

Use of Calcium Modification for Coronary Lesions after Introduction of Coronary Intravascular Lithotripsy: National Trends and Hospital Variation

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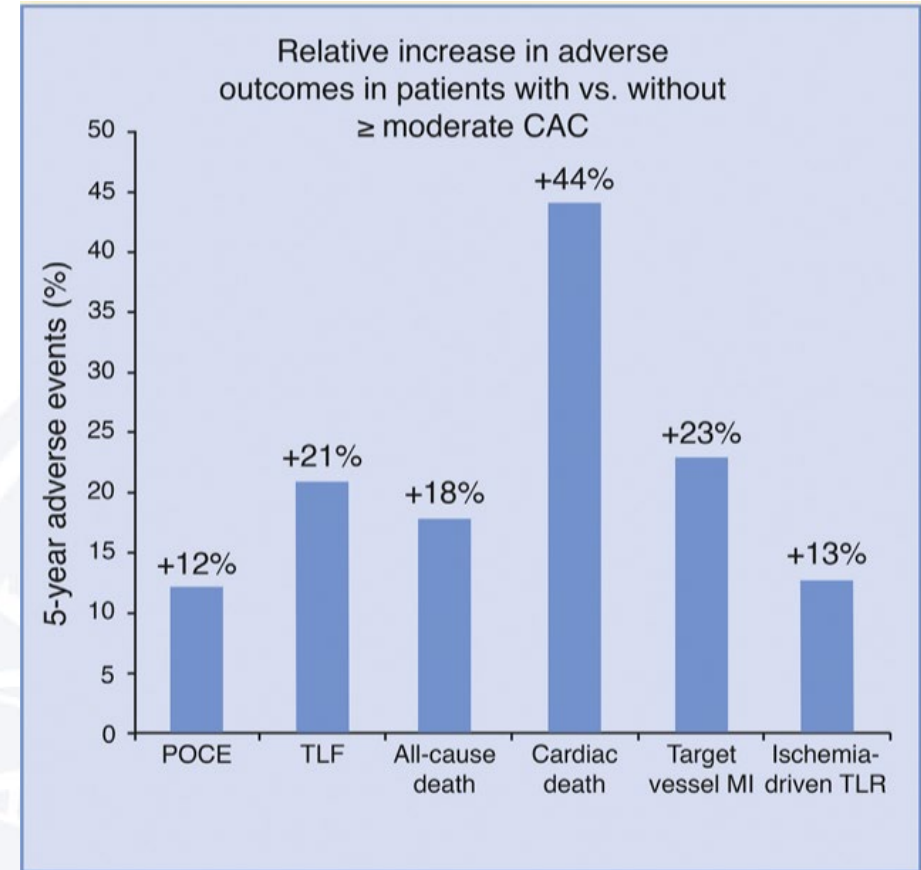
Dr. Butala reports consulting and ownership interest in HiLabs, outside the current work.



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Background

- Calcified coronary lesions represent a challenge for treatment with PCI
 - Worse outcomes compared to other lesions
 - Heavy calcium can make delivery difficult
 - Can lead to stent under-expansion, which is associated with stent thrombosis and ISR
- Increasing proportion of patients have comorbidities associated with coronary calcification



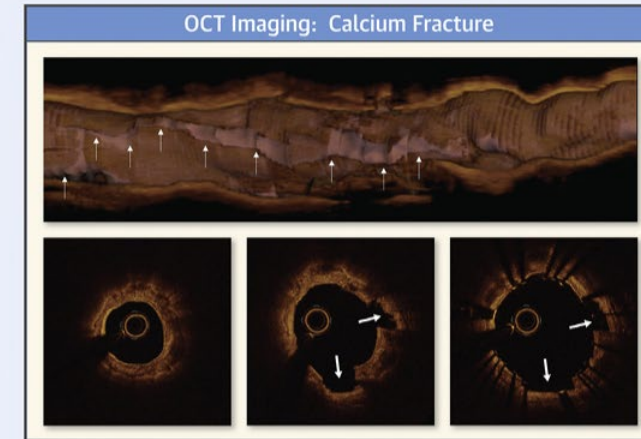
Guedeney et al, *JACC Int* 2020



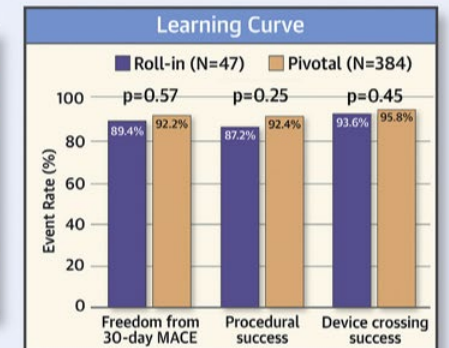
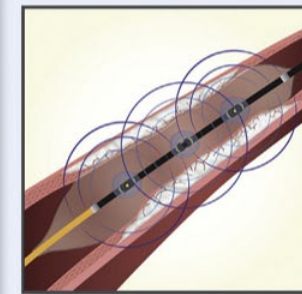
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Background

- Variety of treatment options exist for calcium modification traditionally
 - Cutting or scoring balloons
 - Rotational atherectomy
 - Orbital atherectomy
- Intravascular lithotripsy recently approved for use in coronary arteries
 - Easy for operators to use
 - ↓ risk of dissection or perforation
 - Improves PCI success compared to historical controls



Clinical and Angiographic Complications		
	Peripheral IVL	Coronary IVL
Studies*	Disrupt PAD I-III, BTK, CFA** (55)	Disrupt CAD I-IV (25,30,56,73)
N	336	628
Moderate-Severe Ca ⁺⁺	95.6%	100%
Distal embolization	0%	---
In-hospital MI	---	5.0-6.8%
Dissection (Type D-F)	0.9%	0-0.3%
Perforation	0.3%	0-0.3%
Abrupt closure	0%	0-0.3%
Slow Flow/No-reflow	0%	0%



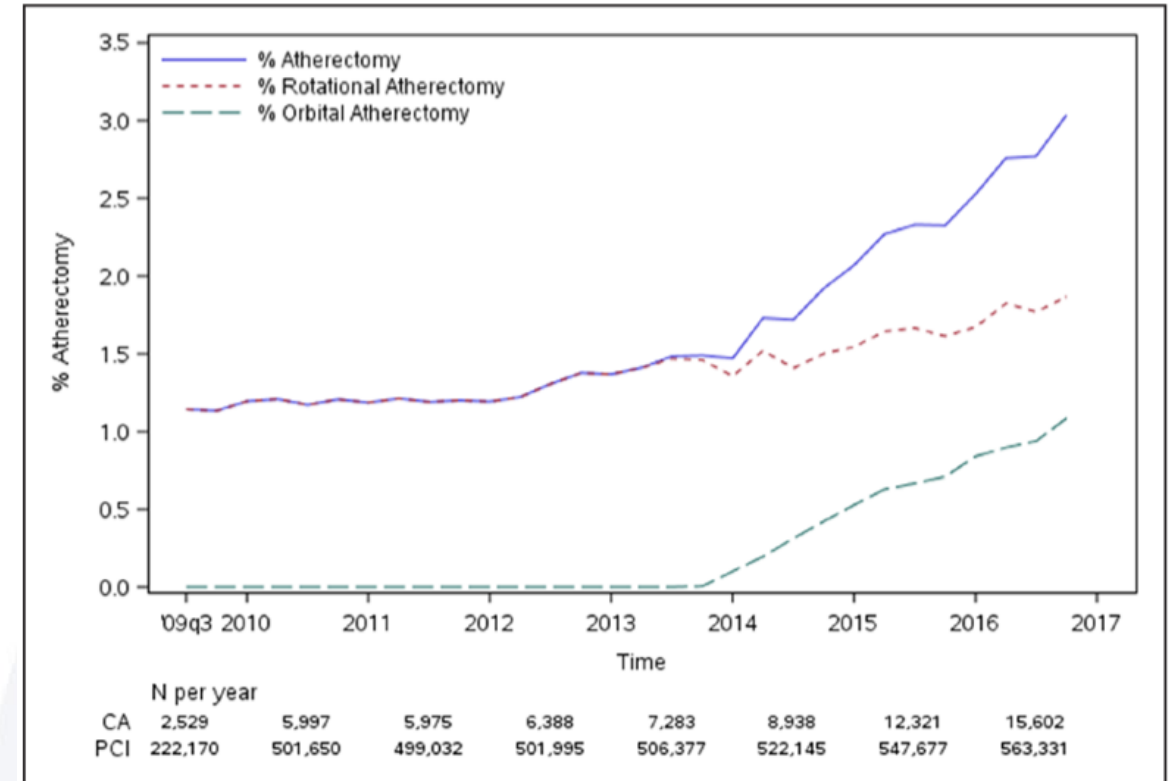
Kereiakes et al, *JACC Int* 2021



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Background

- NCDR CathPCI Registry between 2009 and 2016
 - Use of coronary atherectomy in PCI was infrequent
 - Use did increase from 1.1% to 3.0% of PCIs
- Limited data exist on use of calcium modification strategies during PCI
 - No data on trends since 2016
 - Unclear if variation among centers



Beohar et al, *Circ Int* 2020



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Specific Aims

1. We examined trends in use of calcium modification strategies as coronary intravascular lithotripsy was introduced.
2. We examined hospital variation in use of calcium modification strategies after coronary intravascular lithotripsy was introduced.

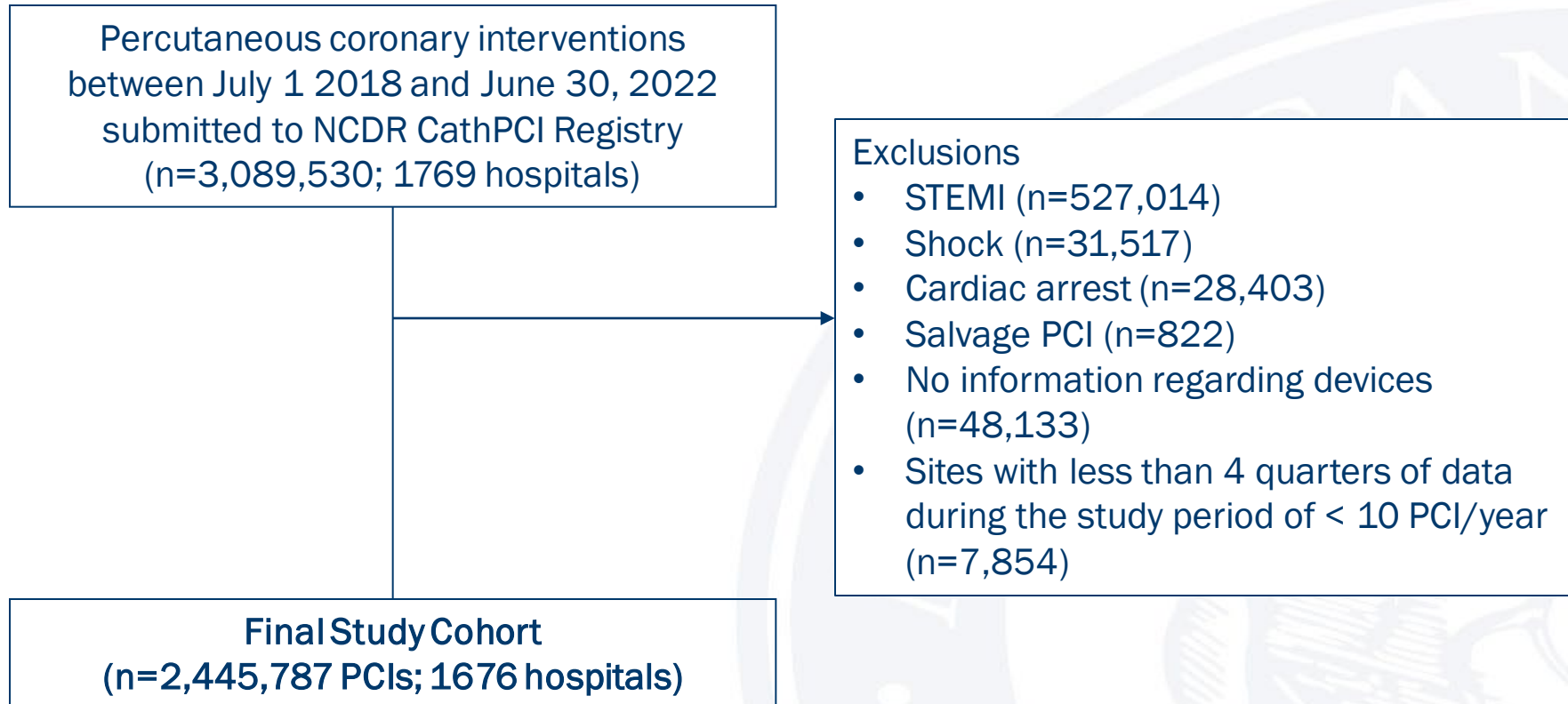


Methods

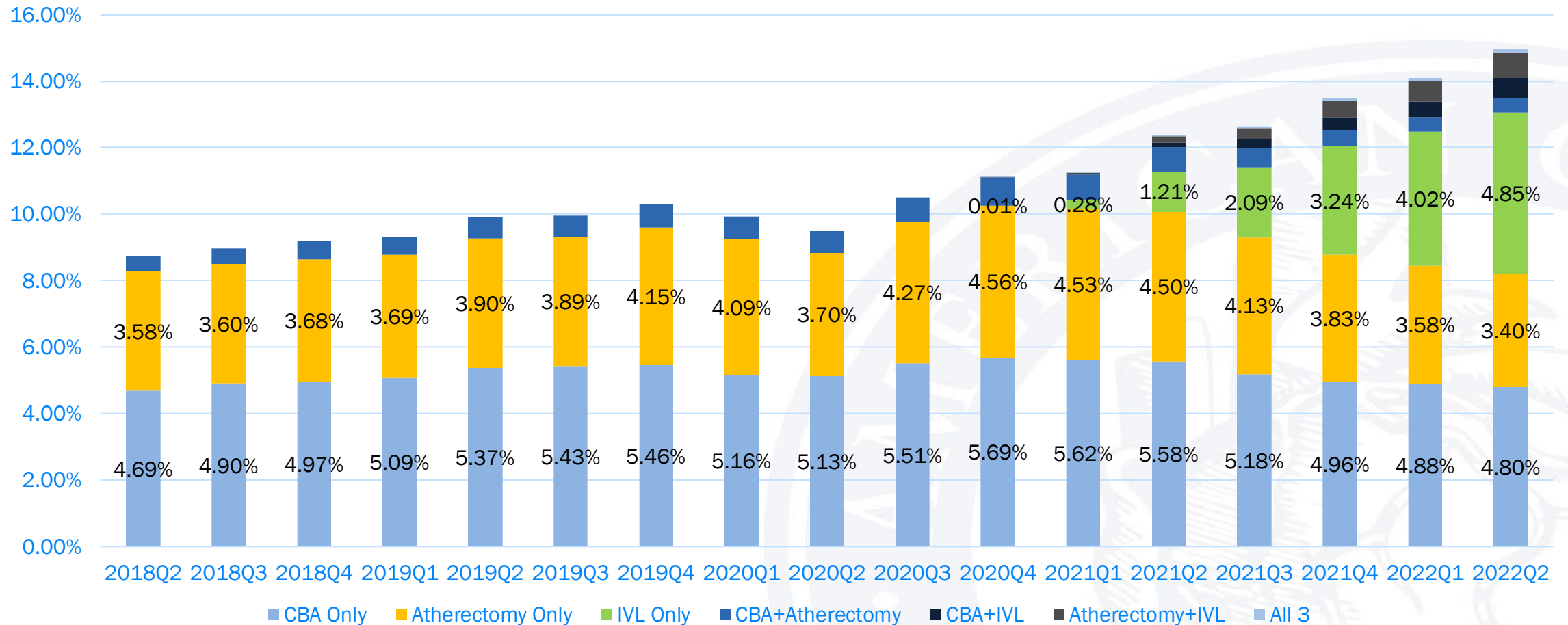
- Study population: Patients in the NCDR CathPCI Registry who received PCI between 7/1/2018 and 6/30/2022
 - Excluded STEMI, cardiogenic shock, cardiac arrest w/i 24 hours, salvage PCI
 - Excluded sites w <10 PCI/yr
- Primary exposure: Calcium modification strategy
 - Cutting or scoring balloon angioplasty (CBA)
 - Rotational or orbital atherectomy
 - Intravascular lithotripsy (IVL)
 - Combination (CBA+IVL, atherectomy+IVL, etc.)



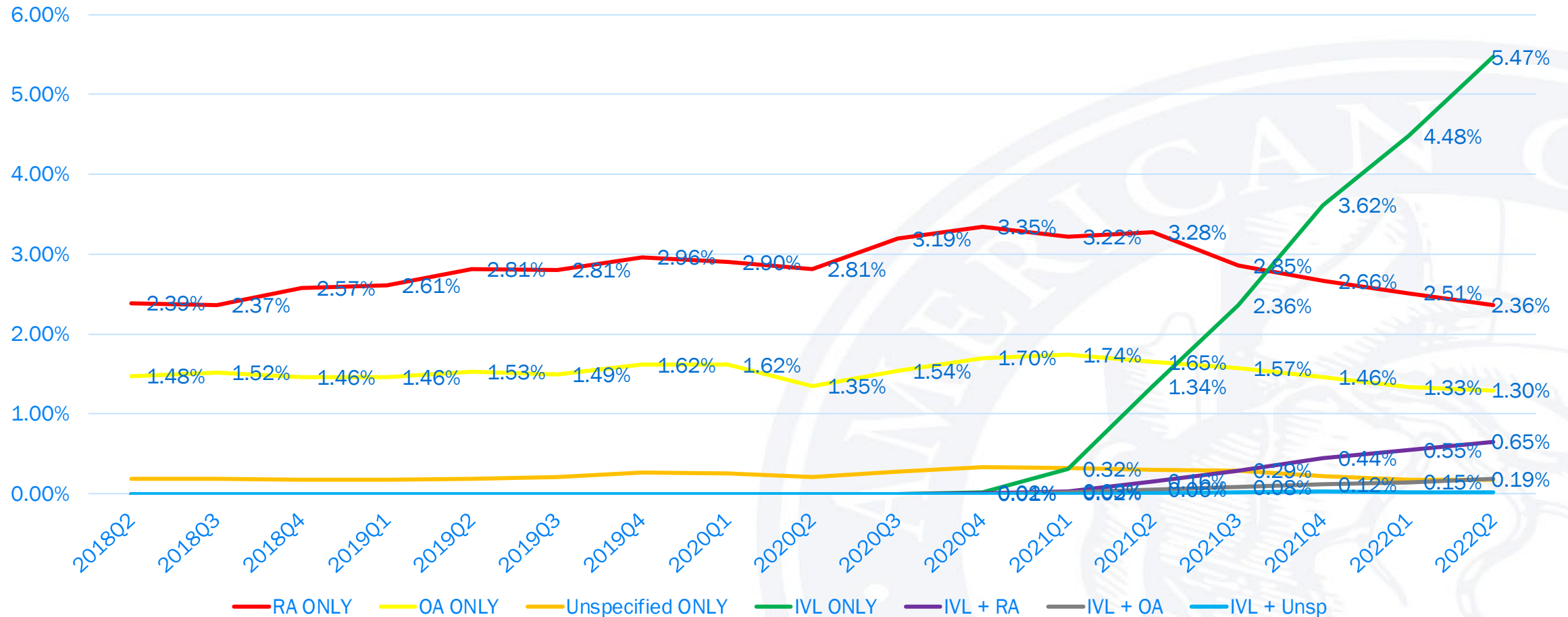
Study Population



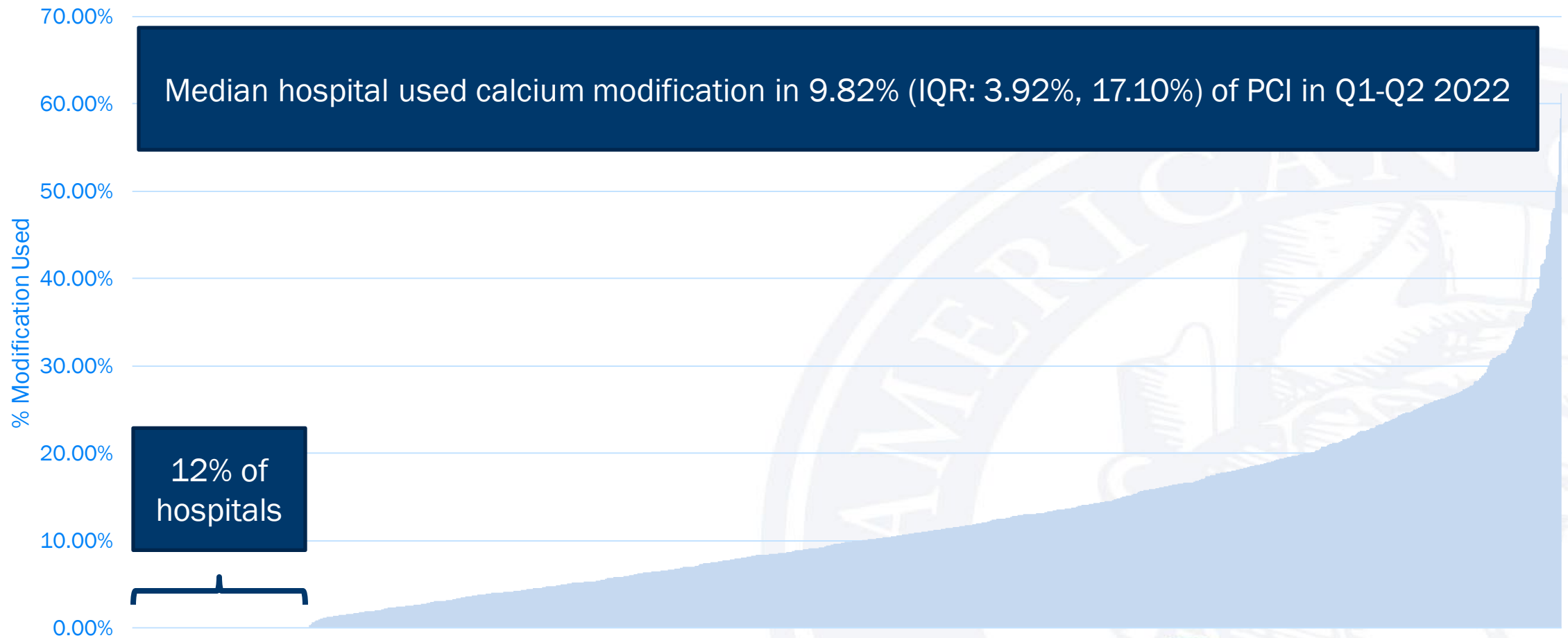
Trends in use of calcium modification strategy among patients undergoing PCI



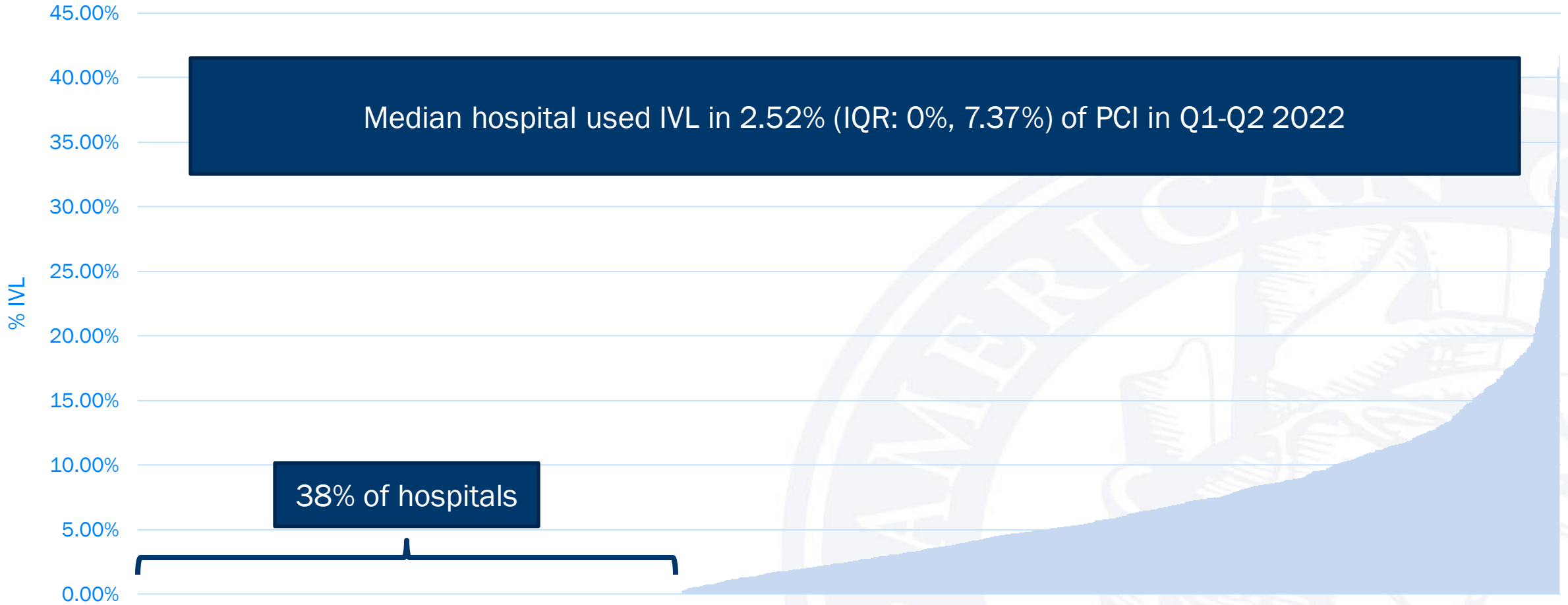
Trends in use of type of atherectomy and IVL among patients undergoing PCI



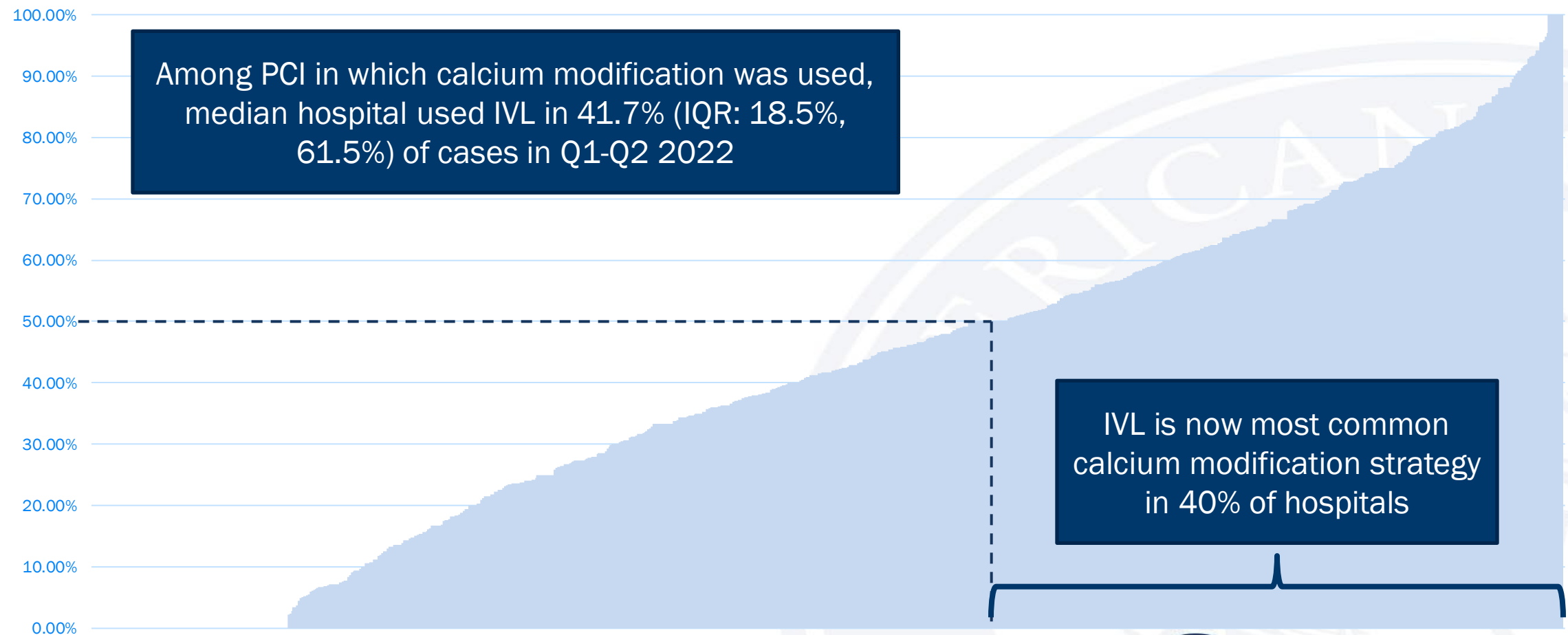
Hospital variation in use of calcium modification



Hospital variation in use of IVL



Use of IVL as calcium modification strategy

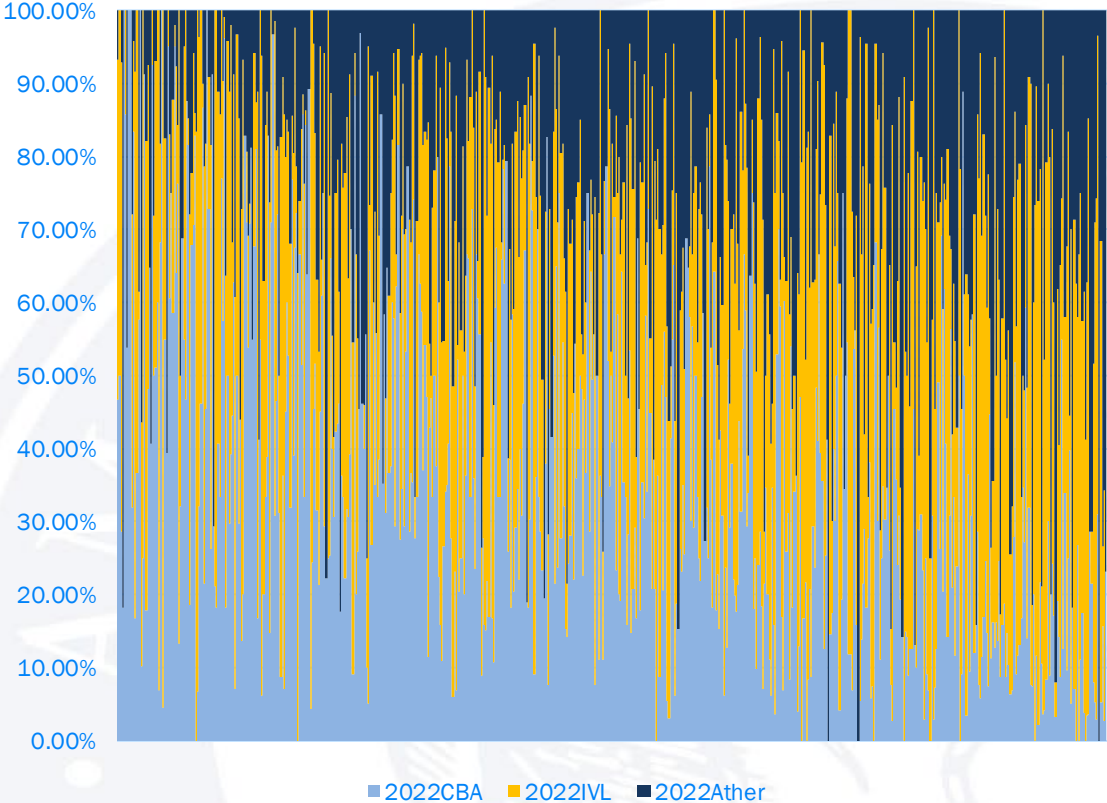


Breakdown of strategy among PCI using any calcium modification, by hospital before and after IVL introduction

2018



2022



Hospital characteristics by IVL use

	Total	Rate of IVL use				P-Value
	n = 1569	0.0 to <.1 n = 600	.1 to <5 n = 396	5 to <10 n = 321	10 to 50.0 n = 252	
Hospital type						< 0.001
Government	33 (2.1%)	19 (3.2%)	4 (1.0%)	7 (2.2%)	3 (1.2%)	
Private	1416 (90.2%)	562 (93.7%)	372 (93.9%)	271 (84.4%)	211 (83.7%)	
University	120 (7.6%)	19 (3.2%)	20 (5.1%)	43 (13.4%)	38 (15.1%)	



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Location						< 0.001
Rural	315 (20.1%)	183 (30.5%)	65 (16.4%)	36 (11.2%)	31 (12.3%)	
Suburban	566 (36.1%)	197 (32.8%)	139 (35.1%)	140 (43.6%)	90 (35.7%)	
Urban	688 (43.8%)	220 (36.7%)	192 (48.5%)	145 (45.2%)	131 (52.0%)	



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Region						0.134
Midwest Region	410 (26.1%)	152 (25.3%)	106 (26.8%)	88 (27.4%)	64 (25.4%)	
Northeast Region	218 (13.9%)	76 (12.7%)	50 (12.6%)	52 (16.2%)	40 (15.9%)	
South Region	652 (41.6%)	254 (42.3%)	183 (46.2%)	114 (35.5%)	101 (40.1%)	
West Region	289 (18.4%)	118 (19.7%)	57 (14.4%)	67 (20.9%)	47 (18.7%)	



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Annual PCI volume						< 0.001
Tertile 1 (16.9 to 256.8)	522 (33.3%)	352 (58.7%)	80 (20.2%)	44 (13.7%)	46 (18.3%)	
Tertile 2 (256.9 to 516.6)	524 (33.4%)	174 (29.0%)	137 (34.6%)	115 (35.8%)	98 (38.9%)	
Tertile 3 (516.7 to 3448.3)	523 (33.3%)	74 (12.3%)	179 (45.2%)	162 (50.5%)	108 (42.9%)	



Summary and Conclusions

- Use of coronary IVL rapidly increased after commercial introduction, and is now the most common calcium modification strategy, amounting to 4.9% of all PCI in Q2 2022
- Overall use of calcium modification strategies increased after introduction of coronary IVL, though IVL displaced some use of atherectomy and cutting or scoring balloons
- There is wide variation in use of calcium modification strategies and IVL across hospitals
- In Q1-Q2 2022, 38% of hospitals do not use coronary IVL at all, whereas the top 5% of hospitals use IVL in 1 out of every 6 cases
- IVL is now most common calcium modification strategy in 40% of hospitals
- There was higher early adoption of IVL in urban, teaching, and high-volume hospitals



Thank you!

- SCAI-Shockwave Early Career Research Grant
- NCDR CathPCI Registry sites
- Robert Yeh, MD, MSc
- Stephen Waldo, MD
- John Messenger, MD
- Eric Secemsky, MD, MSc
- Kevin Kennedy, MS



Backup Slides



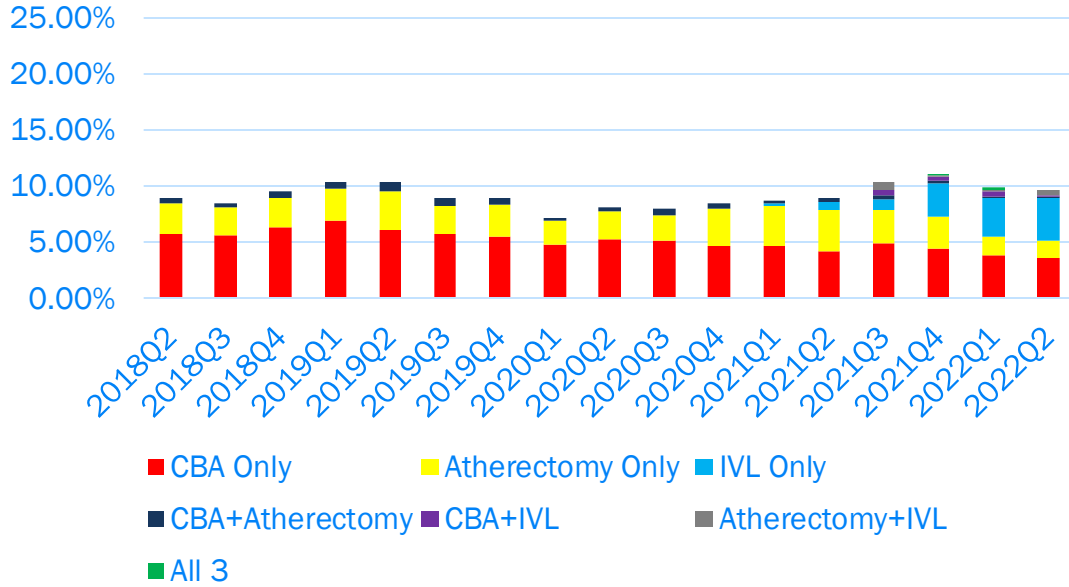
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Methods

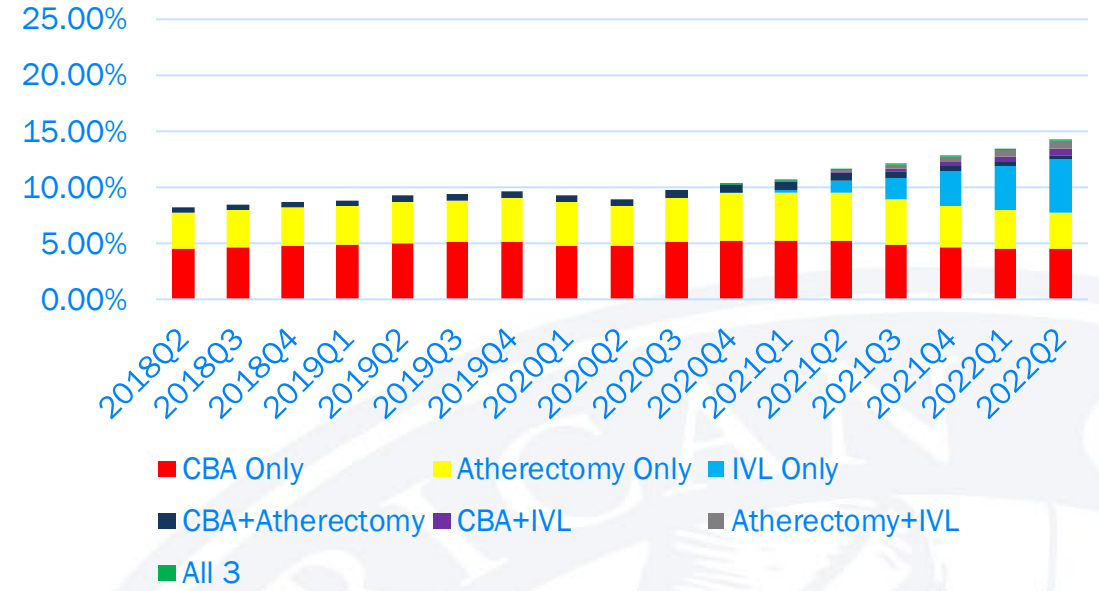
- Statistical analysis
 - We described overall temporal trends in the use of calcium modification strategies in the quarterly proportion of PCI among all patients from Q2 2018 through Q2 2022
 - We examined hospital variation in use of calcium modification strategies for PCI in 2018 and in Q1-Q2 2022
 - We examined choice of strategy among PCI using any calcium modification by hospital Q1-Q2 2022



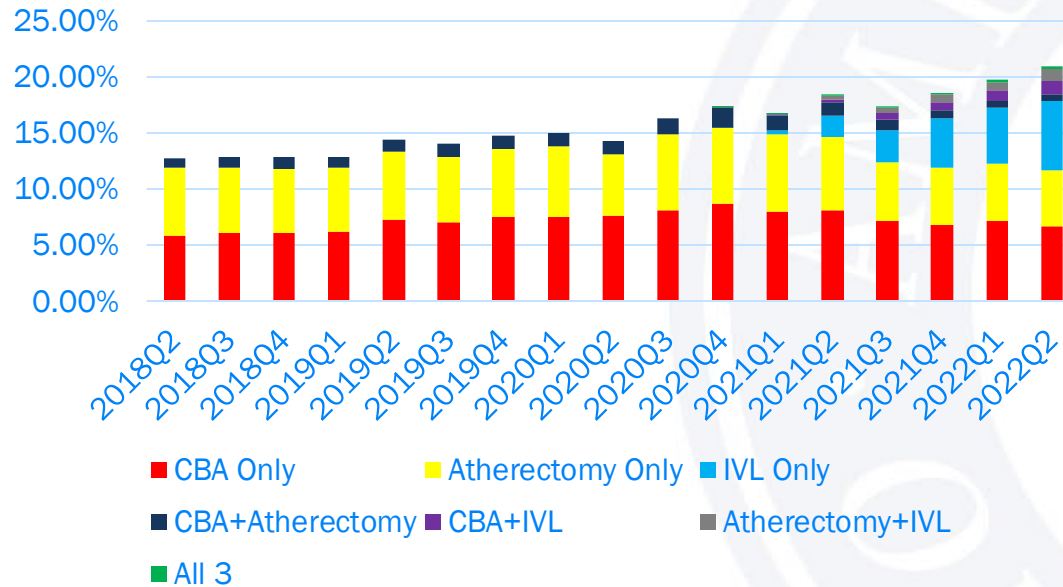
GOVERNMENT



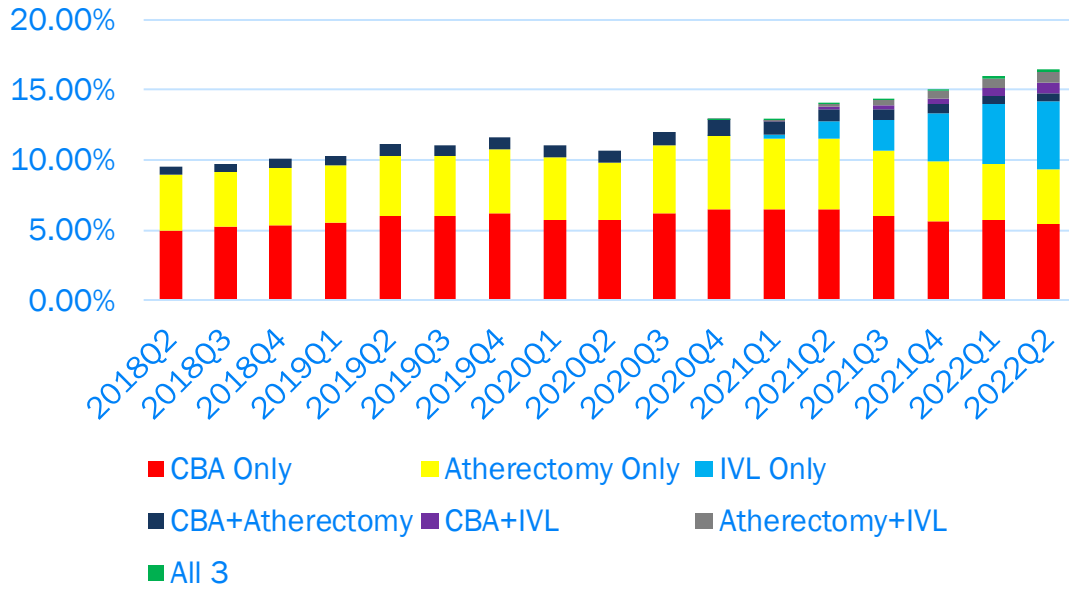
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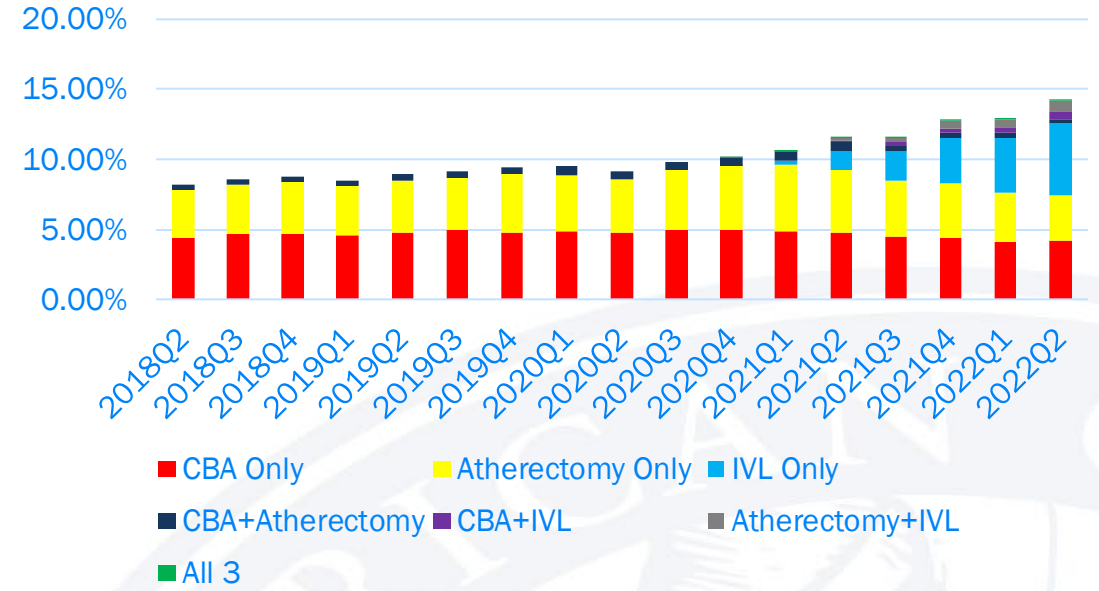
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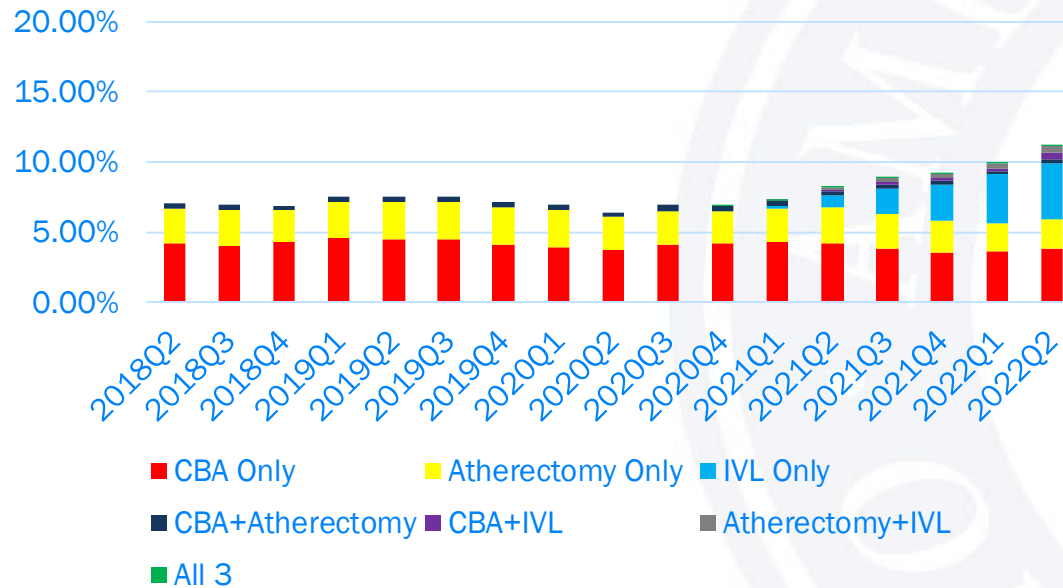
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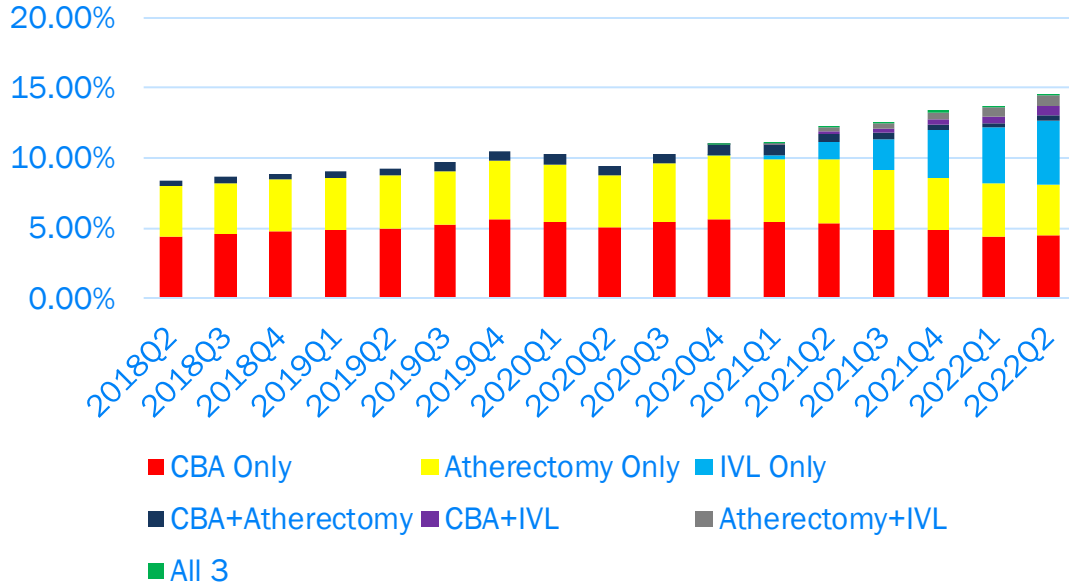
SUBURBAN



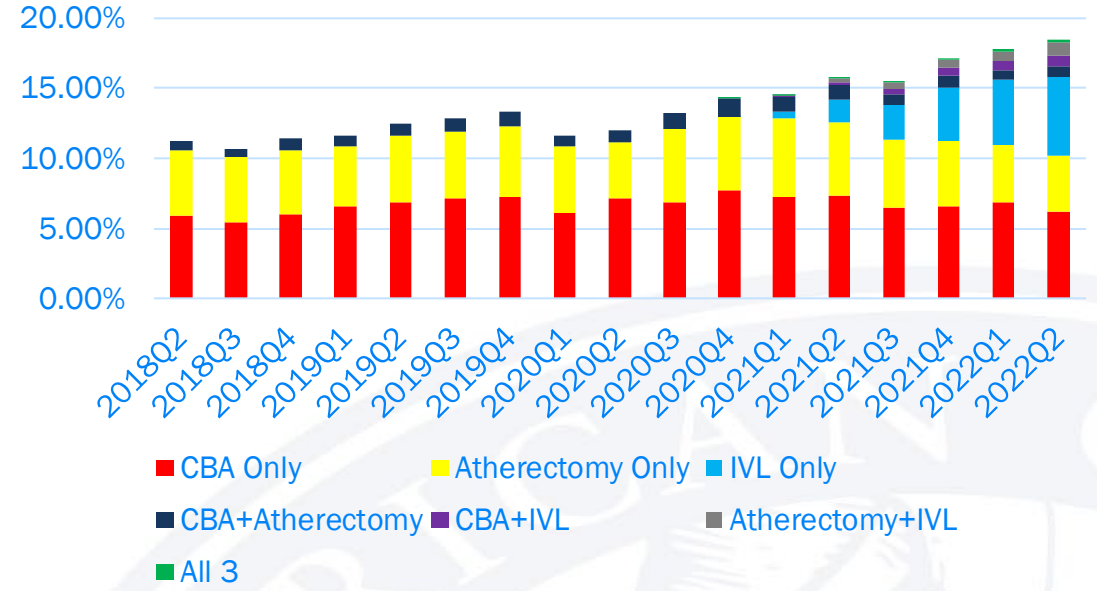
RURAL



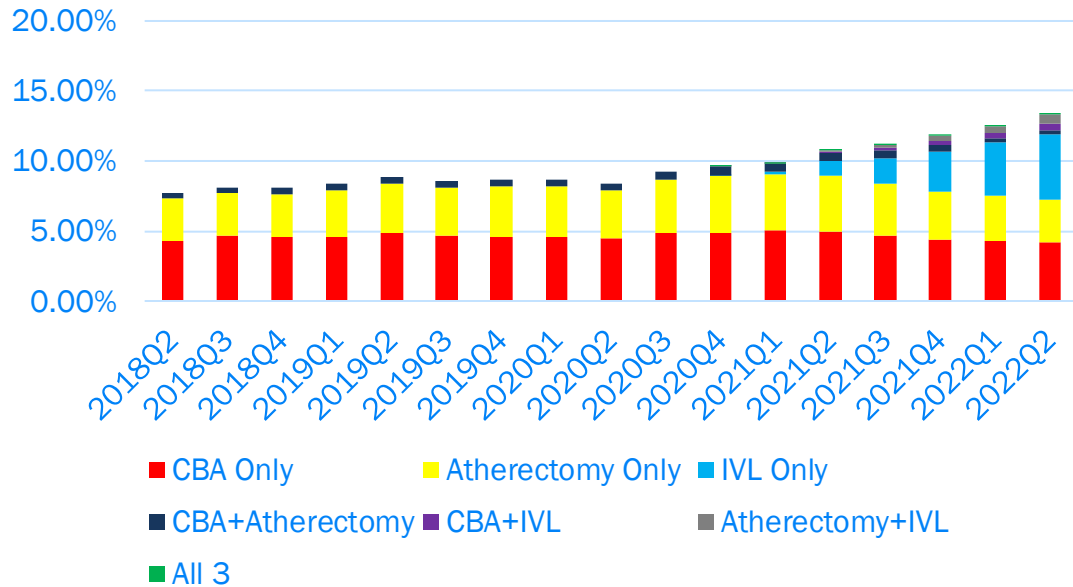
MIDWEST



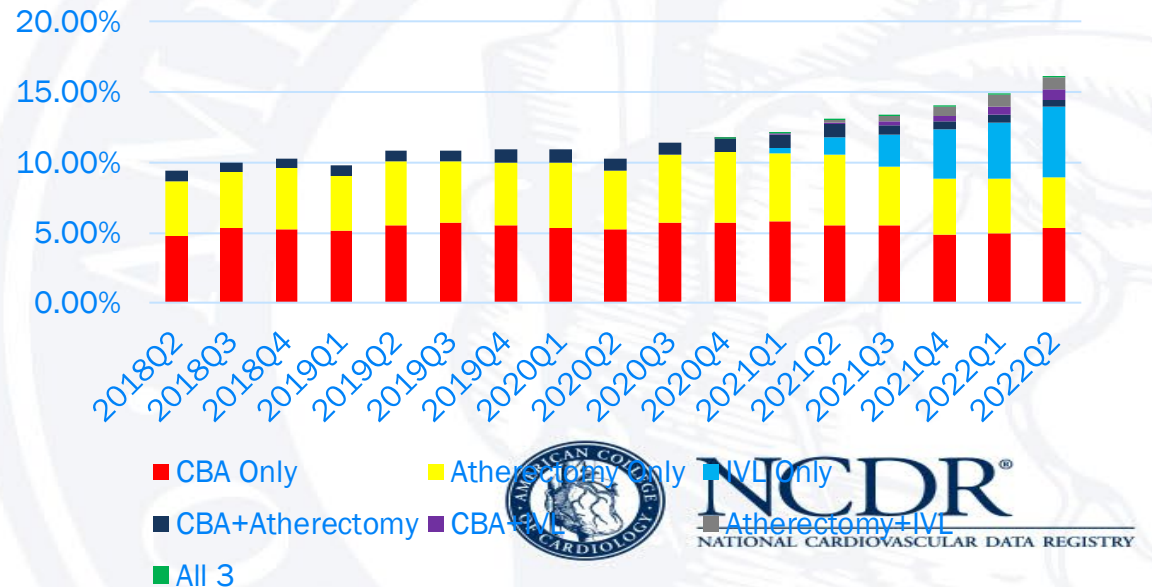
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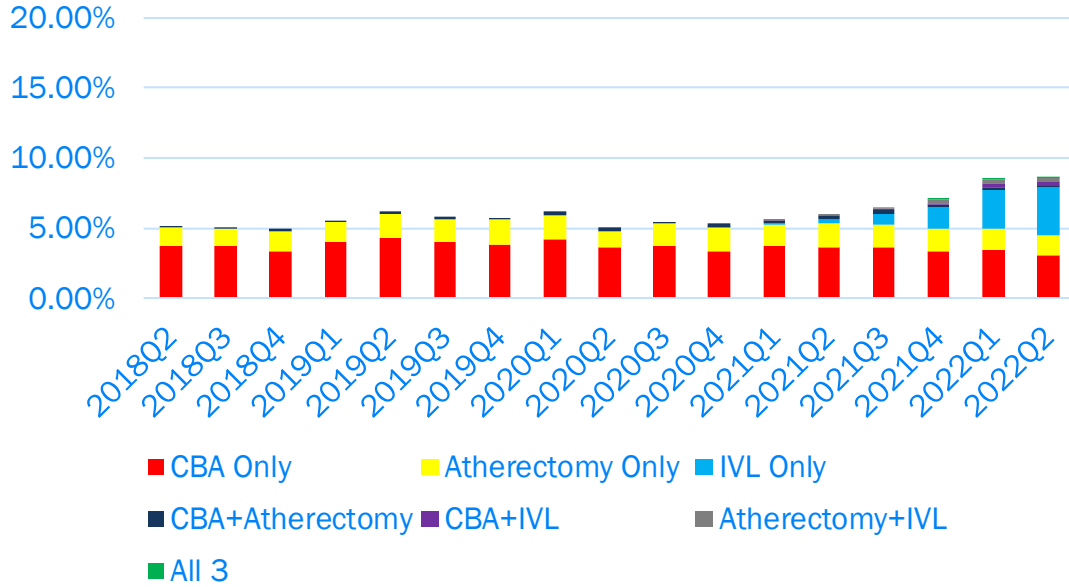
SOUTH



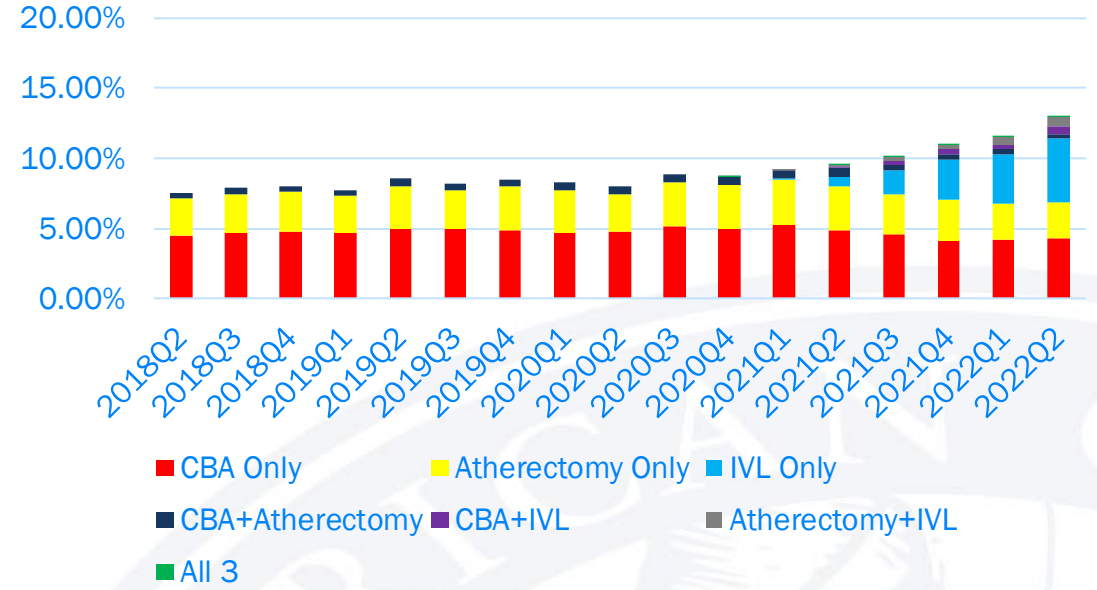
WEST



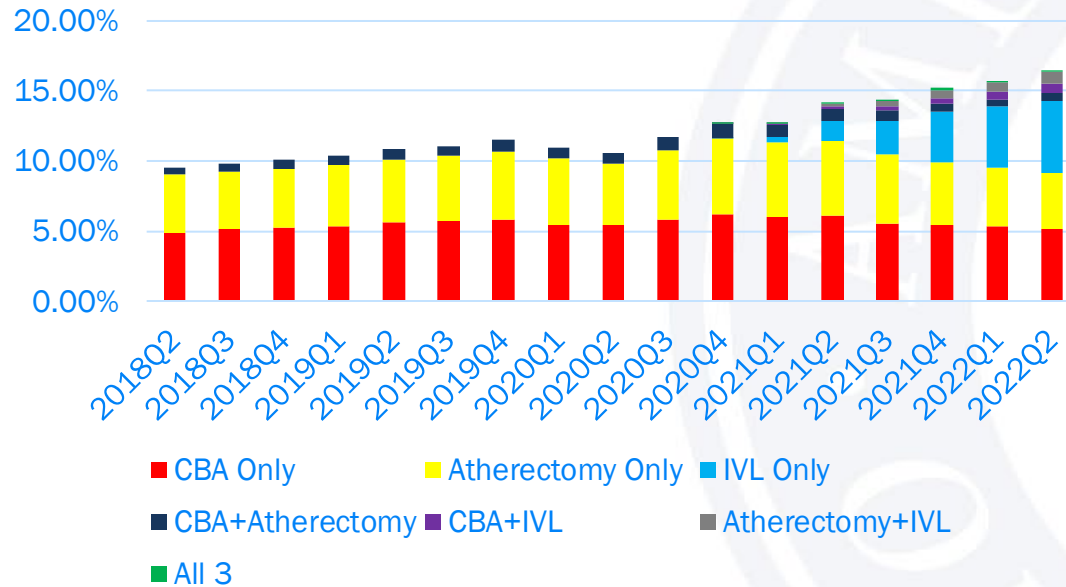
LOWEST VOLUME TERTILE



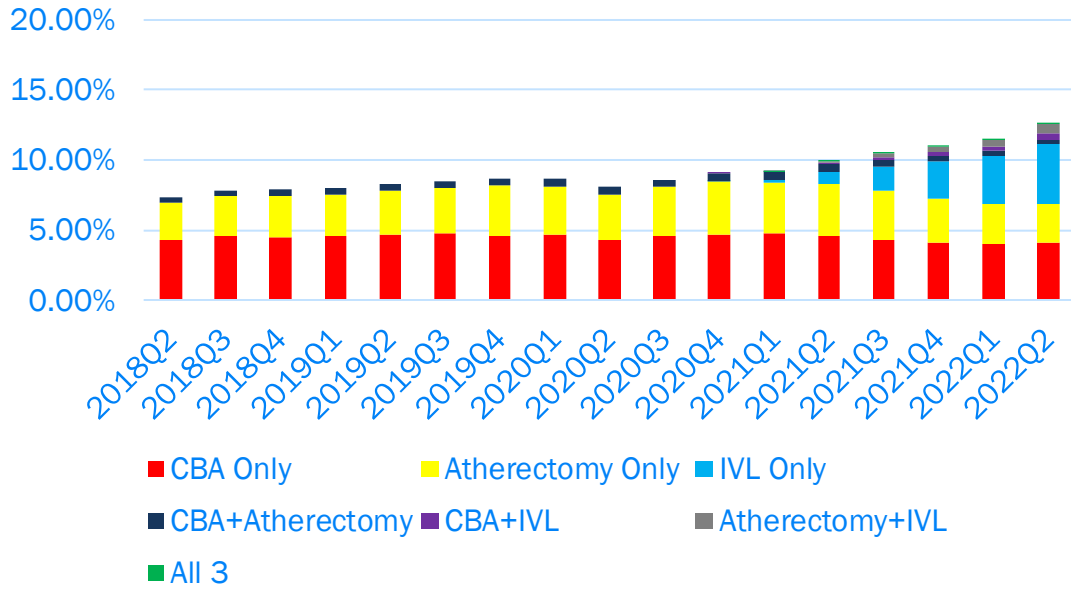
MIDDLE VOLUME TERTILE



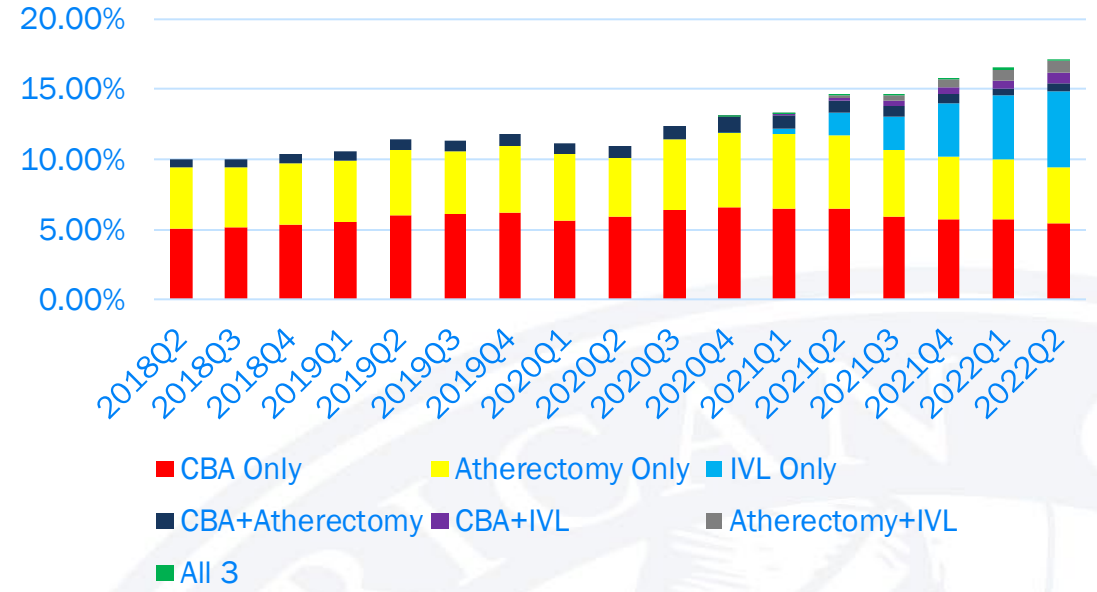
HIGHEST VOLUME TERTILE



NON TEACHING



TEACHING





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