation of aortic wall | 2 |
| Renal failure (CVVH) | Low cardiac output | 2 |
| Pancreatitis | Unknown | 1 |
| Upper GI bleed | Stress ulceration | 1 |
| Toxic skin necrolysis | Unknown | 1 |

Mortality 9.8% (5/51)

Conversion to Sternotomy 3.9% (2/51)

Aortic Dissection 3.9% (2/51)

Five patients (9.8%) died in the perioperative period or at follow-up. One patient with long-term oral cortisone therapy died on postoperative day 12 after he had been

Doubts

- ✓ **Technical Difficulties**
- ✓ **Risk of Complications**
- ✓ **Duration of Surgery**
- ✓ **Costs-Benefits**

volume of cases, so that they can gain sufficient experience with this novel procedure.

CVVH, Continuous veno-venous hemofiltration; GI, gastrointestinal.

Minimally Invasive Approaches

Problems

- Too complex
- Port access, endoscopic, robotic
- Difficult learning curve
- Too expensive
- Morbidity and Mortality



Minimally Invasive Approaches

Solutions

- Simplify the complex procedures
- Limit robotics and fiberoptics
- Make it reproduceble in hands of surgeons and use conventional skills
- Reduce costs
- Improve outcomes



The golden age of minimally invasive cardiothoracic surgery: current and future perspectives

Alexander Iribarne¹, Rachel Easterwood¹, Edward YH Chan¹, Jonathan Yang¹, Lori Soni¹,
Mark J Russo², Craig R Smith¹, and Michael Argenziano^{1,†}

¹ Division of Cardiothoracic Surgery, Department of Surgery, College of Physicians & Surgeons,
Columbia University, New York, NY 10032, USA

² Division of Cardiac & Thoracic Surgery, University of Chicago Medical Center, Chicago, IL, USA

Table 11.3 Minimally invasive approaches: outcome comparisons

| | Partial sternotomy | Right mini-thoracotomy |
|-------------------------------|--------------------|------------------------|
| Cosmesis | ++ | +++ |
| Postoperative pain | ++ | ++ |
| Postoperative NSR | ++ | +++ |
| Short ICU length of stay | +++ | ++++ |
| Short hospital length of stay | +++ | ++++ |
| Transfusion requirement | +++ | +++ |
| Wound infection | ++ | +++ |
| Cost | ++++ | +++ |

NSR, normal sinus rhythm; ICU, intensive care unit



Mitral Valve Surgery Can Now Routinely Be Performed Endoscopically
Filip P. Casselman, Sam Van Slycke, Francis Wellens, Raphael De Geest, Ivan Degrieck,
Frank Van Praet, Yvette Vermeulen and Hugo Vanermen
Circulation 2003;108;II-48-II-54

Minimal invasive mitral valve repair for mitral regurgitation: results in 1339 consecutive patients

Joerg Seeburger, Michael Andrew Borger, Volkmar Falk, Thoralf Schaefer, Thomas Czesla, Thomas Walther, Nicolas Doll and Friedrich W. Mohr
Eur J Cardiothorac Surg 2008;34:532-538

How safe is the port access technique in minimally invasive mitral valve surgery?

Selami Dogan, Kai Graubitz, Tayfun Aybek, M. G. ...

Minimally invasive mitral valve surgery: a meta-analysis

Paul Modi, Ansar Hameed, ... Wood, Jr.
Eur J Cardiothorac Surg 2008;34:952-958

Minimally invasive mitral valve surgery: our experience with 714 patients
Eugene A. Grunkin, ... Metra, Greg H. Ribakove, Patricia ...

Comparison of minimally invasive mitral valve surgery for posterior, bileaflet prolapse

Joerg Seeburger, Nicolas Doll, Thomas Walther, Jurgen Passage, Volkmar Falk and Friedrich W. Mohr
Eur J Cardiothorac Surg 2009;36:532-538

Minimally invasive mitral valve disease
... Greelish, Lawrence H. Cohn, Marzia Leacche, Michael Mitchell, Alexandros Karavas, John Fox, John G. Byrne, Sary F. Aranki and Gregory S. Couper
J Thorac Cardiovasc Surg 2003;126:365-373

MICS is feasible, reproducible and durable

Review

Minimally invasive mitral valve surgery: a systematic review and meta-analysis

Paul Modi, Ansar Hassan, Walter Randolph Chitwood Jr.*

East Carolina Heart Institute, Greenville, NC, USA

Received 23 May 2008; received in revised form 19 July 2008; accepted 28 July 2008; Available online 30 September 2008

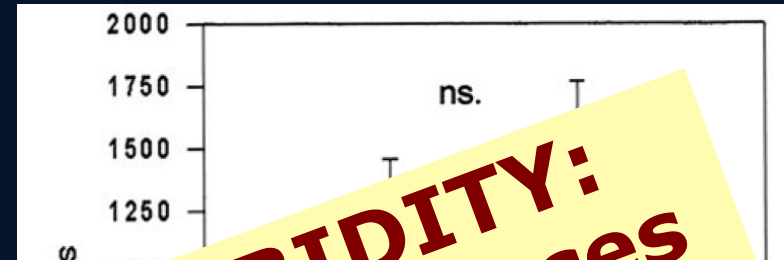
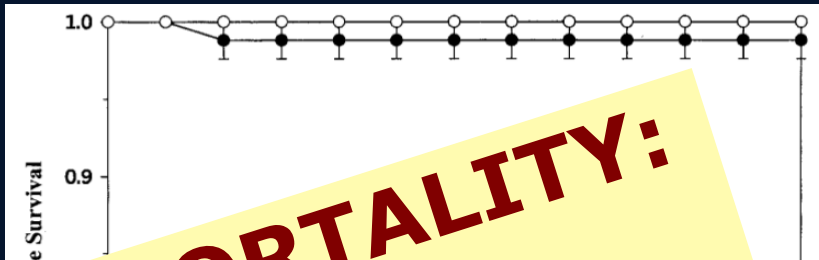


Table 5
Studies reporting long-term results of minimally invasive mitral valve surgery

| Study, year, reference | Institution | Survival | Freedom from re-operation |
|-------------------------------|-------------|------------------------|---------------------------|
| Gulielmos et al. (2000) [43] | Dresden | 93.5% at 3.3 years | — |
| Casselmann et al. (2003) [34] | Aalst | 95.4 ± 1.7% at 4 years | 91 ± 3.5% at 4 years |
| Greelish et al. (2003) [44] | Brigham | 95% at 5 years | 92% at 5 years |
| Walther et al. (2004) [39] | Leipzig | 83% at 6.8 years | — |
| Mishra et al. (2005) [40] | New Delhi | 99% at 3.2 years | 99.3% at 3.2 years |
| Aybek et al. (2006) [41] | Frankfurt | 90.7% at 6.3 years | 96.2% at 6.3 years |
| Torracca et al. (2006) [42] | Milan | 100% at 2.3 years | 95.2% at 4 years |

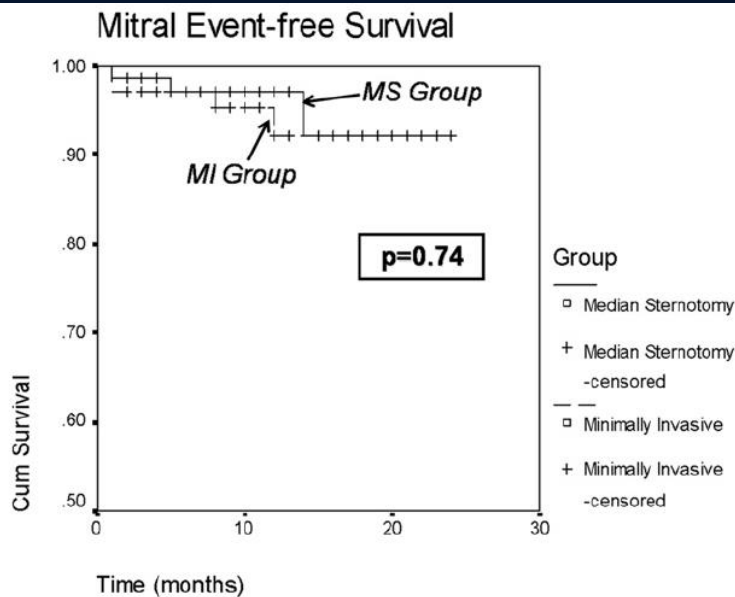
standard deviation. (conv. = conventional mitral valve surgery; MIS = minimally invasive mitral valve surgery.)

GOOD INTERMEDIATE and LONG TERM RESULTS



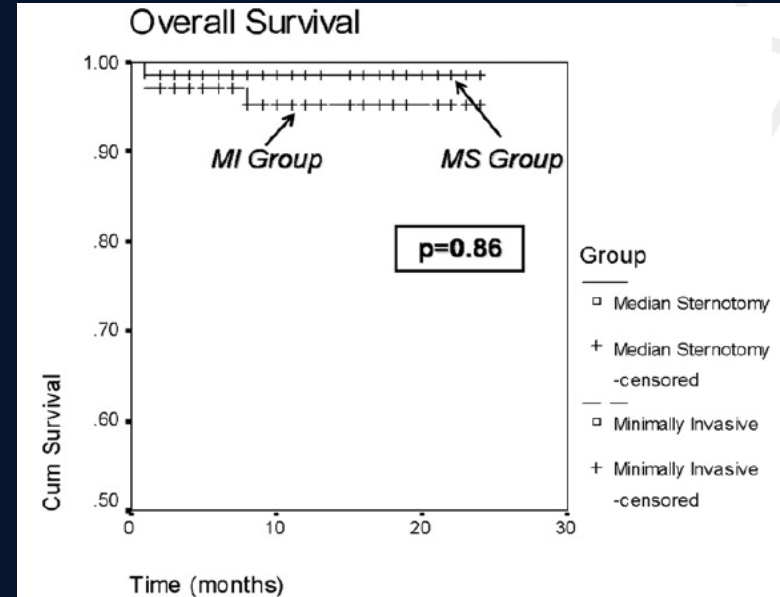
Results of mitral valve repair for Barlow disease (bileaflet prolapse) via right minithoracotomy versus conventional median sternotomy: A randomized trial

Giuseppe Speziale, MD,^a Giuseppe Nasso, MD,^a Giampiero Esposito, MD,^b Massimiliano Conte, MD,^b Ernesto Greco, MD,^c Khalil Fattouch, MD,^d Flavio Fiore, MD,^a Mauro Del Giglio, MD,^e Roberto Coppola, MD,^a and Luigi Tavazzi, MD^e



Patients at risk:

| | | | | | |
|----------|----|----|----|----|----|
| MI Group | 68 | 67 | 66 | 66 | 66 |
| MS Group | 69 | 68 | 67 | 67 | 67 |



Patients at risk:

| | | | | | |
|----------|----|----|----|----|----|
| MI Group | 68 | 67 | 67 | 67 | 67 |
| MS Group | 69 | 69 | 69 | 69 | 69 |

Minimal invasive mitral valve repair for mitral regurgitation: results of 1339 consecutive patients[☆]

Joerg Seeburger^{*}, Michael Andrew Borger, Volkmar Falk, Thomas Kuntze,
Markus Czesla, Thomas Walther, Nicolas Doll, Friedrich Wilhelm Mohr

European Journal of Cardio-thoracic Surgery 34 (2008) 760–765

| | Patients | |
|----------------------------------|------------|-----------|
| | n | % |
| Ring annuloplasty | 1301 | 96.3 |
| Complete/partial ring | 1045/256 | 78.0/22.0 |
| Ring size (mm) | 31.1 ± 3.6 | |
| Quadrangular resection AML | 29 | 2.2 |
| Quadrangular resection PML | 384 | 28.7 |
| Sliding plasty AML | 6 | 0.4 |
| Sliding plasty PML | 61 | 4.6 |
| Neo-chordae (loops) | 511 | 38.1 |
| Neo-chordae AML (loops) | 260 | 19.4 |
| Neo-chordae PML (loops) | 415 | 30.1 |
| Chordae transfer | 113 | 8.4 |
| Commissural suture anterolateral | 32 | 2.4 |
| Commissural suture posteromedial | 30 | 2.2 |
| Cleft repair | 19 | 1.4 |
| Alfieri plasty | 44 | 3.3 |
| Tumor resection | 6 | 0.4 |

AML: anterior mitral leaflet; PML: posterior mitral leaflet.

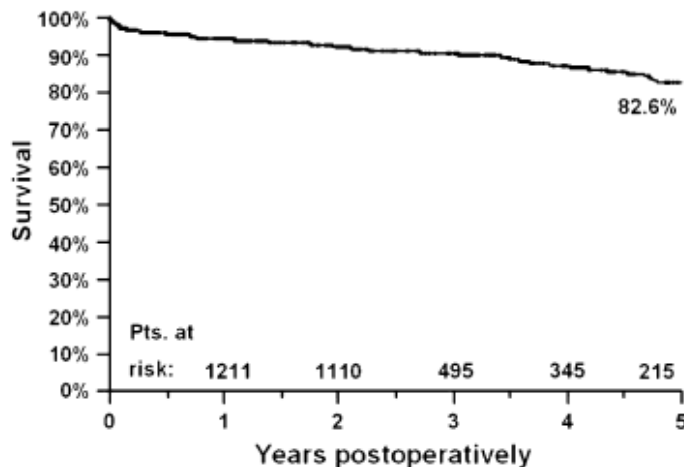


Fig. 1. Kaplan–Meier curve for survival following minimal invasive MV repair for mitral regurgitation.

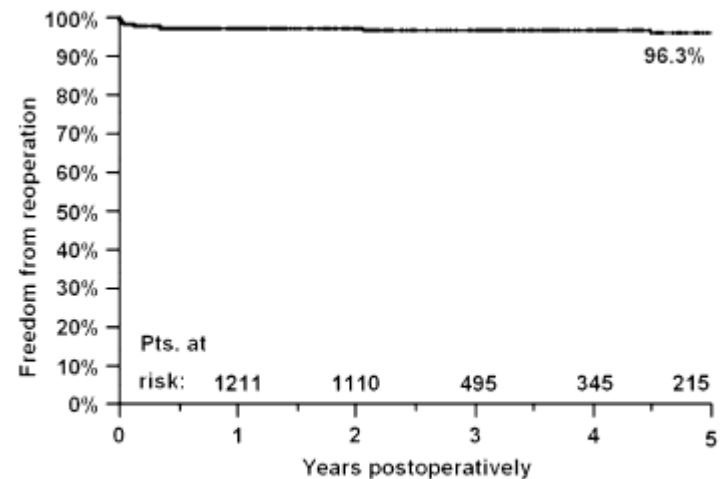


Fig. 2. Kaplan–Meier curve for freedom from MV related reoperation following minimal invasive MV repair.

Comparison of outcomes of minimally invasive mitral valve surgery for posterior, anterior and bileaflet prolapse[☆]

Joerg Seeburger^{*}, Michael A. Borger, Nicolas Doll, Thomas Walther, Jurgen Passage, Volkmar Falk, Friedrich W. Mohr

European Journal of Cardio-thoracic Surgery 36 (2009) 532–538

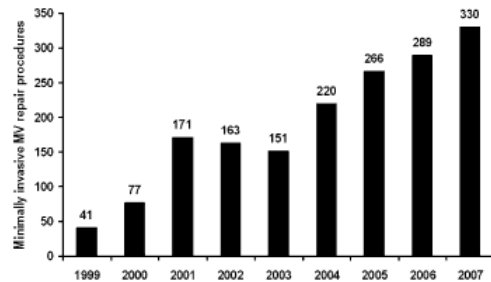


Fig. 1. Number of minimal invasive mitral valve repair procedures performed per year at Leipzig Heart Center over the study period.

| | PML (n = 672) | | AML (n = 156) | | BL (n = 402) | |
|-------------------------------------|---------------|------|---------------|------|--------------|------|
| | [n] | % | [n] | % | [n] | % |
| Annulus dilatation | 565 | 84.1 | 125 | 80.1 | 344 | 85.6 |
| Chordae elongation [*] | 435 | 64.7 | 103 | 66 | 322 | 80.1 |
| Chordae rupture [*] | 264 | 39.3 | 60 | 38.5 | 219 | 54.5 |
| Calcification PML [*] | 21 | 3.1 | 4 | 2.6 | 25 | 6.2 |
| Calcification AML [*] | 9 | 1.3 | 9 | 5.8 | 11 | 2.7 |
| Calcification annulus | 27 | 4 | 3 | 1.9 | 22 | 5.5 |
| Cleft | 0 | 0 | 1 | 0.6 | 3 | 0.7 |
| Rupture papillary muscle | 10 | 1.5 | 3 | 1.9 | 25 | 6.2 |
| Additional restriction [*] | 15 | 0.2 | 16 | 10.3 | 12 | 3 |
| Commissural closure | 3 | 0.4 | 2 | 1.3 | 4 | 1 |
| Endocarditis [*] | 17 | 2.5 | 11 | 7.1 | 12 | 3 |

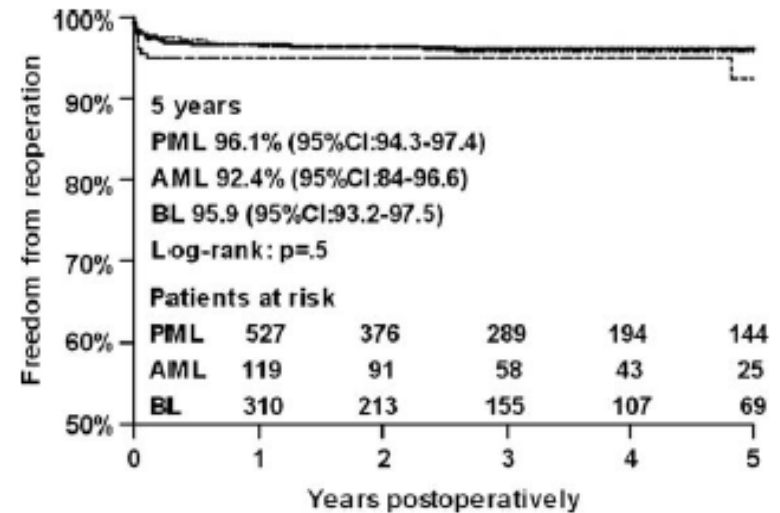
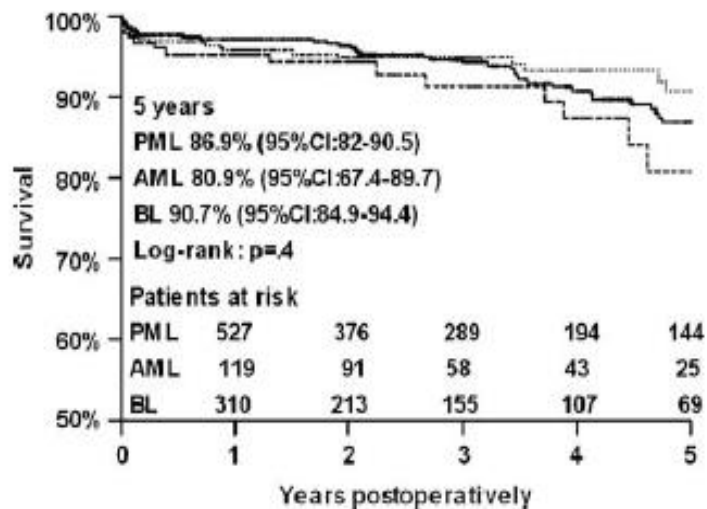
Postoperative outcomes after mitral valve surgery for isolated anterior, posterior, or bileaflet prolapse.

| | PML (n = 672) | | AML (n = 156) | | BL (n = 402) | |
|-----------------------------|---------------|-----|---------------|-----|--------------|-----|
| | [n] | % | [n] | % | [n] | % |
| Postop LVEF | 57.8 ± 9.9 | | 56.6 ± 11.4 | | 58.3 ± 10.3 | |
| Postop MR | 0.28 ± 0.54 | | 0.31 ± 0.57 | | 0.35 ± 0.58 | |
| Hospital stay | 11.3 ± 6.4 | | 12.9 ± 9.2 | | 11.4 ± 13.6 | |
| Stroke | 18 | 2.7 | 4 | 2.6 | 8 | 2.0 |
| Low cardiac output syndrome | 20 | 3.0 | 5 | 3.2 | 13 | 3.2 |
| Reoperation for bleeding | 38 | 5.7 | 8 | 5.1 | 18 | 4.5 |
| 30-day mortality | 10 | 1.5 | 4 | 2.6 | 9 | 2.2 |

Comparison of outcomes of minimally invasive mitral valve surgery for posterior, anterior and bileaflet prolapse[☆]

Joerg Seeburger^{*}, Michael A. Borger, Nicolas Doll, Thomas Walther, Jurgen Passage, Volkmar Falk, Friedrich W. Mohr

European Journal of Cardio-thoracic Surgery 36 (2009) 532–538





Silvana B:

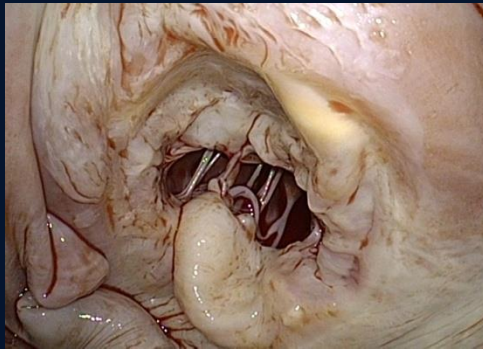
Good Team - Best Performance



Role of Cardiologists in developing Mitral Repair

- Repair techniques - evolving surgical philosophy and practice
- **Refer patients to high skill surgeons**
- To play a key role in developing a mitral valve reference center

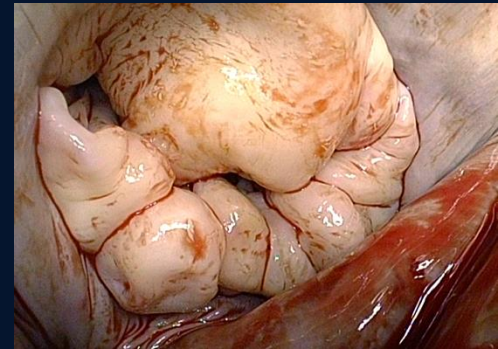
Degenerative Mitral Regurgitation: Who Should Operate?



Easy



Moderate



high experience

Reference Mitral Valve Centers

Repair rates > 90% in
Most Centers Today

Easy Repair



Type I



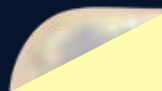
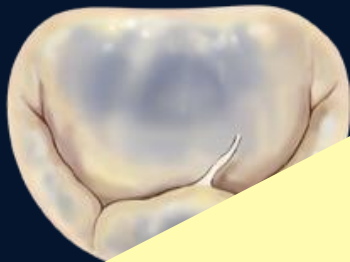
Type II P2

Spectrum of Degenerative Mitral Disease

FED

FED+

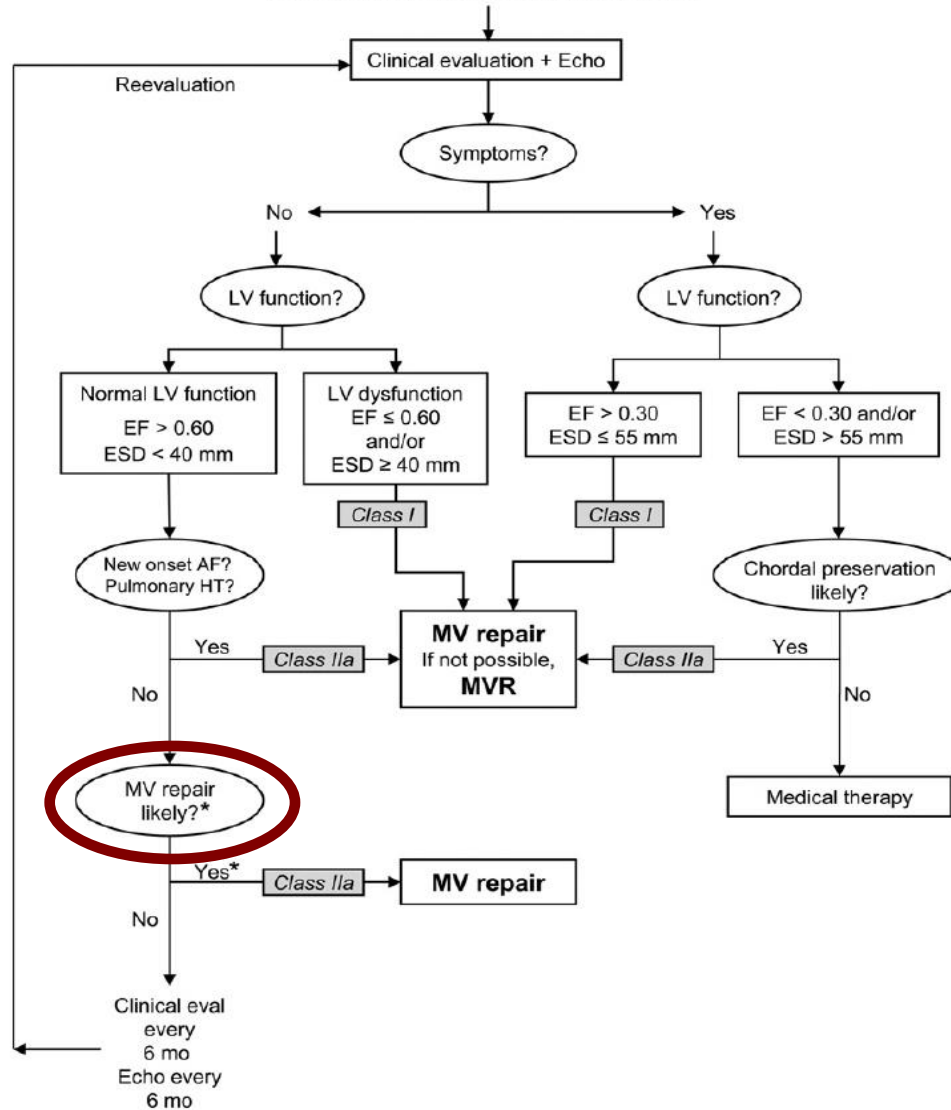
Barlow's



Reference Centre

Increasing Repair Difficulty

Chronic Severe Mitral Regurgitation



Why Mitral Valve Repair rate will be Predictable?



Trends in Mitral Valve Surgery in the United States: Results From The Society of Thoracic Surgeons Adult Cardiac Database

James S. Gammie, MD, Shubin Sheng, PhD, Bartley P. Griffith, MD, Eric D. Peterson, MD, J. Scott Rankin, MD, Sean M. O'Brien, PhD, and James M. Brown, MD

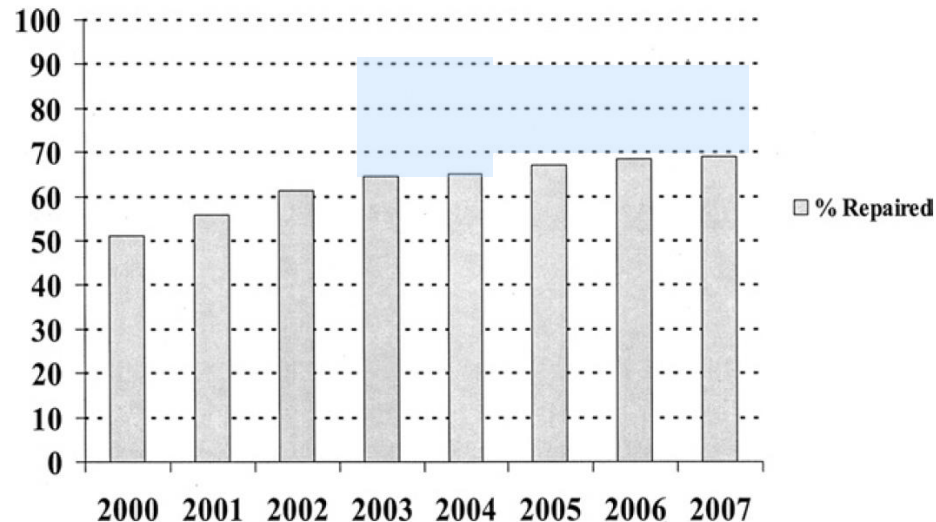


Fig 4. Mitral valve repair rates, percent repaired (gray bars), for isolated primary mitral regurgitation, for the years 2000 to 2007 ($p < 0.0001$).

INTERVENTIONAL CARDIOLOGY AND SURGERY

Mitral repair best practice: proposed standards

B Bridgewater, T Hooper, C Munsch, S Hunter, U von Oppell, S Livesey, B Keogh, F Wells, M Patrick, J Kneeshaw, J Chambers, N Masani, S Ray



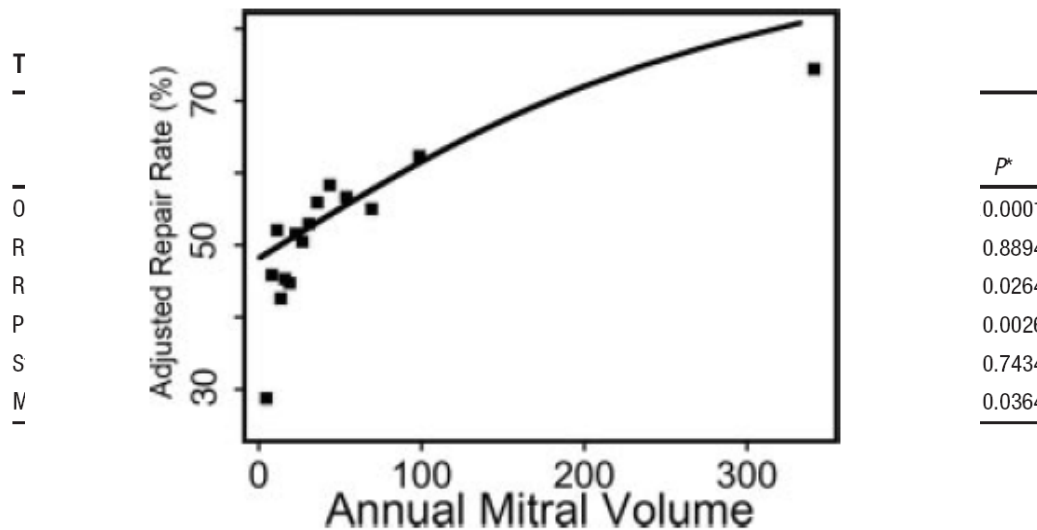
Volume thresholds

Surgeons undertaking mitral repair surgery should be doing more than 25 repairs each year

Hospitals undertaking mitral repair surgery should be doing more than 50 repairs each year

Cardiovascular Surgery

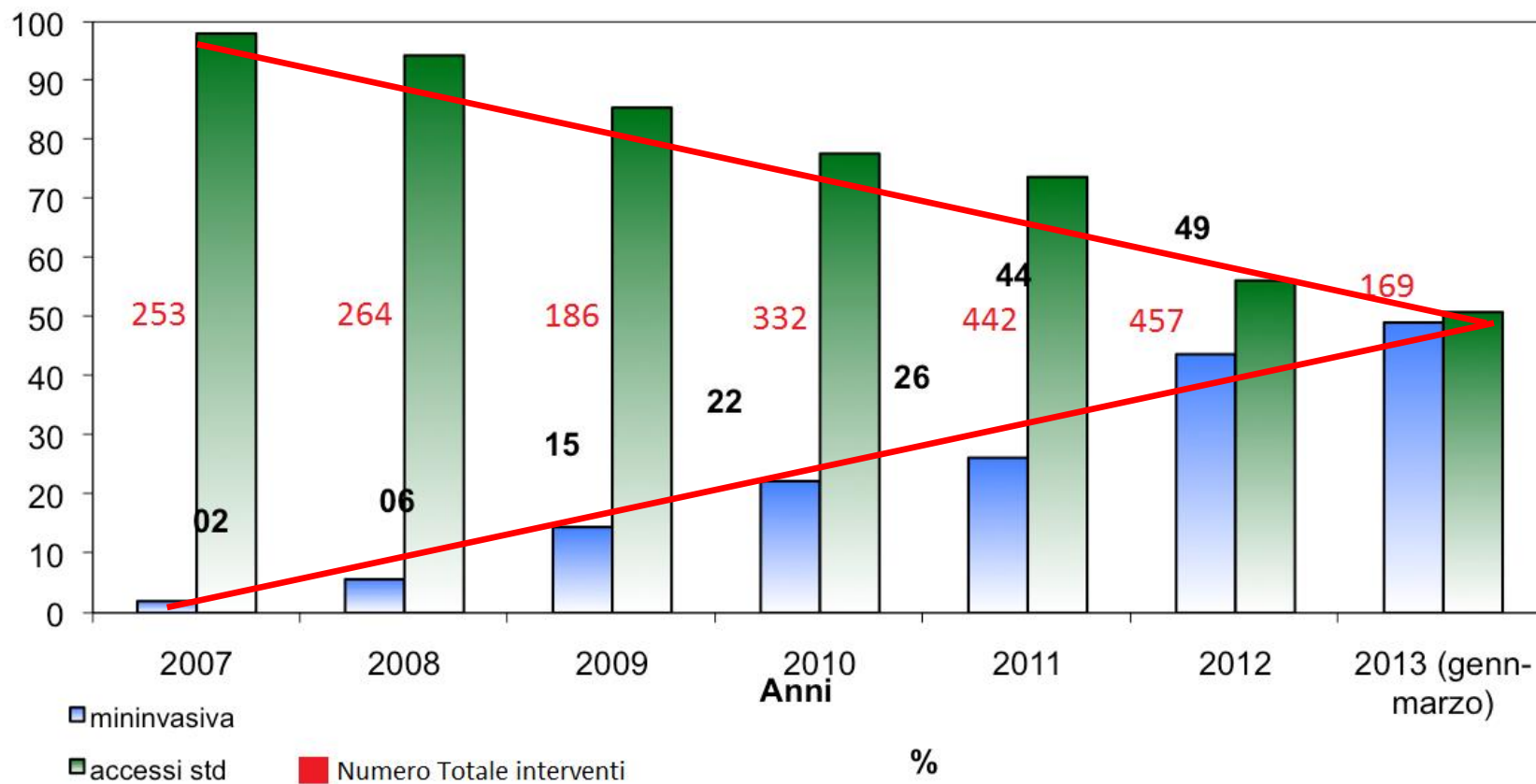
Influence of Hospital Procedural Volume on Care Process and Mortality for Patients Undergoing Elective Surgery for Mitral Regurgitation



**Can we start a minimally
invasive mitral valve
repair program without
compromising the
surgical results?**

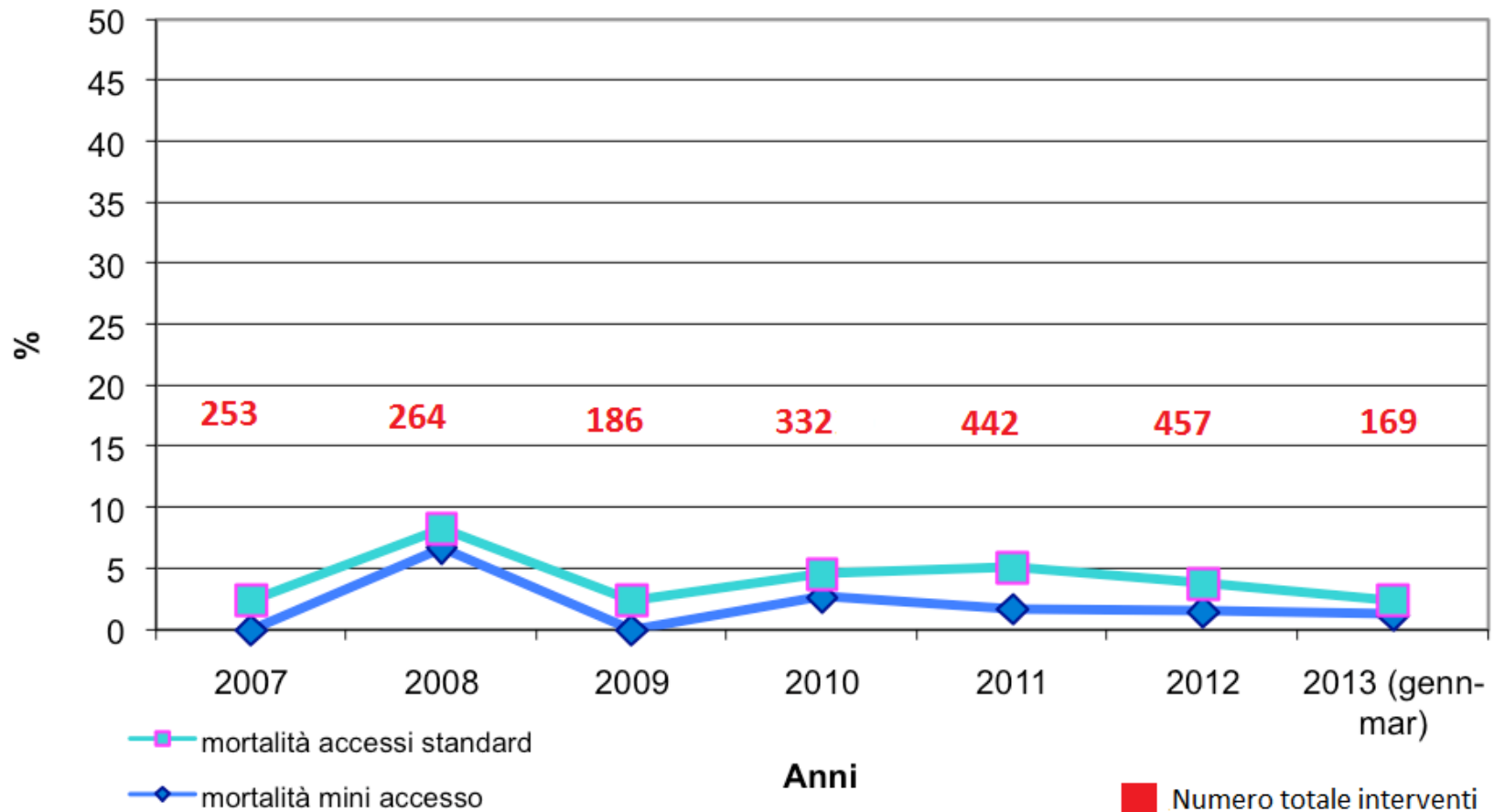
GVM Care and Research Experience

GVM Interventi VM isolata, % mininvasiva su totale

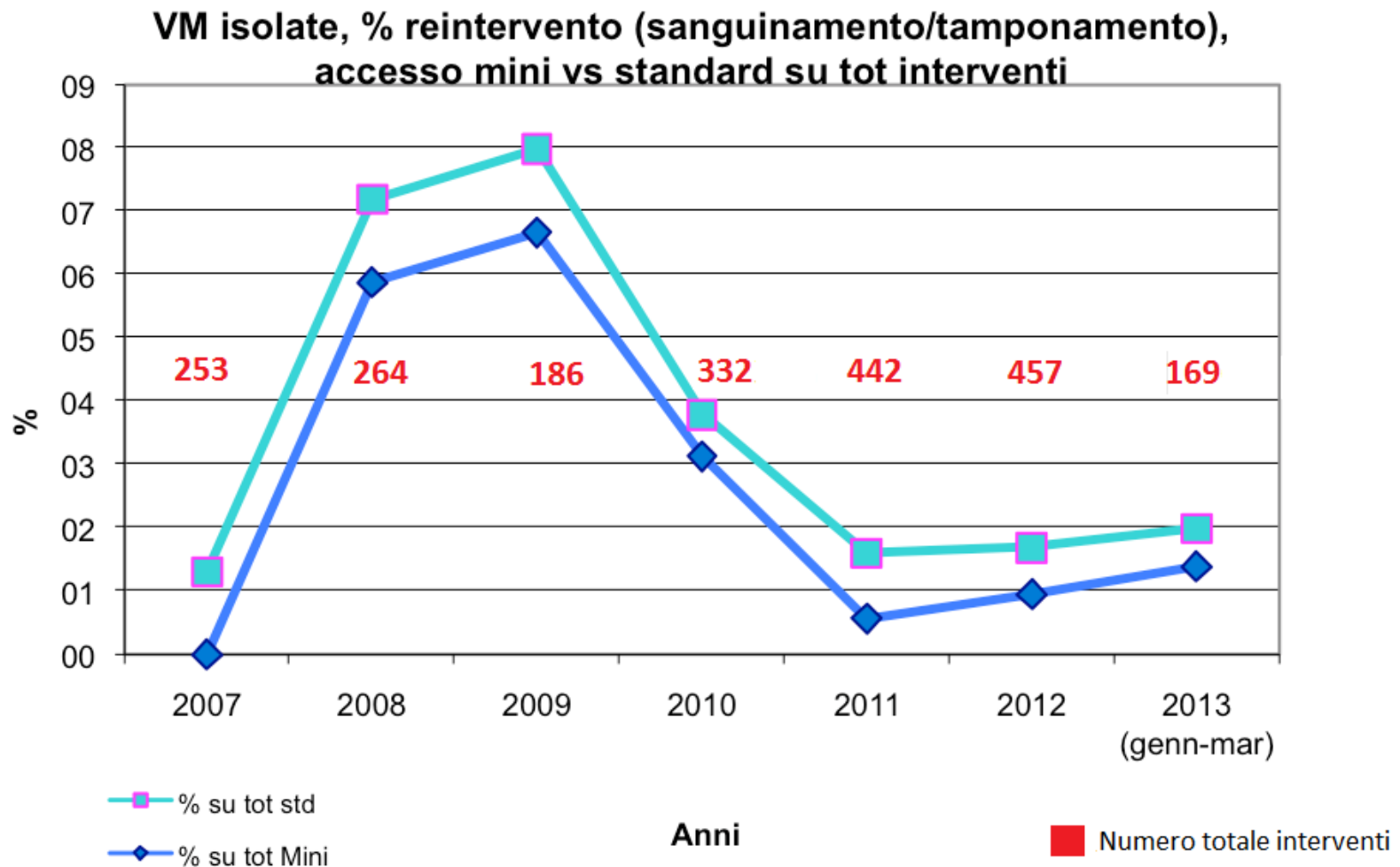


GVM Care and Research Experience

VM isolate, mortalità accesso mini vs standard

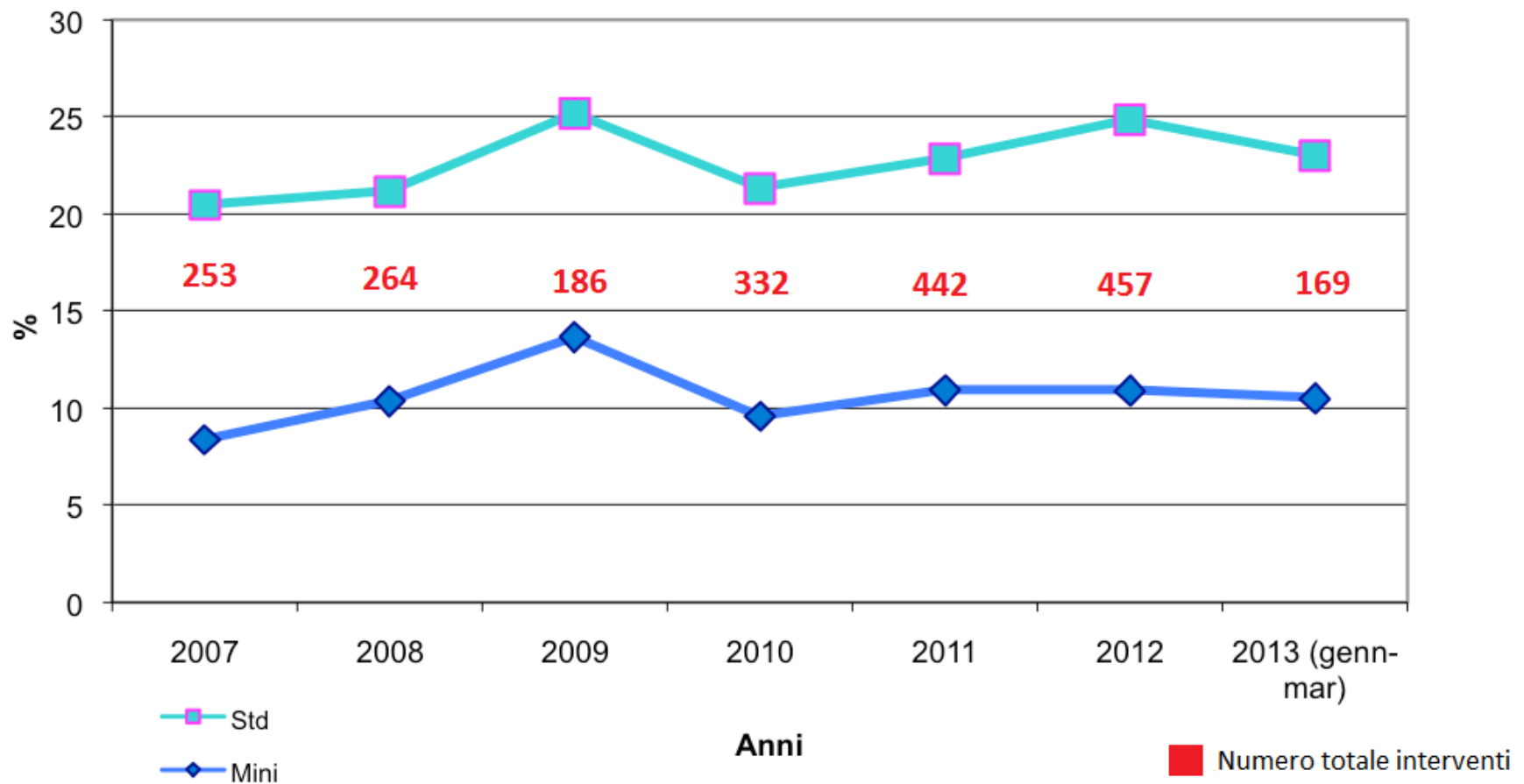


GVM Care and Research Experience



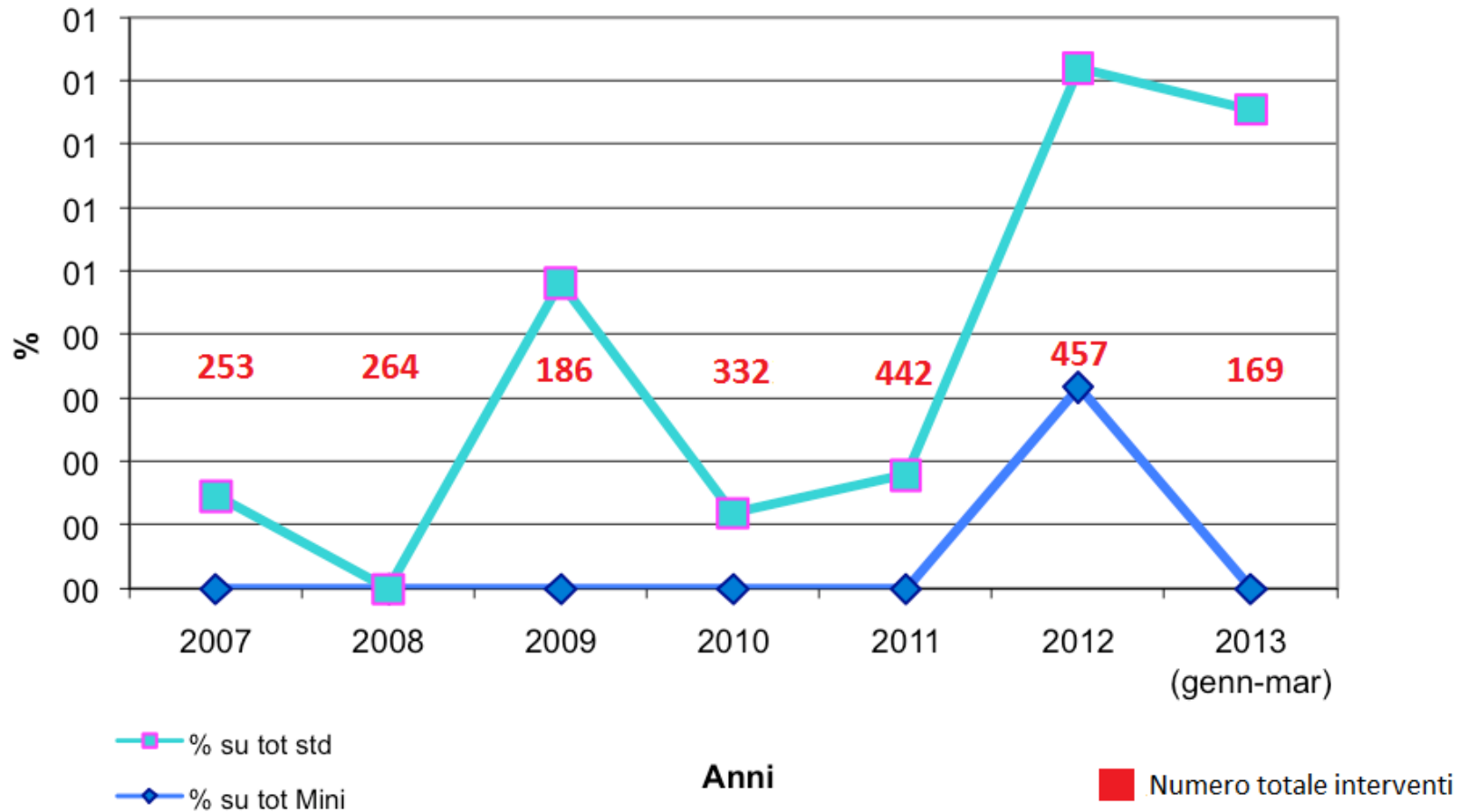
GVM Care and Research Experience

VM isolate, degenza media accesso mini vs standard

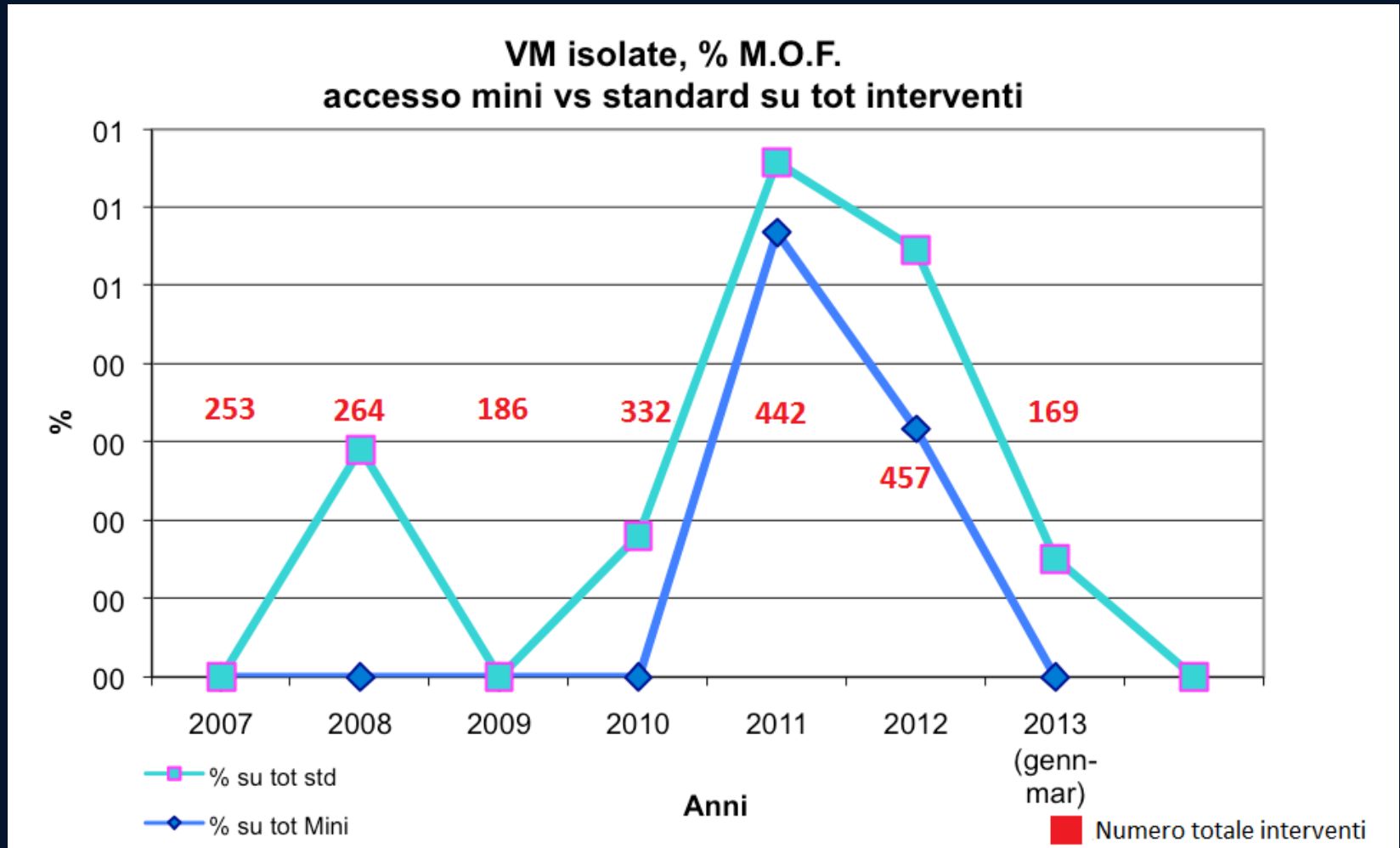


Anthea Hospital & GVM Experience

VM isolate, % revisione sternale
accesso mini vs standard su tot interventi



GVM Care and Research Experience



Take Home Messages

- . Minimally invasive surgery represents a safe and effective approach**
- . No differences in short- or long-term results compared with standard sternotomy**
- . MIMV is associated with lower perioperative complications**
- . With regard to outcome measures such as quality of life, minimally invasive approach may be the standard to compare evolving percutaneous technologies.**

Take Home Messages

- Expansion of minimally invasive surgery
- Standardize the minimally approaches
- Focus on perfection of repair
- Increase number of Reference Mitral Valve Repair Centers