



Trends in Implanted Valve Sizes for Minimally Invasive Aortic Valve Replacement at a Veterans Affairs Healthcare System

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Introduction

Minimally invasive surgical aortic valve replacement (miSAVR) is a valuable option for patients with isolated aortic valve disease, offering a less invasive surgical alternative while preserving the benefits of direct valve excision and implantation. While transcatheter aortic valve replacement (TAVR) has transformed the management of aortic stenosis, miSAVR remains a critical treatment for select patient populations who may not be ideal TAVR candidates.

This retrospective analysis evaluates the evolution of miSAVR practices and outcomes at the San Francisco VA Healthcare System (SFVAHCS), with a focus on the integration of TAVR-derived imaging modalities—specifically ECG-gated computed tomography angiography (CTA)—into surgical planning and assess key clinical outcomes in the miSAVR patient population.

Objectives

- 1) Evaluate miSAVR Practice Evolution:** Analyze procedural characteristics, focusing on surgical approaches, valve types, and ancillary technologies.
- 2) Assess Patient Outcomes:** Examine postoperative metrics, including mortality and valve gradients, to determine the impact of procedural changes.

Methods

**Patients:** miSAVR patients at SFVAHCS between January 2009 and July 2024.

**RedCap Database:** STS-PROM risk calculation variables, outcomes, and surgical techniques

**Data Collection:** Retrospective review medical records in CPRS inputted in RedCap

**Data Analysis:** Analyze data in R to assess trends and outcomes

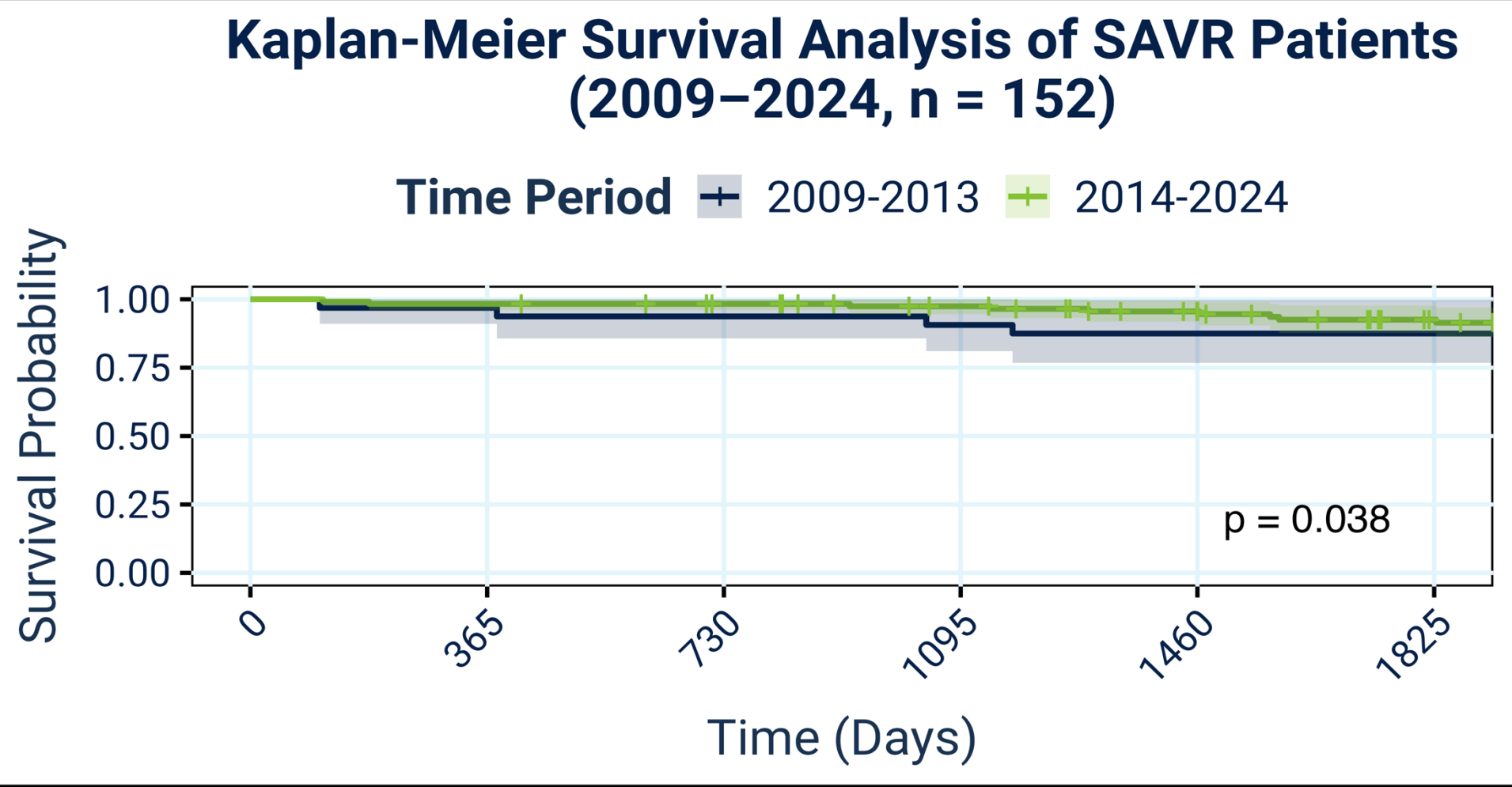
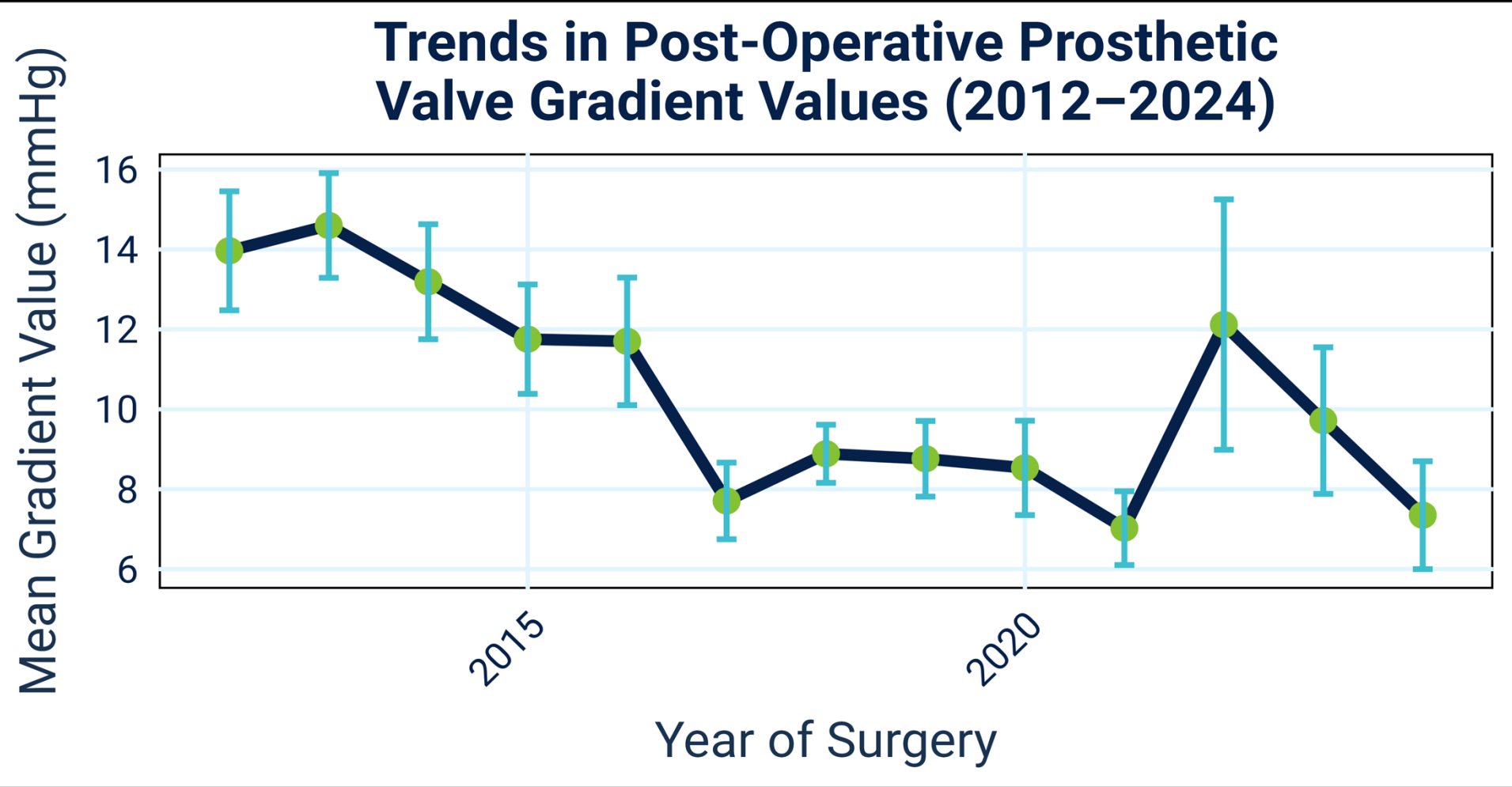
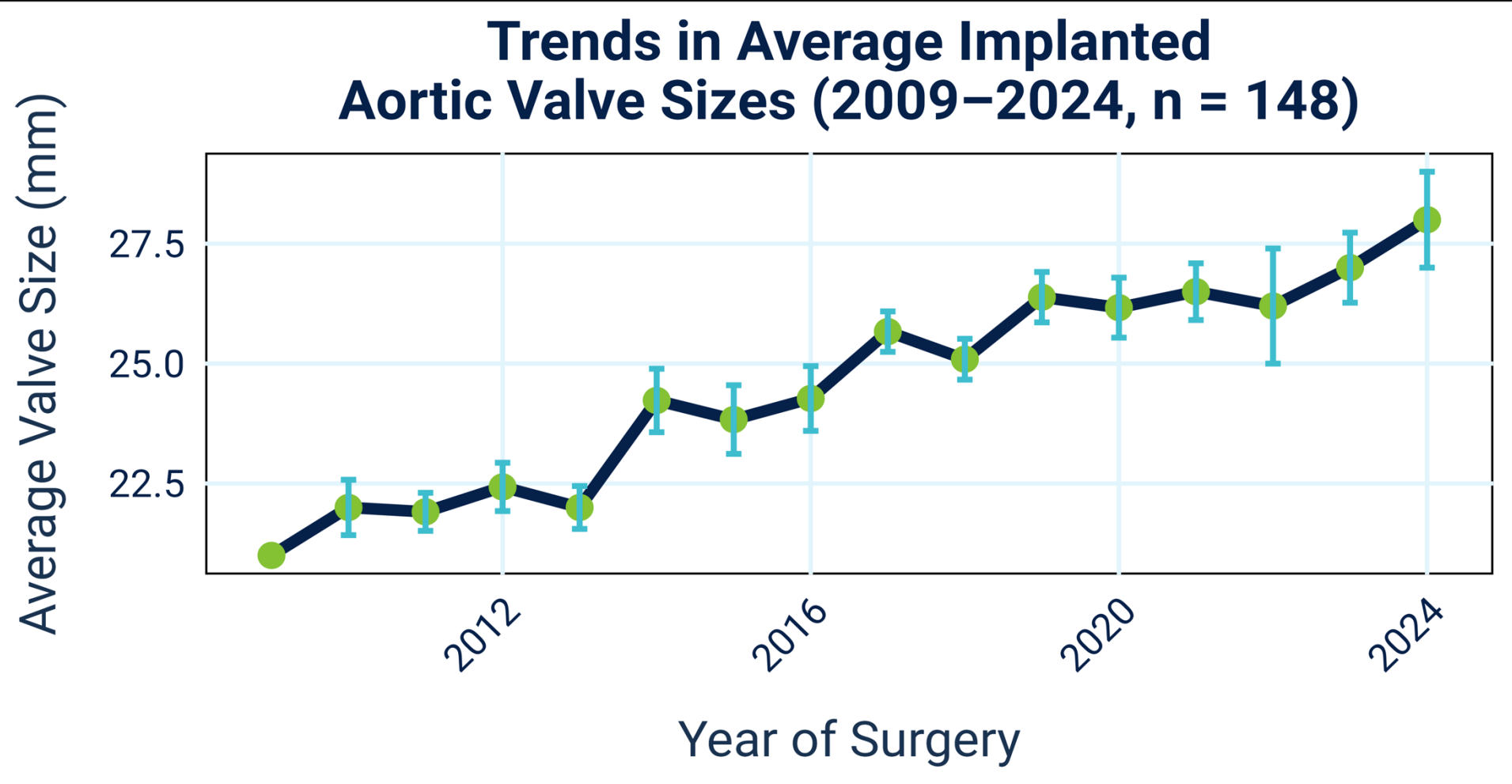
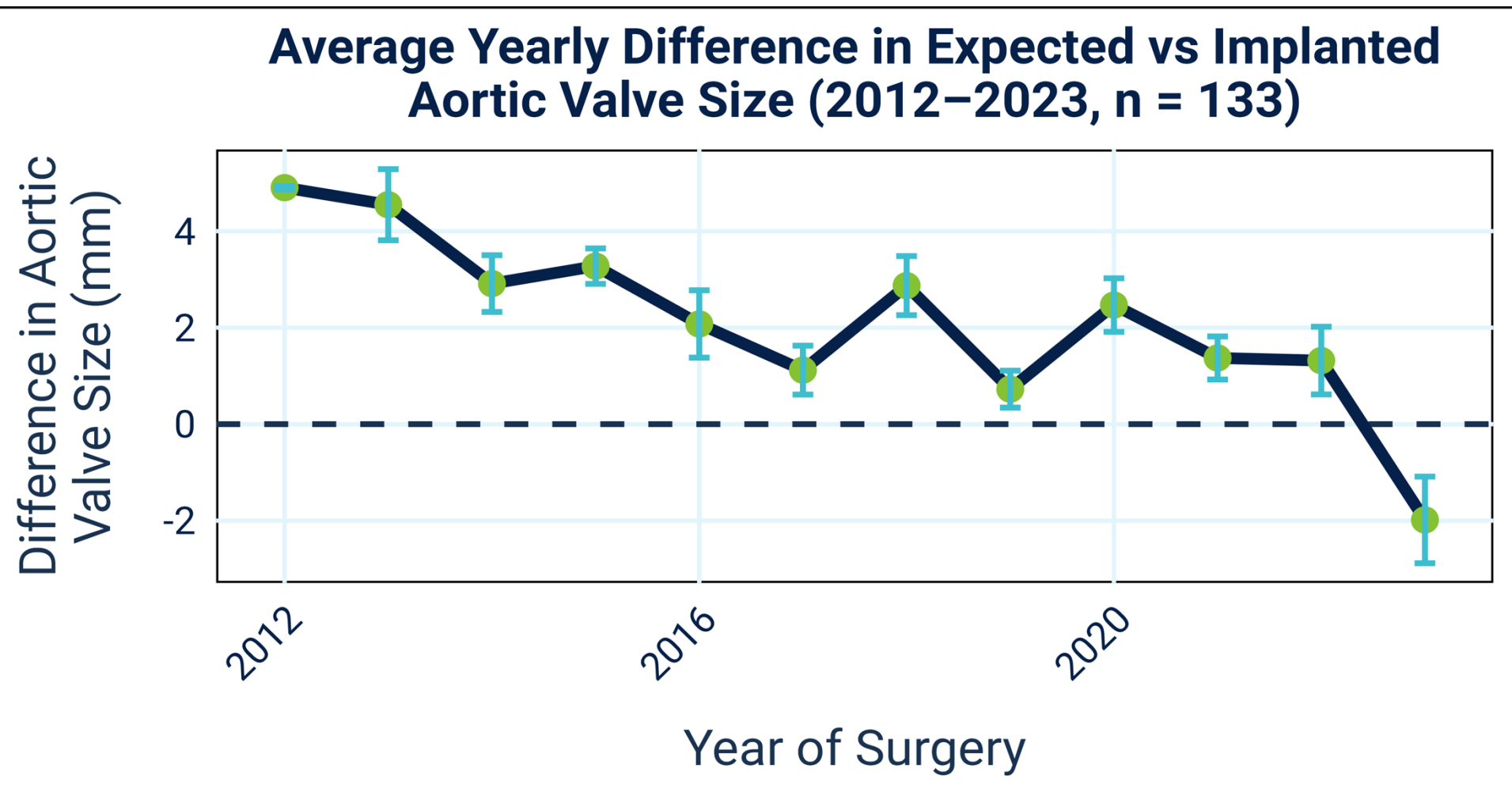
Results

Patient Characteristics	Pre-TAVR (2009-2013, n=29)		Post-TAVR (2014-2024, n=119)		p-value
Mean age (<i>Std Dev</i>)	70.8	(8.3)	66.7	(9.9)	0.03
Mean Body surface area (<i>Std Dev</i>)	2.2	(0.2)	2.1	(0.3)	0.48
Median operative mortality risk (<i>IQR</i>)	1.4%	(0.7%)	1.3%	(1.0%)	0.92
Sex reported as male	28	(96.6%)	116	(97.5%)	1.00
History of diabetes	9	(28.1%)	43	(35.8%)	0.54
Cancer diagnosis within 5 years	0	(0%)	8	(8.9%)	1.00
Patient on dialysis	0	(0%)	1	(8.3%)	1.00
History of illicit drug use	1	(3.1%)	26	(21.7%)	0.02
History of smoking	24	(75.0%)	96	(80.0%)	0.71

Table 1. Comparison of Patient Characteristics Amongst Patients Undergoing miSAVR Before and After Implementation of TAVR at the SFVAMC, (n=148)

Surgical Characteristics		2009-2012 (n=26)	2013-2016 (n=42)	2017-2020 (n=62)	2021-2024 (n=22)
Surgical priority	Elective	85.7%	81.0%	91.8%	95.5%
	Urgent	14.3%	19.0%	8.2%	4.5%
Surgical approach	Upper Hemi-Sternotomy	92.3%	100%	100%	95.5%
	Right Parasternal	7.7%	—	—	4.5%
	Non-sternotomy				
	Isolated AVR	92.3%	66.7%	91.5%	77.3%
Surgery type	AVR + CABG	-	31.0%	3.4%	-
	AVR + Other	7.7%	2.3%	5.1%	22.7%
	Sutured	100%	86.0%	73.3%	90.5%
Valve type	Rapid Deployment	-	14.0%	26.7%	9.5%
	Aortic root enlargement performed	3.8%	2.4%	—	13.6%
Other surgical Characteristics	Cor Knots used	23.0%	95.2%	96.8%	95.5%
	Del Nido Cardioplegia used	3.8%	81.0%	96.8%	95.5%

Table 2. Evolving Characteristics of miSAVR Surgeries Over 3-Year Intervals (2009–2024, n=152)



Discussion

This study highlights the evolution of minimally invasive surgical aortic valve replacement (miSAVR) at SFVAHCS over the past decade, particularly in the context of TAVR program development and cross-application of imaging modalities.

- 1.Valve Sizing Trends:** Implanted valve sizes increased significantly—from 21 mm in 2009 to 27 mm in 2023—while the discrepancy between expected and implanted sizes narrowed. These findings reflect improved preoperative planning and a shift toward minimizing patient-prosthesis mismatch (PPM).
- 2.Surgical Technique Evolution:** Root enlargement techniques, performed in 13.6% of cases post-2020, supported larger valve implantation. This underscores a surgical focus on optimizing valve hemodynamics even in minimally invasive cases.
- 3.Improved Hemodynamics:** Postoperative valve gradients improved from 13.97 mmHg in 2012 to 7.35 mmHg in 2023, suggesting better valve performance and potentially improved long-term outcomes.
- 4.Role of TAVR CTA:** Adopted in 2011, TAVR CTA contributed to enhanced surgical planning, bridging innovations between transcatheter and surgical approaches.

Limitations and Future Directions: These findings stem from a single-center VA cohort, predominantly older males, which may limit generalizability. Further studies are needed to assess the long-term clinical impact of these surgical and imaging advances.

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