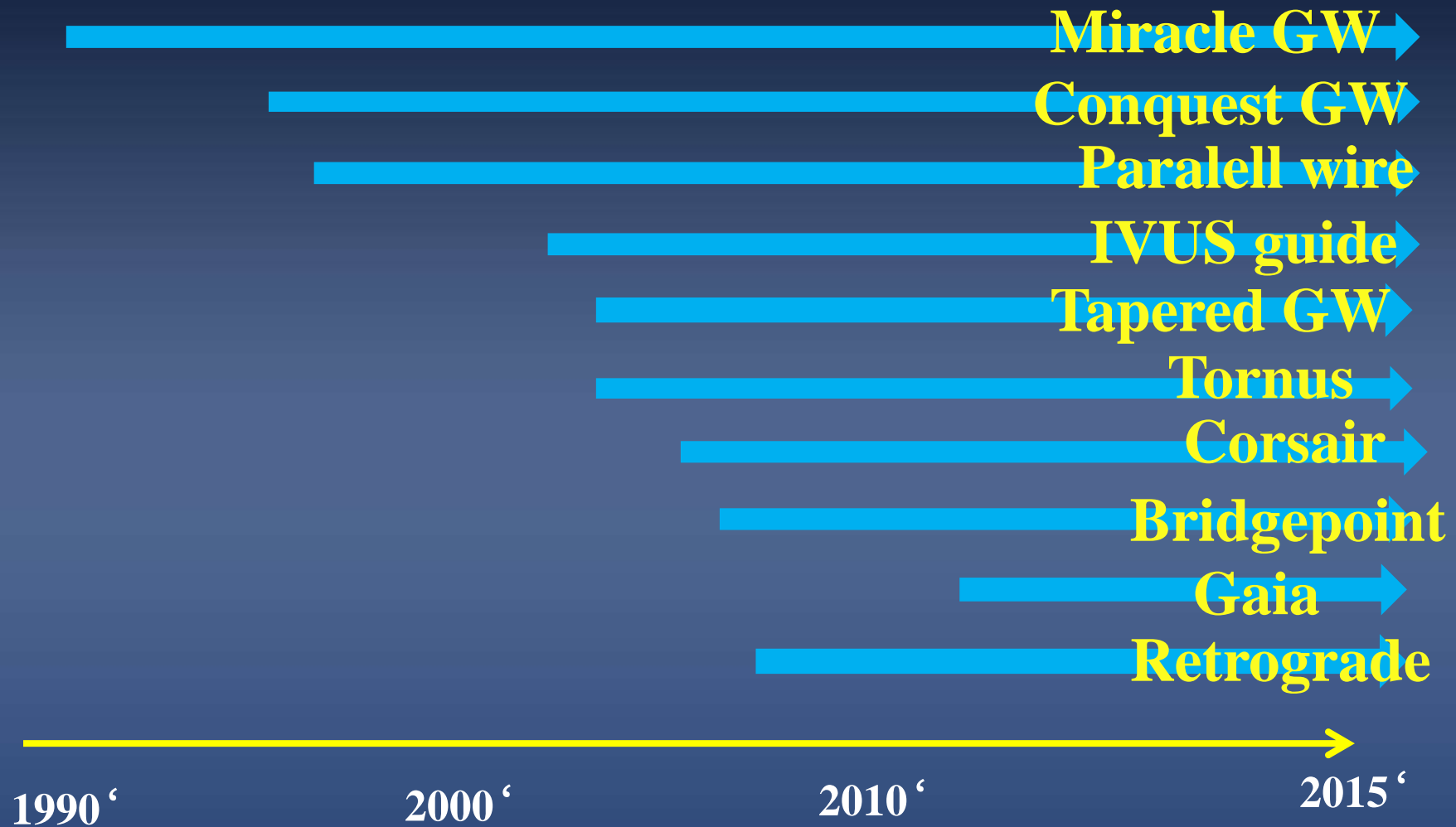


Current CTO Algorithm from Japanese CTO Expert Registry

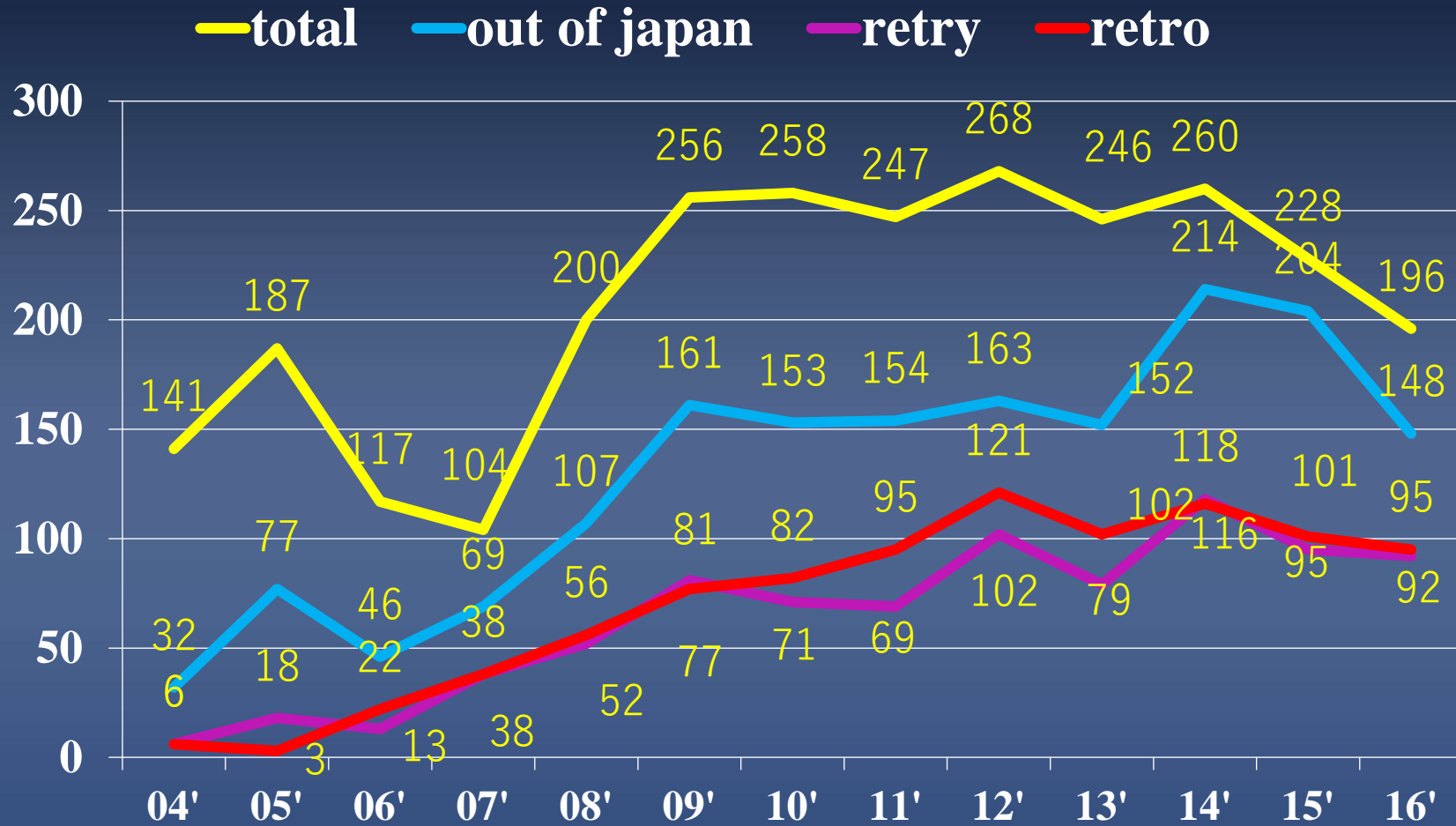
Toshiya Muramatsu

Tokyo Heart Center

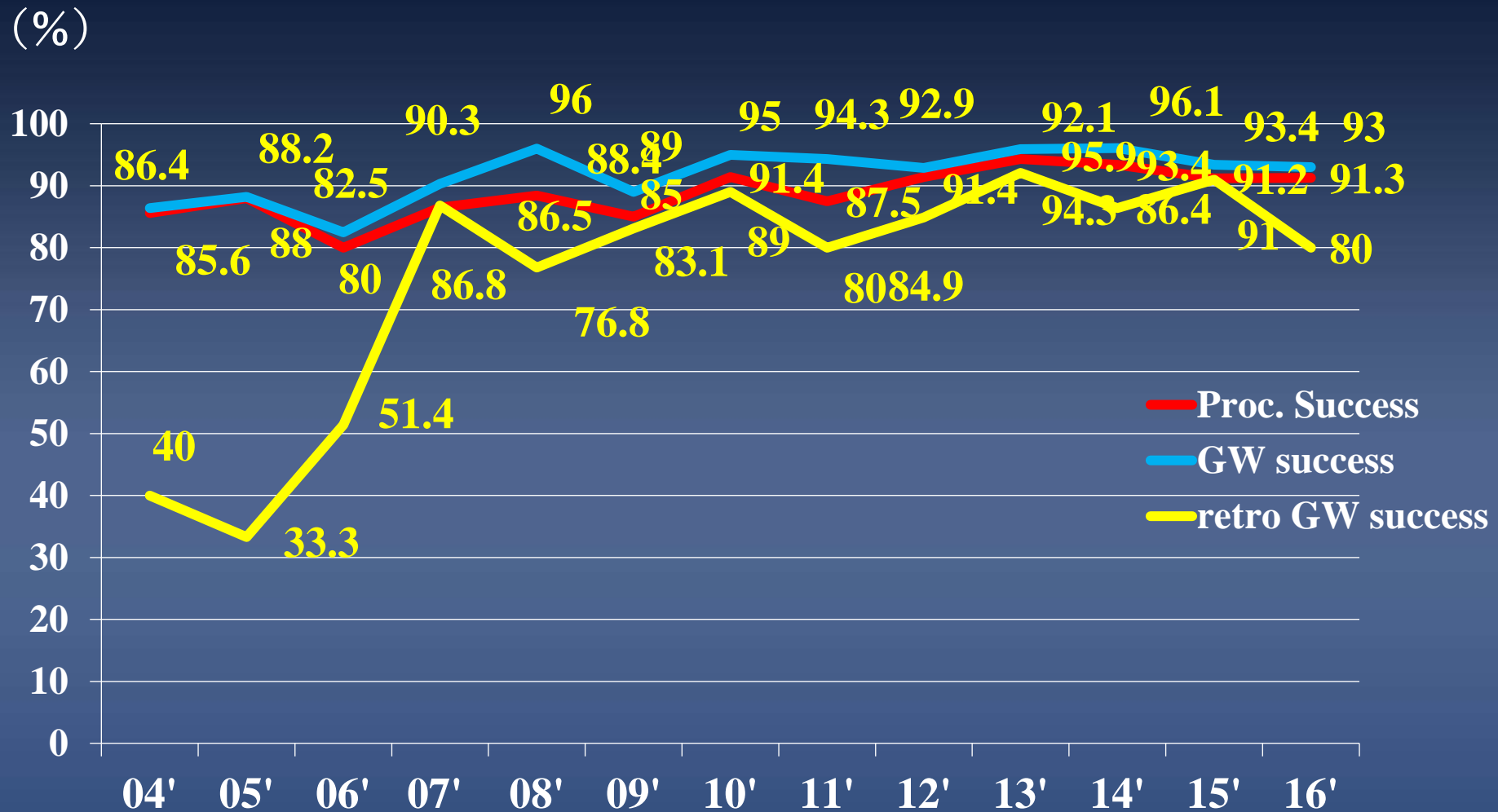
History of PCI for CTO



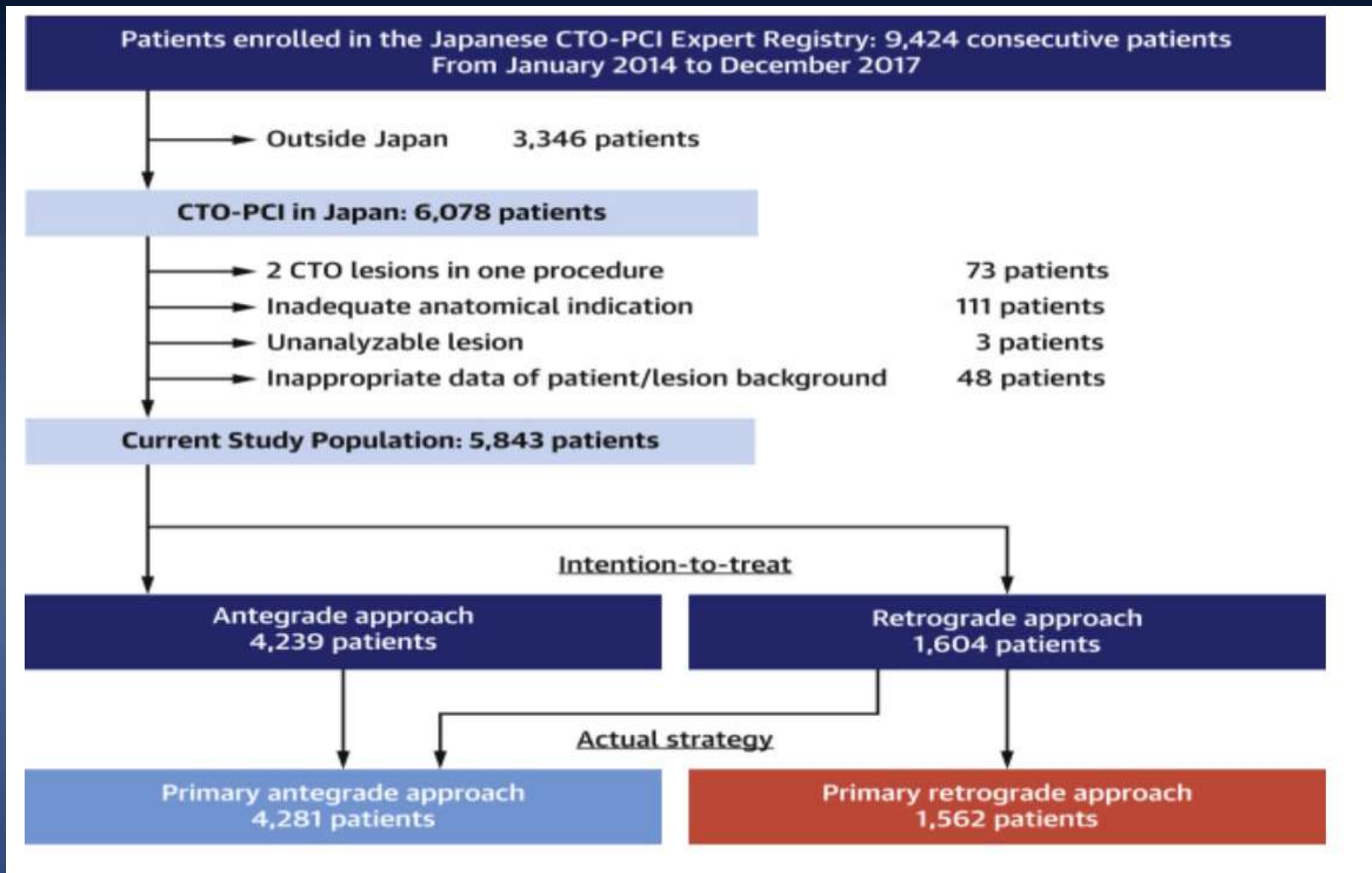
Number of CTO lesion



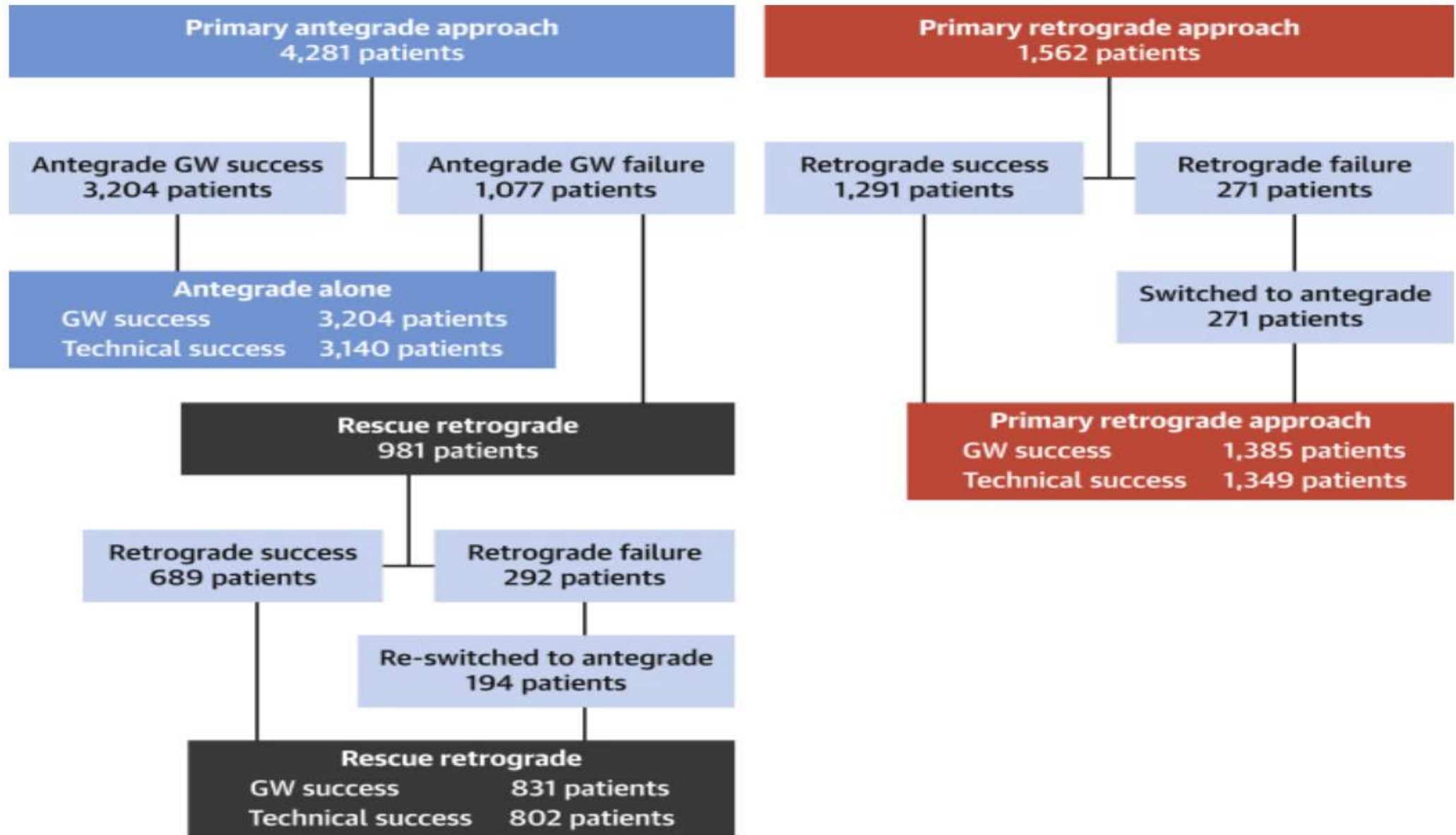
Success rate and retrograde approach for CTO



Patient Flow Chart



Selected CTO Strategies



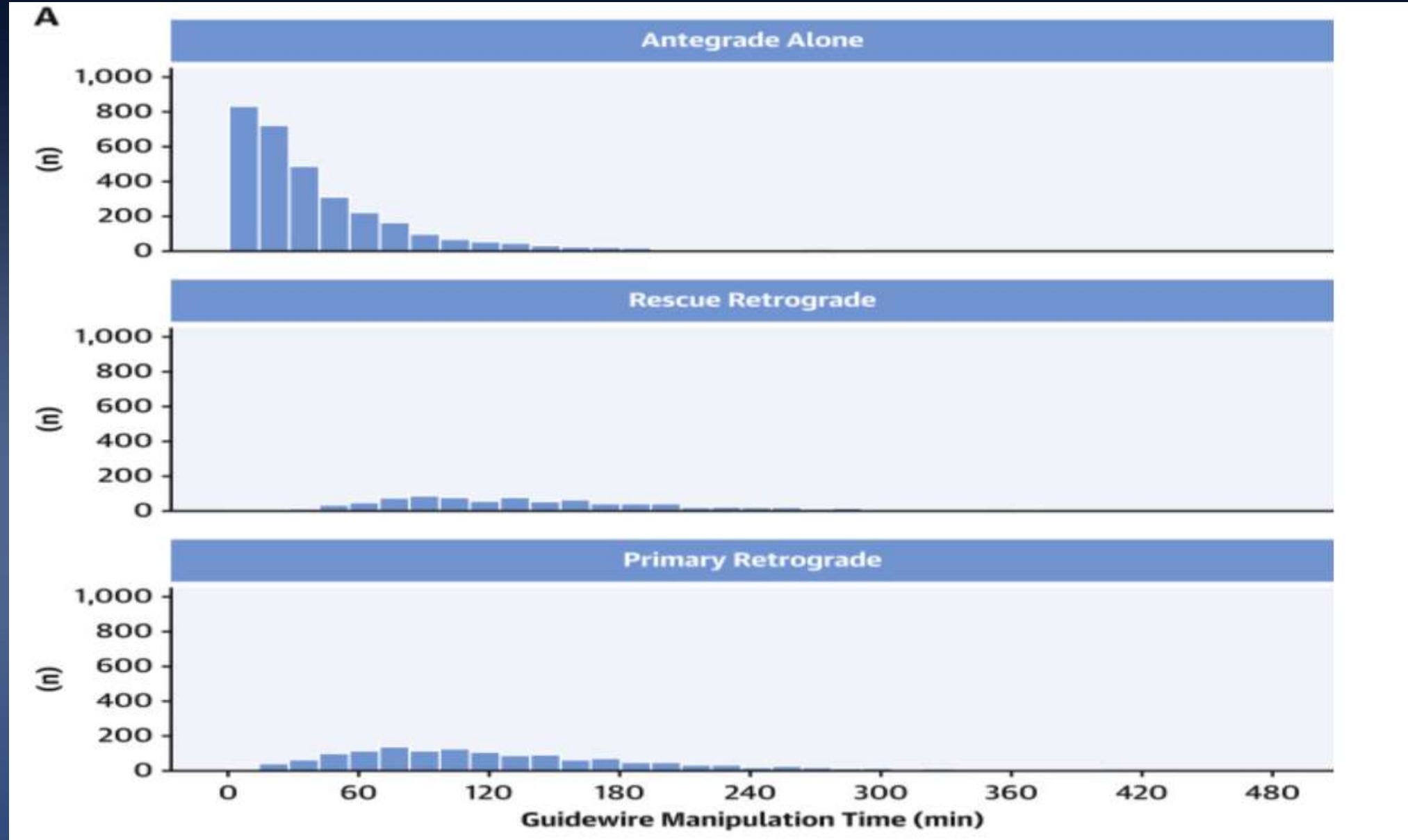
Procedural Characteristics

	Overall (N = 5,843)	Primary Antegrade (n = 4,281)	Primary Retrograde (n = 1,562)	p Value
GW success	5,420 (92.8)	4,035 (94.3)	1,385 (88.7)	<0.01
Technical success	5,291 (90.6)	3,942 (92.1)	1,349 (86.4)	<0.01
Procedural success	5,218 (89.3)	3,900 (91.1)	1,318 (84.4)	<0.01
Stent size				<0.01
<2.5 mm	382 (6.5)	328 (7.7)	54 (3.5)	
2.5–2.9 mm	1,088 (18.6)	880 (20.6)	208 (13.3)	
3.0–3.4 mm	1,670 (28.6)	1,218 (28.5)	452 (28.9)	
≥3.5 mm	1,977 (33.8)	1,329 (31.0)	648 (41.5)	
Total stent length, mm	62.6 ± 30.0	58.3 ± 28.6	74.4 ± 30.5	<0.01
Number of stents	2.1 ± 0.9	2.0 ± 0.9	2.4 ± 0.9	<0.01
GW manipulation time, min	60 (23–120)	40 (17–90)	113 (72–170)	<0.01
Procedural time, min	140 (91–205)	120 (81–180)	190 (145–255)	<0.01
Contrast volume, ml	215.3 ± 100.9	209.8 ± 99.4	230.1 ± 103.5	<0.01
Reasons for technical failure	552 (9.4)	339 (7.9)	213 (13.6)	<0.01
GW did not pass	425 (7.3)	248 (5.8)	177 (11.3)	<0.01
Device did not pass	29 (0.5)	22 (0.5)	7 (0.4)	0.75
Poor runoff of distal artery	68 (1.2)	48 (1.1)	20 (1.3)	0.62
Major side branch occlusion	22 (0.4)	16 (0.4)	6 (0.4)	1.0
Others	26 (0.4)	18 (0.4)	8 (0.5)	0.64
In-hospital adverse outcomes				
MACCE	88 (1.5)	52 (1.2)	36 (2.3)	<0.01
Death	18 (0.3)	11 (0.3)	7 (0.4)	0.24
Procedure-related death	1 (0.0)	1 (0.0)	0 (0.0)	0.55
Non-procedure-related death	15 (0.3)	8 (0.2)	7 (0.4)	0.08
Unknown	2 (0.0)	2 (0.0)	0 (0.0)	0.39
Stroke	11 (0.2)	8 (0.2)	3 (0.2)	0.97
Myocardial infarction	58 (1.0)	31 (0.7)	27 (1.7)	<0.01
Acute stent thrombosis	11 (0.2)	7 (0.2)	4 (0.3)	0.47
Emergent CABG	2 (0.0)	1 (0.0)	1 (0.1)	0.46
Emergent PCI	7 (0.1)	6 (0.1)	1 (0.1)	0.46
Other complications				
Coronary embolism	10 (0.2)	4 (0.1)	6 (0.4)	0.02
Coronary perforation	232 (4.0)	119 (2.8)	113 (7.2)	<0.01
Cardiac tamponade	22 (0.4)	11 (0.3)	11 (0.7)	0.01
Complication of puncture site	88 (1.5)	60 (1.4)	28 (1.8)	0.28
Contrast-induced nephropathy	324 (5.5)	216 (5.0)	108 (6.9)	<0.01

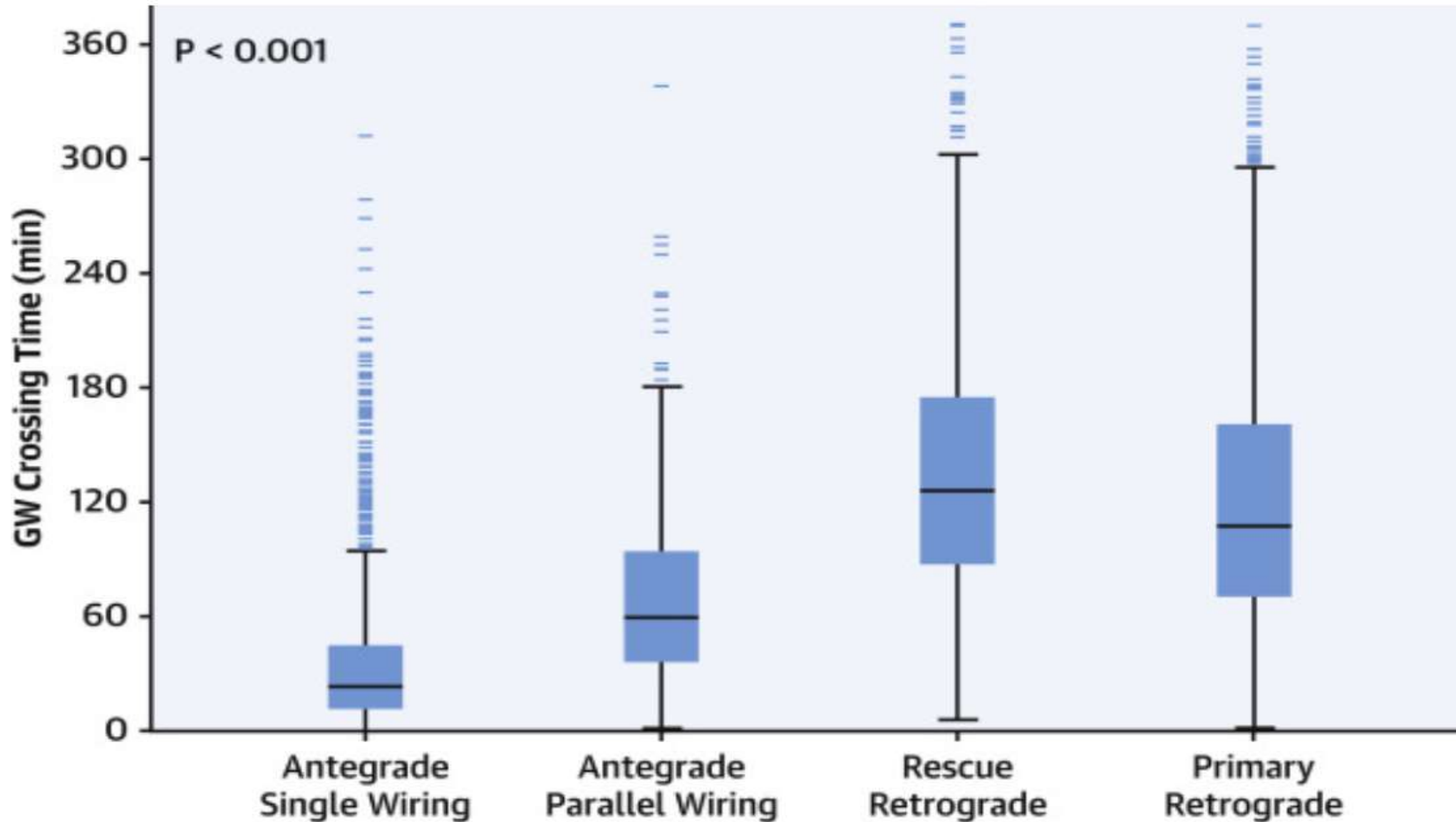
Values are n (%), mean ± SD, or median (interquartile range).

GW = guidewire; MACCE = major adverse cardiac and cerebrovascular events; other abbreviations as in Table 1.

Frequency Distribution of GW Manipulation Time



Frequency Distribution of Successful GW Crossing Time



Univariate and Multivariate Analyses of Technical Success

	Univariate			Multivariate		
	OR	95% CI	p Value	OR	95% CI	p Value
Diabetes	0.80	0.67-0.96	0.015	0.93	0.77-1.12	0.437
Chronic hemodialysis	0.40	0.31-0.53	<0.001	0.59	0.44-0.80	0.001
Prior CABG	0.53	0.40-0.69	<0.001	0.66	0.49-0.89	0.007
Prior PCI	0.72	0.59-0.88	<0.001	0.85	0.69-1.06	0.153
Reattempt	0.63	0.51-0.77	<0.001	0.74	0.59-0.93	0.008
<u>CTO length \geq20 mm</u>	0.48	0.40-0.58	<0.001	0.56	0.45-0.68	<0.001
Side branch at proximal cap	0.78	0.64-0.95	0.011	0.79	0.64-0.98	0.032
Ostial location	0.56	0.40-0.78	0.001	0.85	0.59-1.23	0.394
<u>Severe lesion calcification</u>	0.31	0.24-0.39	<0.001	0.38	0.29-0.50	<0.001
<u>Tortuosity of CTO lesion</u>	0.45	0.37-0.54	<0.001	0.56	0.46-0.69	<0.001
<u>Morphology of proximal cap, no stump</u>	0.60	0.49-0.74	<0.001	0.66	0.52-0.83	<0.001

CI = confidence interval; OR = odds ratio; other abbreviations as in Table 1.

Univariate and Multivariate Analyses of Successful Antegrade GW crossing in Primary Antegrade Approach

	Univariate			Multivariate		
	OR	95% CI	p Value	OR	95% CI	p Value
<u>In-stent occlusion</u>	2.98	2.31-3.83	<0.001	4.08	3.10-5.36	<0.001
CC grade ≤ 1	2.95	2.29-3.80	<0.001	1.28	1.10-1.50	0.001
<u>Reattempt</u>	0.47	0.39-0.56	<0.001	0.49	0.40-0.59	<0.001
Severe lesion calcification	0.64	0.49-0.83	<0.001	0.72	0.54-0.96	0.027
<u>Tortuosity of CTO lesion</u>	0.51	0.43-0.60	<0.001	0.57	0.47-0.69	<0.001
<u>CTO length ≥ 20 mm</u>	0.42	0.37-0.49	<0.001	0.41	0.35-0.48	<0.001
<u>Morphology of proximal cap, no stump</u>	0.58	0.49-0.69	<0.001	0.60	0.49-0.73	<0.001
Bifurcation at exit point	0.77	0.65-0.92	0.004	0.88	0.73-1.06	0.173
Ostial location	0.65	0.47-0.91	0.012	0.84	0.58-1.22	0.356
Non-LAD CTO	0.84	0.72-0.97	0.018	0.85	0.71-1.02	0.072
Contralateral collateral	0.78	0.68-0.90	<0.001	0.95	0.82-1.11	0.536
Mean distal reference diameter <3.0 mm	1.13	0.97-1.31	0.119	1.06	0.90-1.25	0.497
Side branch at proximal cap	0.99	0.85-1.16	0.936	1.03	0.86-1.23	0.757
Proximal tortuosity	0.90	0.79-1.04	0.141	1.11	0.94-1.30	0.231

Univariate and Multivariate Analyses of Successful GW crossing after CC Crossing in Primary Antegrade Approach

	Univariate			Multivariate		
	OR	95% CI	p Value	OR	95% CI	p Value
In-stent occlusion	0.41	0.21-0.81	0.010	0.48	0.22-1.03	0.060
CC grade ≤ 1	0.63	0.41-0.98	0.041	0.63	0.39-1.01	0.056
Reattempt	0.98	0.62-1.56	0.937	0.90	0.55-1.46	0.660
<u>Severe lesion calcification</u>	0.24	0.14-0.40	<0.001	0.23	0.13-0.41	<0.001
Tortuosity of CTO lesion	0.39	0.25-0.61	<0.001	0.46	0.27-0.80	0.006
CTO length ≥ 20 mm	0.55	0.32-0.94	0.030	0.55	0.31-1.01	0.053
Morphology of proximal cap, no stump	1.16	0.67-2.01	0.596	1.23	0.66-2.29	0.526
Bifurcation at exit point	0.75	0.45-1.26	0.279	0.75	0.43-1.32	0.314
Ostial location	0.68	0.34-1.35	0.268	0.90	0.40-2.05	0.801
Non-LAD CTO	0.86	0.51-1.45	0.566	1.49	0.76-2.94	0.249
Contralateral collateral	0.96	0.61-1.52	0.870	1.29	0.79-2.13	0.312
Mean distal reference diameter <3.0 mm	1.92	1.23-2.99	0.004	1.57	0.97-2.55	0.067
Side branch at proximal cap	0.75	0.47-1.22	0.253	0.60	0.34-1.06	0.076
Proximal tortuosity	1.11	0.72-1.72	0.642	0.85	0.52-1.41	0.539

Novel Algorithm for Treating CTO

