MSH Heart Hospital Ranking 2015-2024
(U.S. News & World Report)

Best Hospitals in Cardiology, Heart and Vascular Surgery

1. Cleveland Clinic
2. Cedars-Sinai Medical Center
3. Mayo Clinic
4. **Mount Sinai Hospital**
5. NYU Langone Hospitals
6. New York-Presbyterian Hospital-Columbia and Cornell
7. Northwestern Medicine-Northwestern Memorial Hospital
8. Massachusetts General Hospital
9. Stanford Health Care-Stanford Hospital
10. Lenox Hill Hospital at Northwell Health

MSH Heart Hospital Ranking 2015-2024
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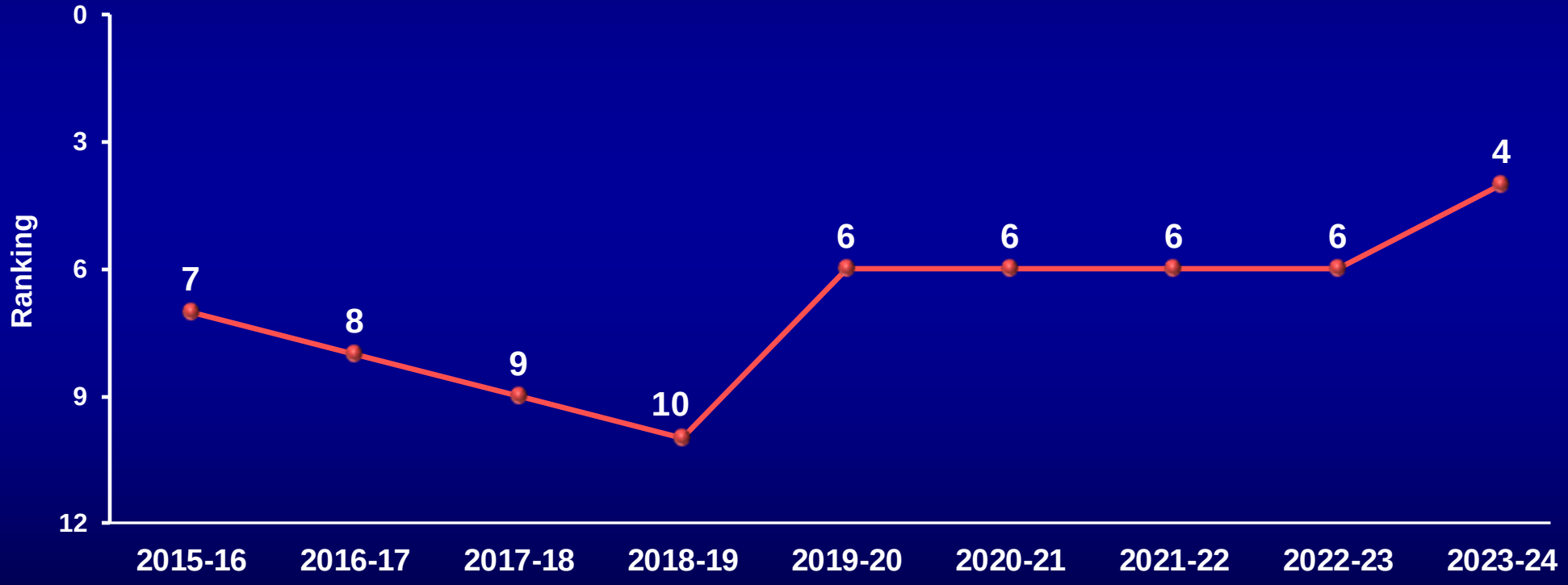
Best Hospitals in Cardiology, Heart and Vascular Surgery



MSH Heart Hospital Ranking Score Card 2023-2024
(U.S. News & World Report)

Overall Cardiology, Heart & Vascular Surgery Score

National Rank #4

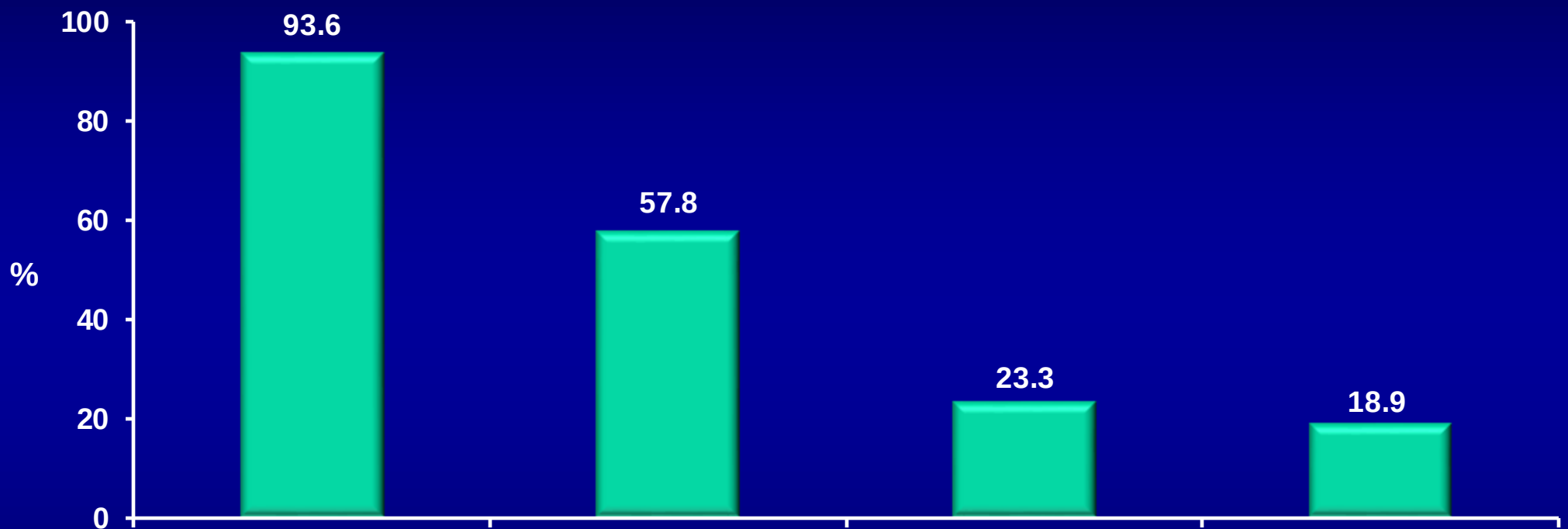
Overall Score 93.6/100

National Score Distribution

This hospital ranked among the top 50 out of 4515 hospitals.

Ineligible for Scoring
Scored / Not Ranked
High Performing
Ranked

MSH Heart Hospital Ranking 2023-2024
(U.S. News & World Report)



30-day survival – Excellent
D/C to home – Excellent
Pt Experience – Average
Patient Volume – Very High

Nursing Staff – Excellent
Advance Tech – Excellent
Patient Svcs – Excellent

Nurse Magnet since 2/1/19
Expert Opinion – Good

MSH Heart Hospital Ranking Score Card 2023-2024
(U.S. News & World Report)

Outcomes and Experience (57.8% of score)

Higher numbers suggest better survival odds, fewer complications and more patients treated.

30-day survival
Survival 30 days after being admitted relative to other hospitals treating similarly complex conditions.
Excellent

Discharging patients to home
How often patients go directly home from this hospital rather than being discharged to another facility.
Excellent

Patient experience
Reflects opinions of inpatients completing a government-endorsed survey in 2021 about the overall quality of their stay.
Average

Number of patients
Relative volume of high-risk patients treated for cardiology-related disorders over three years. Higher volume is associated with better outcomes.
Very High

Professional Recognition (18.9% of score)

Endorsements by respected national organizations demonstrate high standards.

Recognized as Nurse Magnet hospital
Indicates hospital meets high nursing standards. Based on American Nurses Credential Center designation as of December 31, 2022.
✔

Expert opinion
Percentage of cardiologists and heart surgeons in 2021, 2022 and 2023 who named hospital as among best for very challenging patients.
Good
Most hospitals are named by a few specialists or not at all.

Key Programs, Services and Staff (23.3% of score)

Care of challenging patients demands hands-on attention and highly specialized expertise.

Nurse staffing
More nursing care per patient is associated with better outcomes and better patient experience.
Excellent

Intensivists
Whether hospital has at least one intensive-care unit staffed by a doctor specifically certified or trained to care for ICU patients.
✔

Public transparency
Whether hospital submits its cardiovascular data to the Society of Thoracic Surgeons (STS), to the American College of Cardiology (ACC) and/or to the Americna Heart Association (AHA) and was publicly reporting its data by the deadlines specified below. Transparency is important to patient choice of care and in raising industry standards.
✔
This hospital has voluntarily disclosed performance data from both registries.

See public transparency metrics

Advanced technologies
Such as specialized imaging technologies and transplant services.
Excellent

Patient services
Such as programs for cardiac rehabilitation and hospice.
Excellent

Trauma center
Hospital is a certified provider of advanced trauma care.
✔

Complex Coronary Cases Supported by:

- Abbott Vascular Inc.
- Boston Scientific Corp.
- Terumo Vascular Corp.
- Cardiovascular Systems Inc.
- Shockwave Medical Inc.
- Abiomed Inc.
- Chiesi Inc.
- Cardinal Health Cordis Inc.

Disclosures

Samin K. Sharma, MD, MSCAI, FACC

Nothing to disclose

Annapoorna S. Kini, MD, MRCP, FACC

Nothing to disclose

Sameer Mehta, MD, FACC (Moderator)

Nothing to disclose

CCC Live Case # 170

Patient Demographics
76 yrs, Female

Present Clinical Presentation
Presented with mild angina and a stress MPI, as preop for shoulder surgery, revealed multivessel inferior and lateral ischemia

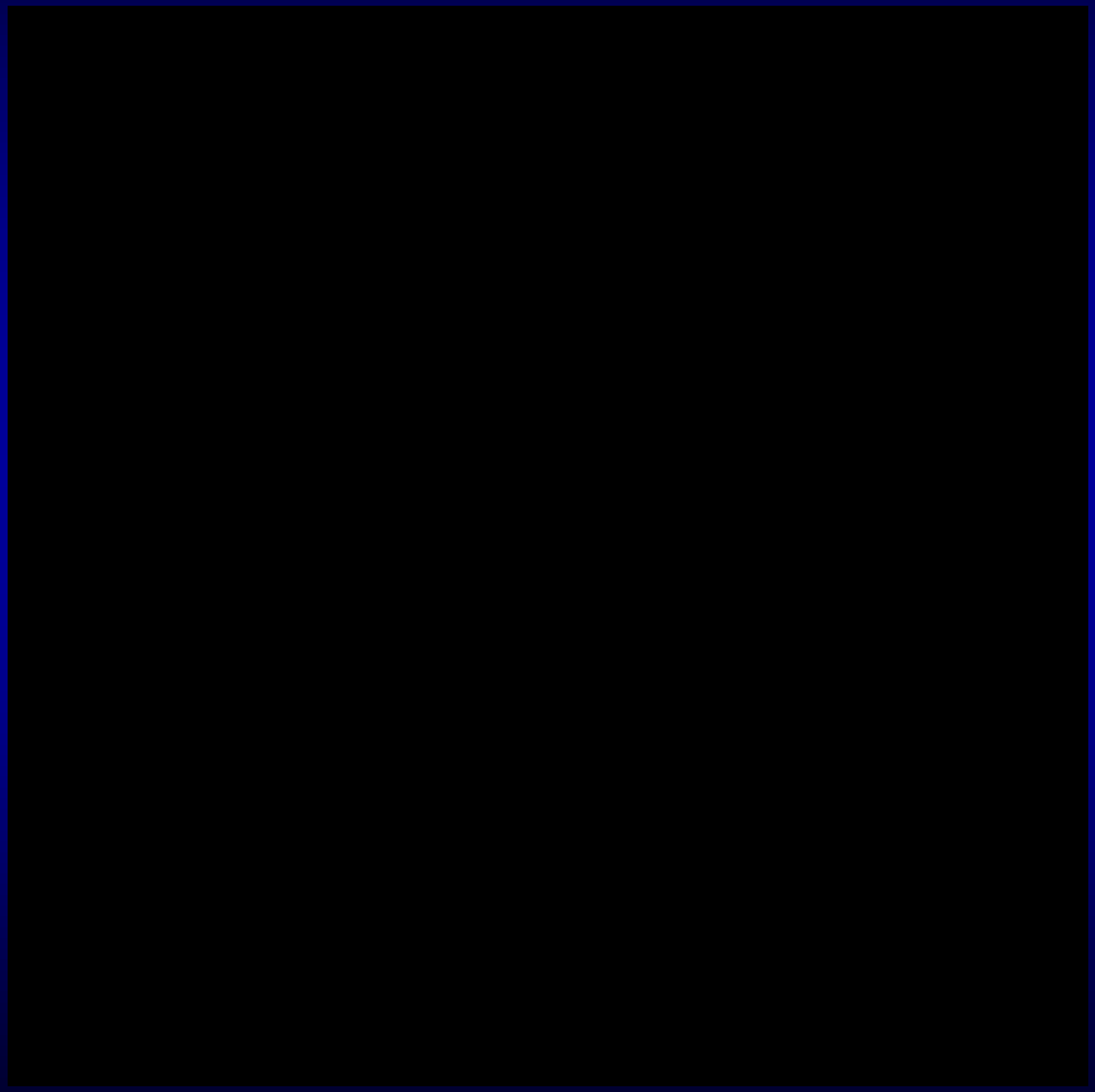
CAD Risk Factors
Controlled Hyperlipidemia
Controlled Hypertension
PAD s/p PTA, OA of knee/shoulder
SAQ-7 score: 89

Clinical Variables
No prior CAD history, Echo unremarkable with normal EF in the past

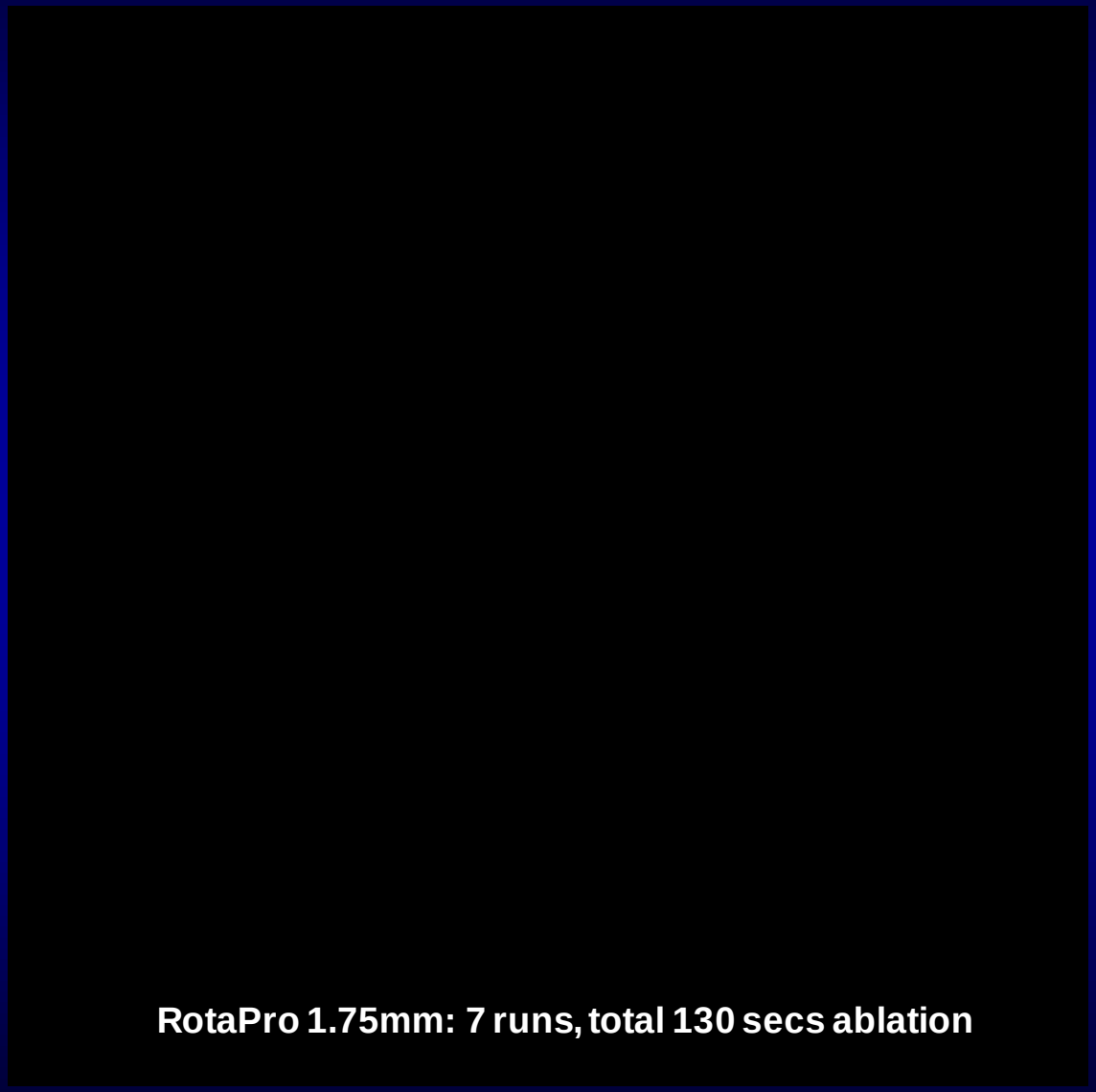
Medications
Aspirin, Nebivolol, Amlodipine, Losartan, Atorvastatin

Cath: Cardiac cath on 7/31/2023 revealed 2 V CAD; multiple calcified 80-95% lesions in RCA, 95% severely calcified angulated lesion in prox LCx with syntax score 20 and LVEF 50%. Pt underwent successful Rota+3DES PCI of RCA with excellent results.

Calcified Proximal, Mid and Distal RCA Lesions

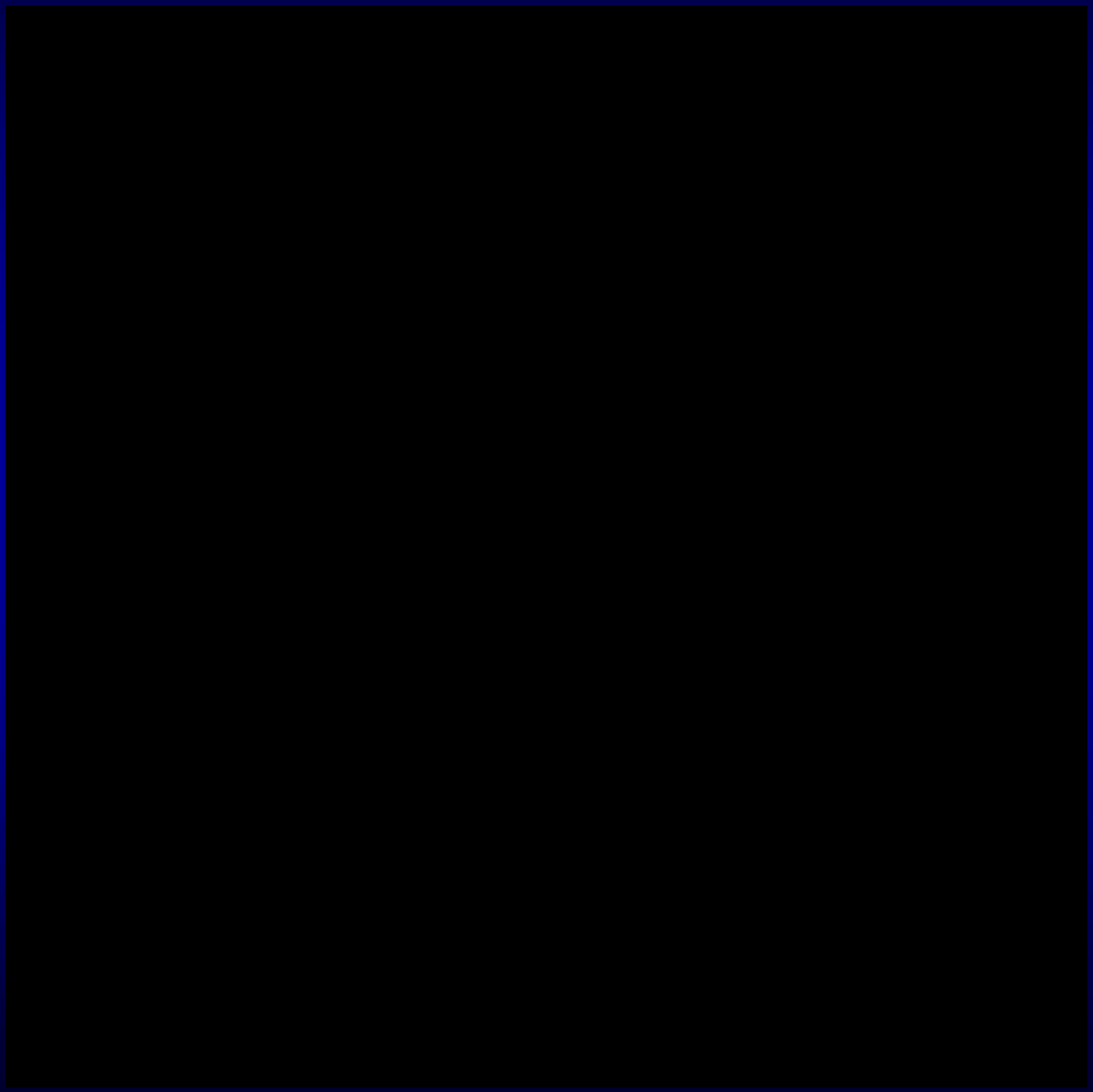


RA

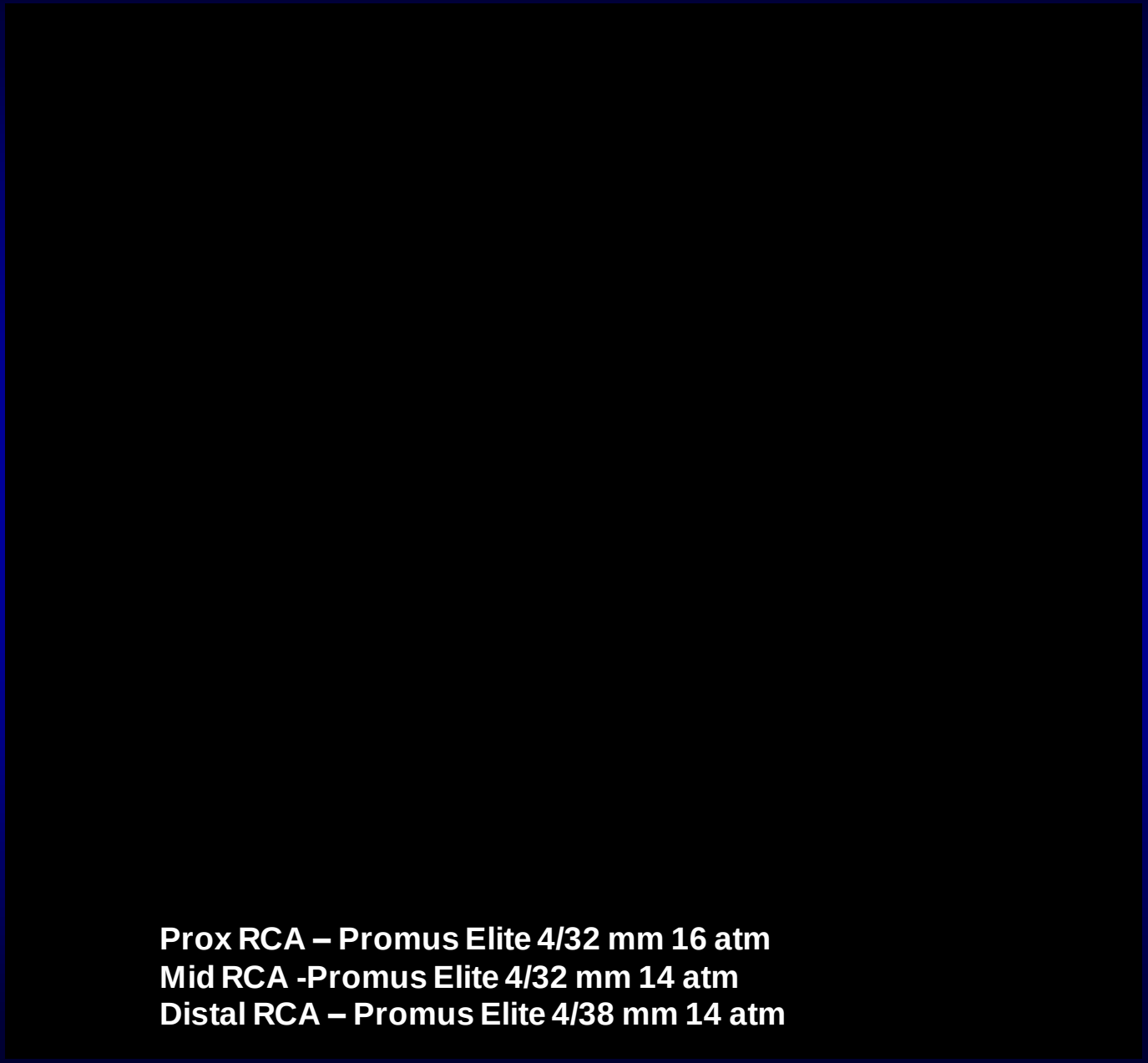


RotaPro 1.75mm: 7 runs, total 130 secs ablation

Stents Deployment



Successful Rota+3DES of RCA



Prox RCA – Promus Elite 4/32 mm 16 atm
Mid RCA -Promus Elite 4/32 mm 14 atm
Distal RCA – Promus Elite 4/38 mm 14 atm

CCC Live Case # 170

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Plan: Now planned for staged complex PCI of angulated calcified prox LCx using rotational atherectomy and DES.

AUC 2017: One-Vessel Disease

Appropriate Use Score (1-9)

One-Vessel Disease

		Asymptomatic				Ischemic Symptoms			
		Not on AA Therapy or With AA Therapy		Not on AA Therapy		On 1 AA Drug (BB Preferred)		On ≥2 AA Drugs	
	Indication	**PCI**	**CABG**	**PCI**	**CABG**	**PCI**	**CABG**	**PCI**	**CABG**
No Proximal LAD or Proximal Left Dominant LCX Involvement									
1.	■ Low-risk findings on noninvasive testing	R (2)	R (1)	R (3)	R (2)	M (4)	R (3)	A (7)	M (5)
2.	■ Intermediate- or high-risk findings on noninvasive testing	M (4)	R (3)	M (5)	M (4)	M (6)	M (4)	A (8)	M (6)
3.	■ No stress test performed or, if performed, results are indeterminate ■ FFR ≤0.80*	M (4)	R (2)	M (5)	R (3)	M (6)	M (4)	A (8)	M (6)
Proximal LAD or Proximal Left Dominant LCX Involvement Present									
4.	■ Low-risk findings on noninvasive testing	M (4)	R (3)	M (4)	M (4)	M (5)	M (5)	A (7)	A (7)
5.	■ Intermediate- or high-risk findings on noninvasive testing	M (5)	M (5)	M (6)	M (6)	A (7)	A (7)	A (8)	A (8)
6.	■ No stress test performed or, if performed, results are indeterminate ■ FFR ≤0.80	M (5)	M (5)	M (6)	M (6)	M (6)	M (6)	A (8)	A (7)

Patel et al., J Am Coll Cardiol 2017;69:2212

Latest Issues in Coronary Intervention

- **Interventional Trials from EuroPCR 2023: BIOADAPTOR RCT, CVT-ISR Study, EURO-SHOCK Trial, KISS Study**

Focused review of the month

- **Update in guidelines for chronic coronary disease:** ***2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the management of patients with chronic coronary disease (CCD, CCS in European guidelines)***

Latest Issues in Coronary Intervention

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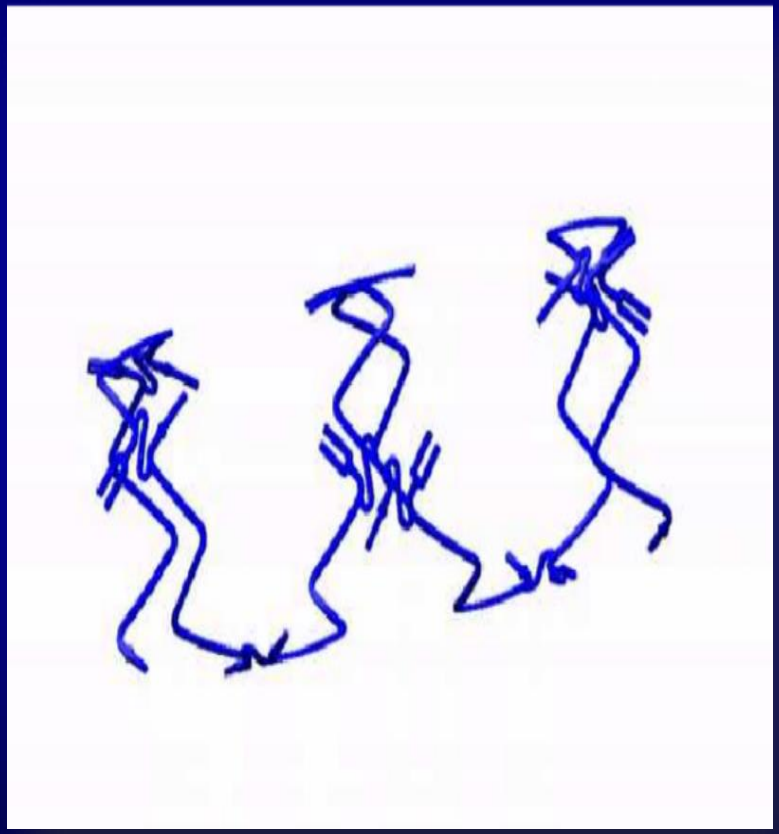
BIOADAPTOR RCT

Randomized Controlled Trial of Sirolimus-Eluting Bioadaptor Scaffold Versus Zotarolimus-Eluting Drug-Eluting Stent

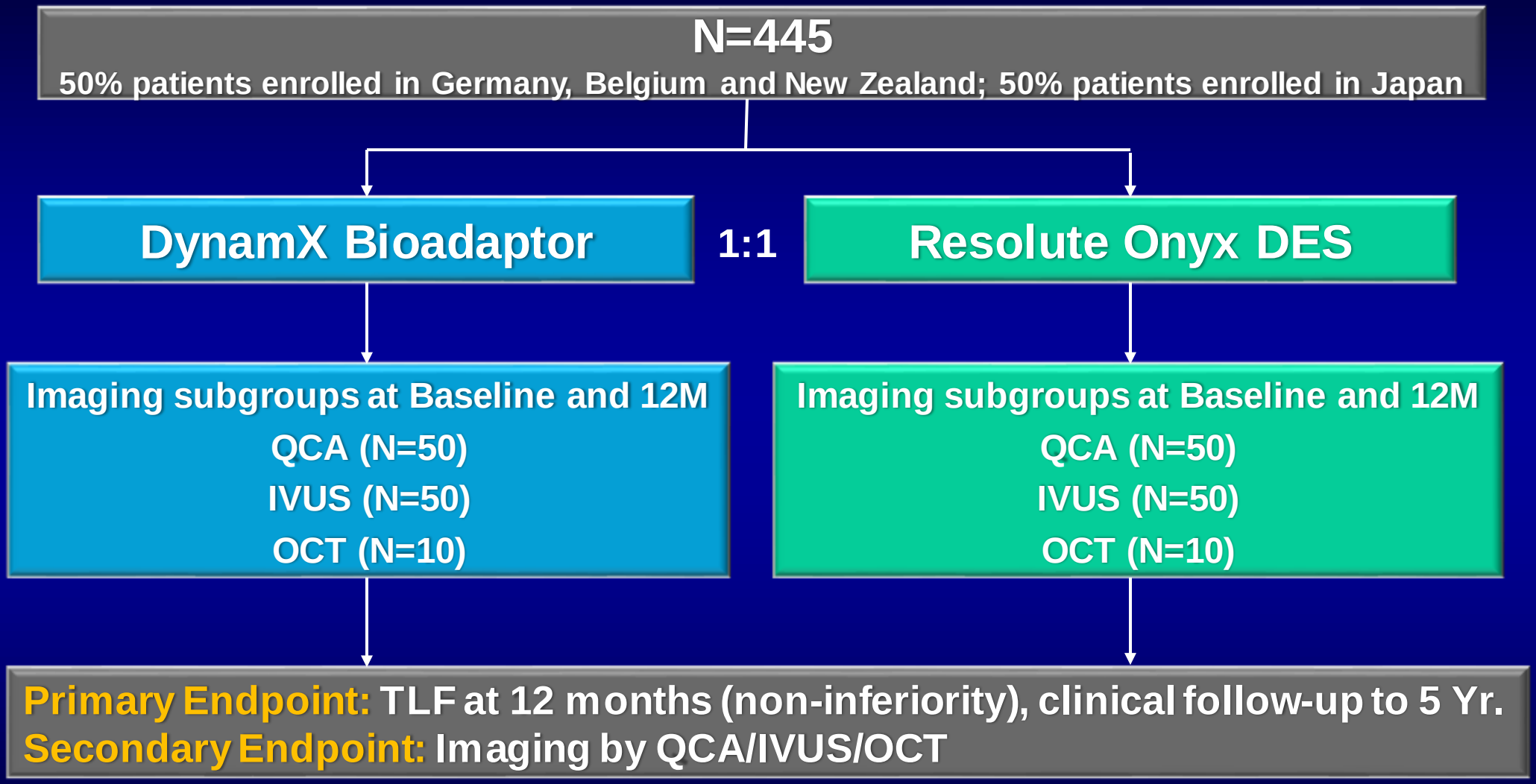
BIOADAPTOR RCT: Study Device
DynamX Bioadaptor Scaffold



- Three thin (71µm) Co-Cr helical sinusoid strands
- PLGA bioresorbable topcoat contains Sirolimus designed to elute over 3 mths
- PLLA bioresorbable polymer basecoat resorbs over 6 months to UNLOCK the scaffold circumferentially along the 3 uncaging elements in each ring
- Following neointimal formation and healing, unlocked helical strands continue to provide dynamic scaffolding support

Saito S, EuroPCR 2023

BIOADAPTOR RCT: Trial Design



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BIOADAPTOR RCT: Procedural Outcomes

Acute Success Rate	DynamX	Resolute Onyx
Device Success*	224/225 (99.6%)	228/229 (99.6%)
Lesion Success**	225/226 (99.6%)	229/230 (99.6%)
Procedure Success***	220/223 (98.7%)	216/222 (97.3%)

*Device success (% diameter stenosis after implantation of allocated study device <30%)
**Lesion success (% diameter stenosis after treatment of target lesion with PCI, PCI, < 30%)
***Procedure success (lesion success without major adverse cardiac events during index hospitalization)

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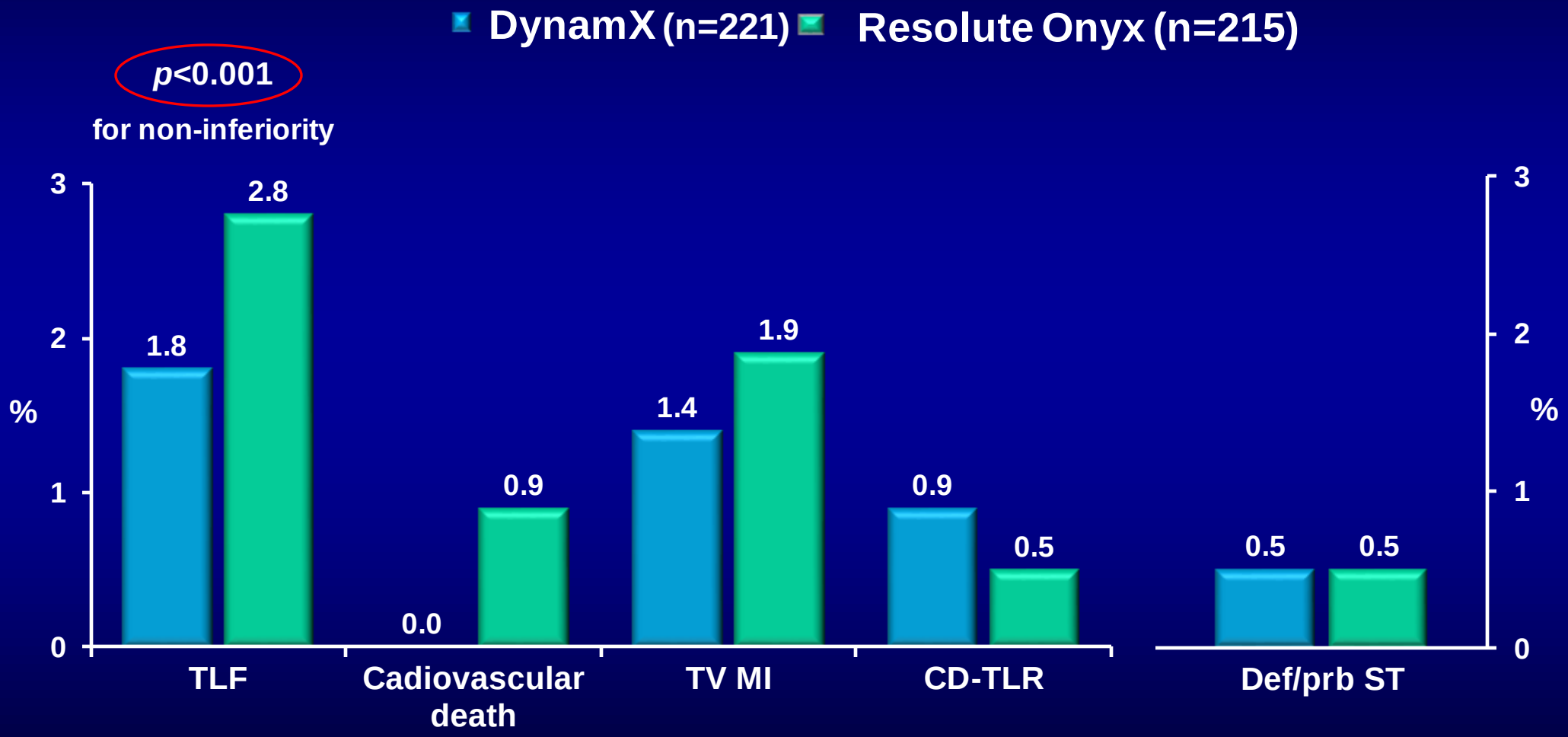
BIOADAPTOR RCT: Primary Endpoint of TLF
(Non-inferiority was met)



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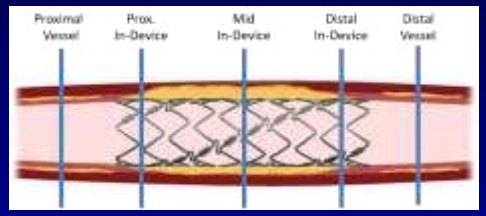
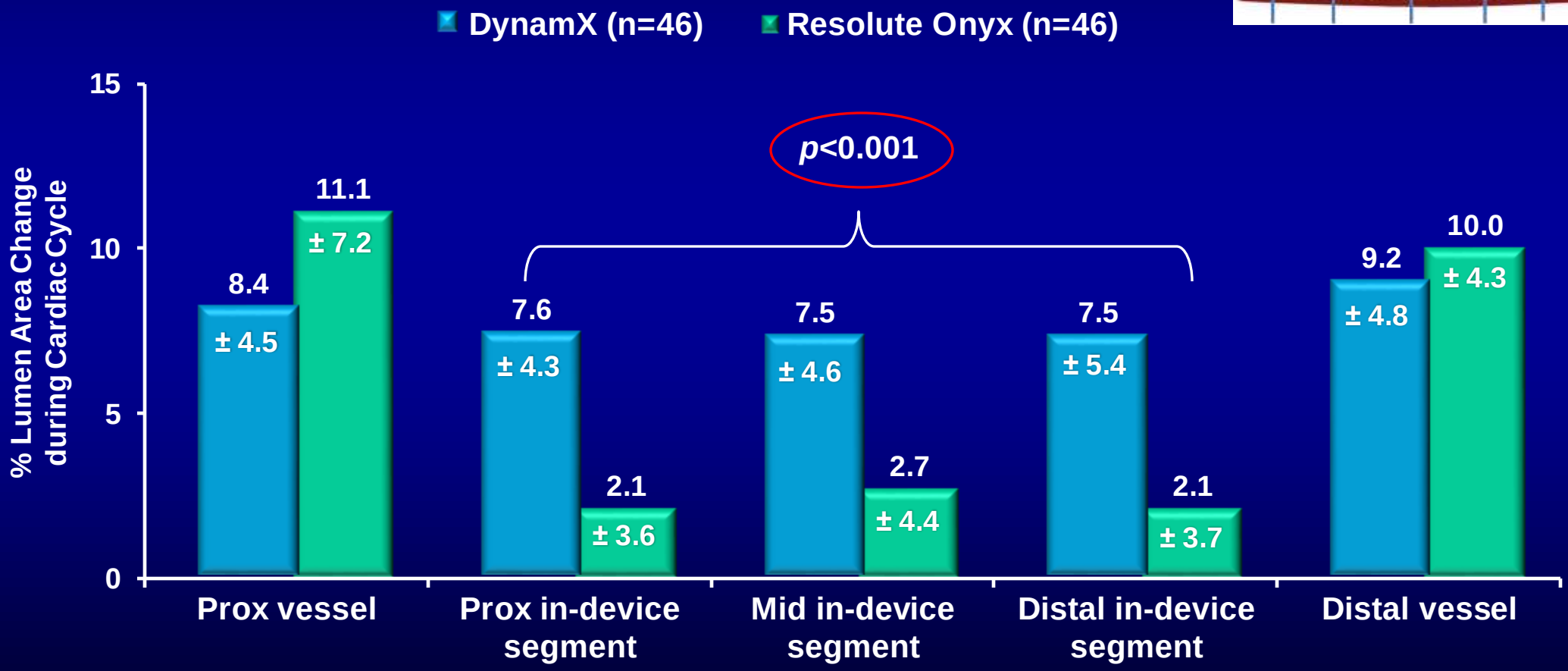
BIOADAPTOR RCT: Pulsatility at 12 Months Restored in DynamX



12-Month Lumen Area Change



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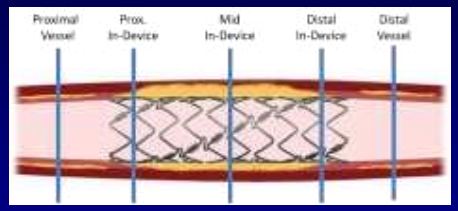
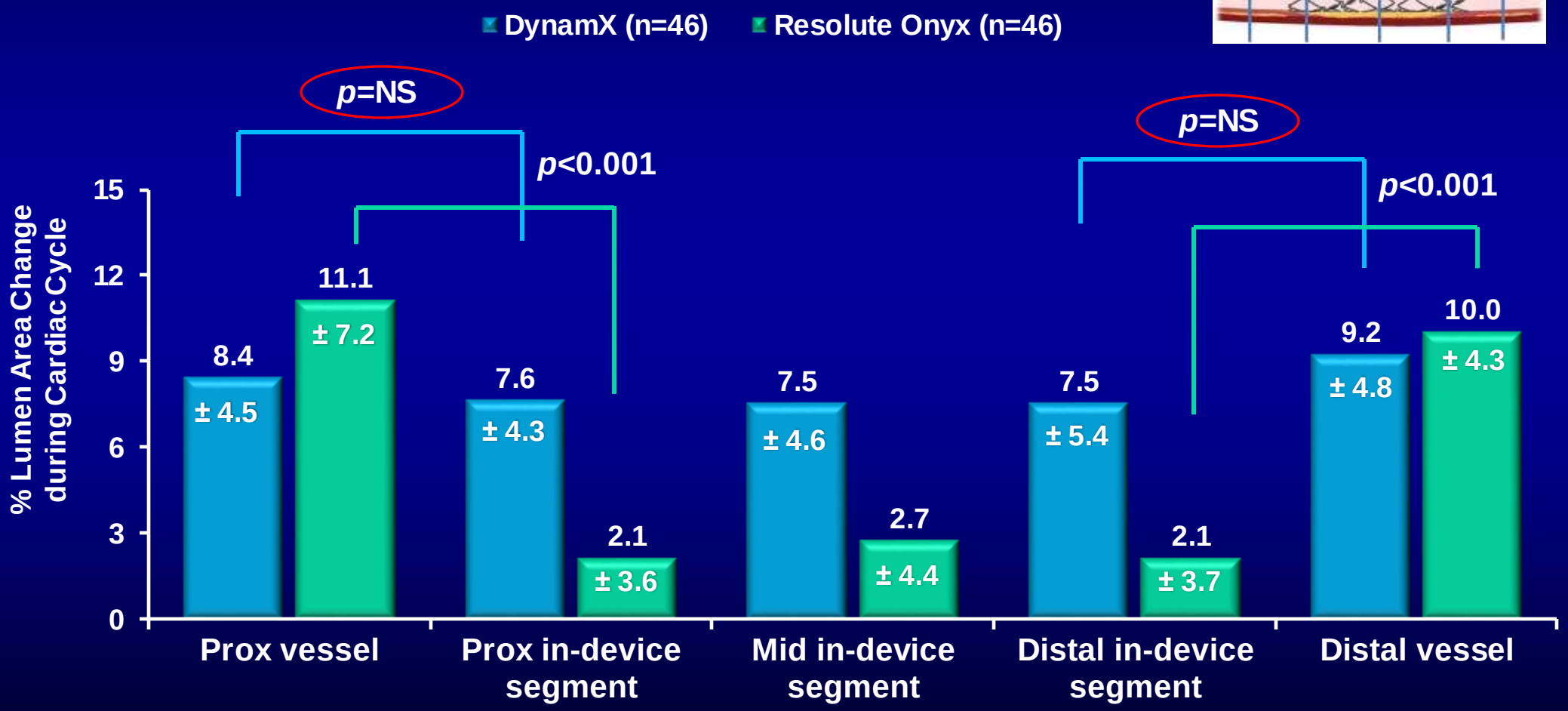
BIOADAPTOR RCT: Return of Compliance Only in DynamX Arm

12-Month Lumen Area Change





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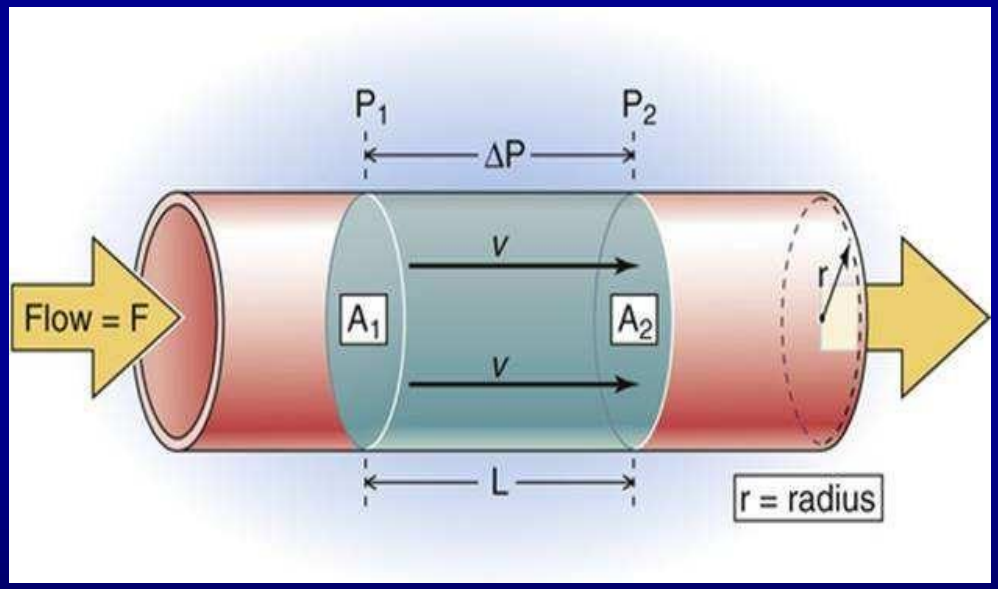
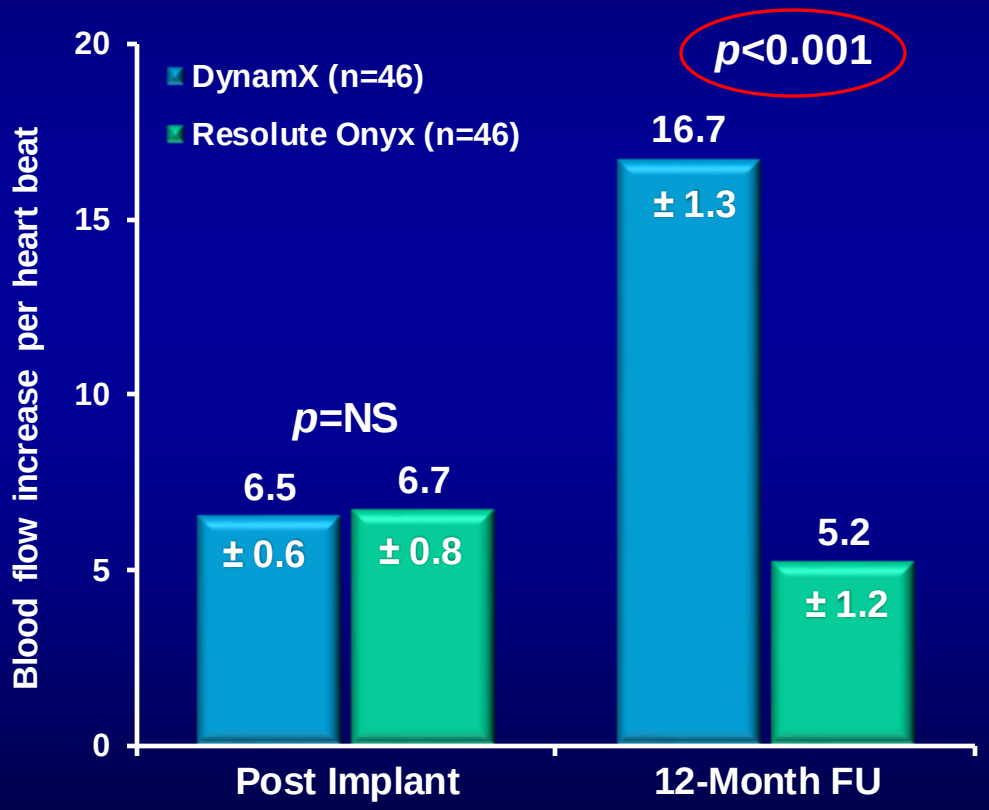
BIOADAPTOR RCT: Significant Increase in Blood Flow with DynamX

Blood flow change estimated by Hagen Poiseuille flow equation (Pontiga and Gaytan 2005)



Blood Flow Changes During Cardiac Cycle



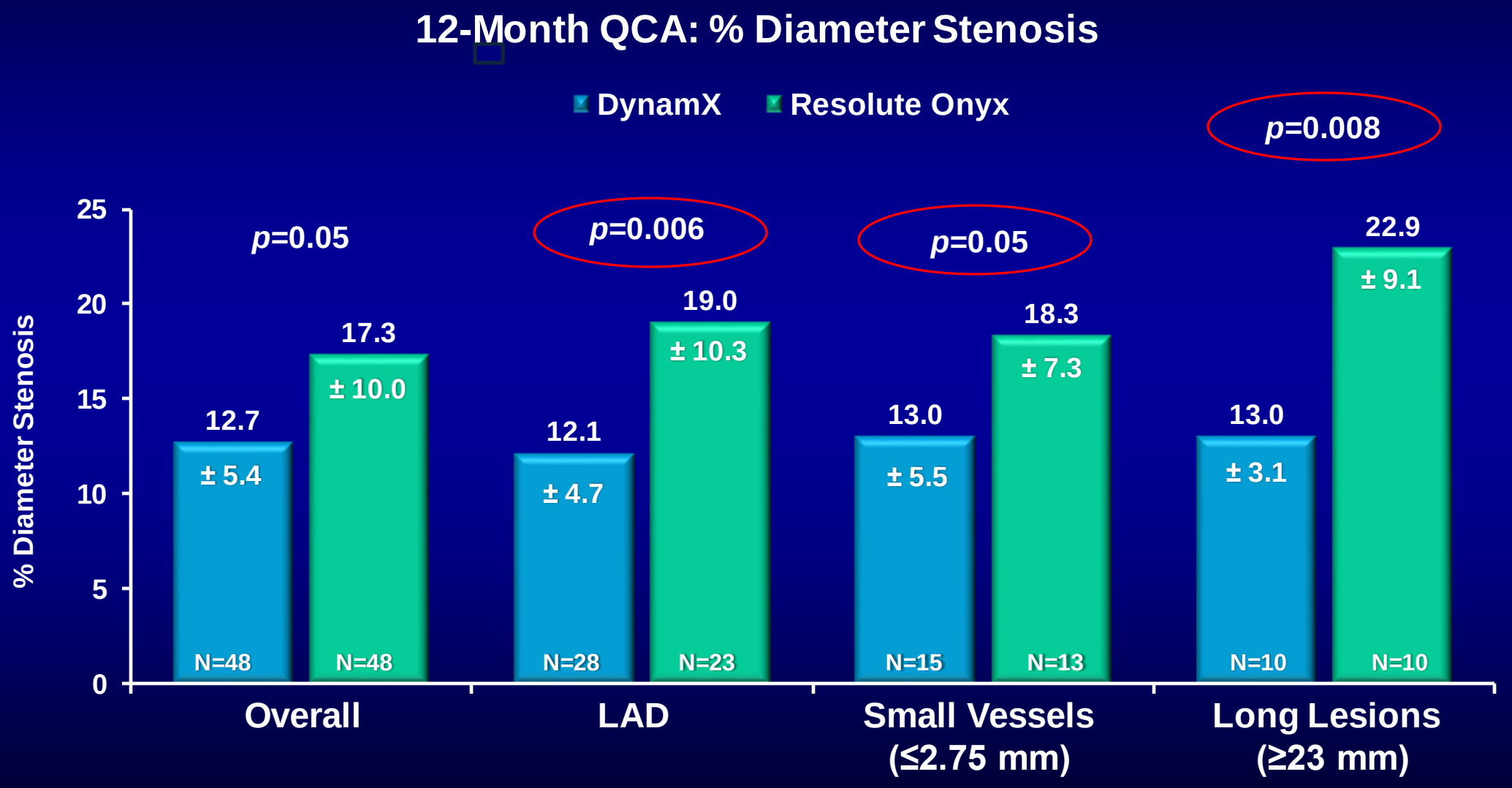
Saito S, EuroPCR 2023

BIOADAPTOR RCT: QCA – Acute Performance

In-device	DynamX (n=48)	Resolute Onyx (n=48)	*P*-value
Reference Diameter (mm)	2.64 ± 0.48	2.72 ± 0.55	0.48
%DS Stenosis Pre-procedure	64.39 ± 11.04	64.40 ± 13.29	1.0
Residual %DS Post implant	9.56 ± 3.77	10.24 ± 5.22	0.77
Acute gain, mm	1.66 ± 0.45	1.75 ± 0.52	0.41

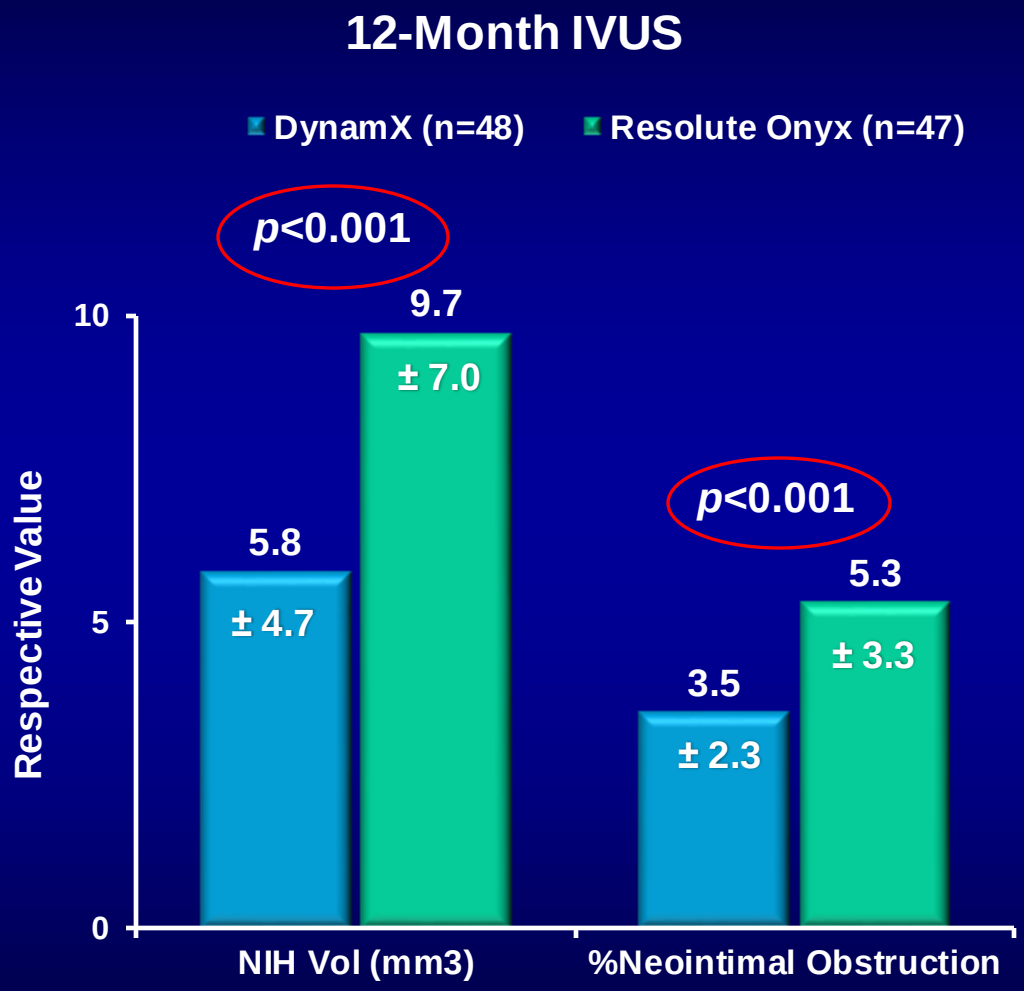
Saito S, EuroPCR 2023

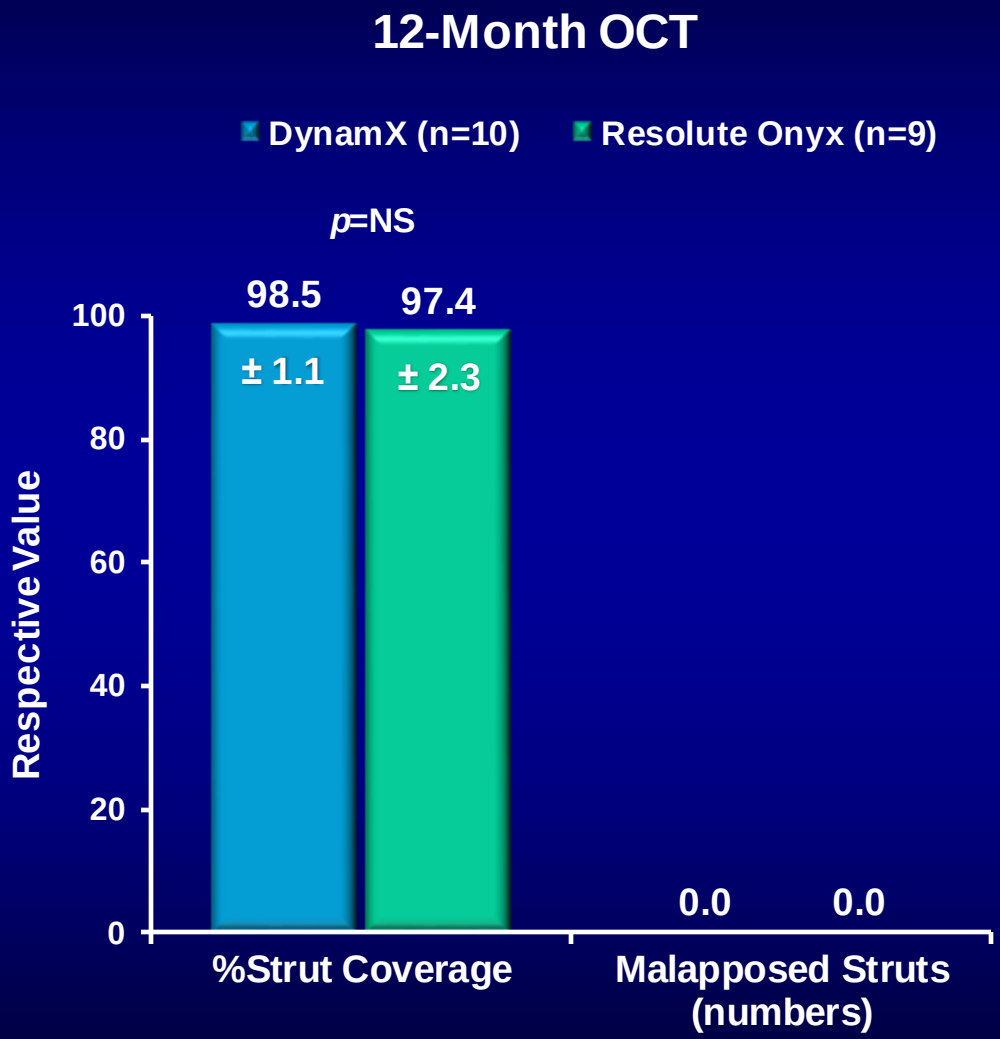
BIOADAPTOR RCT: Lower %DS in Overall Cohort and Subgroups



Saito S, EuroPCR 2023

BIOADAPTOR RCT: Lower NIH Volume, Complete Strut Coverage





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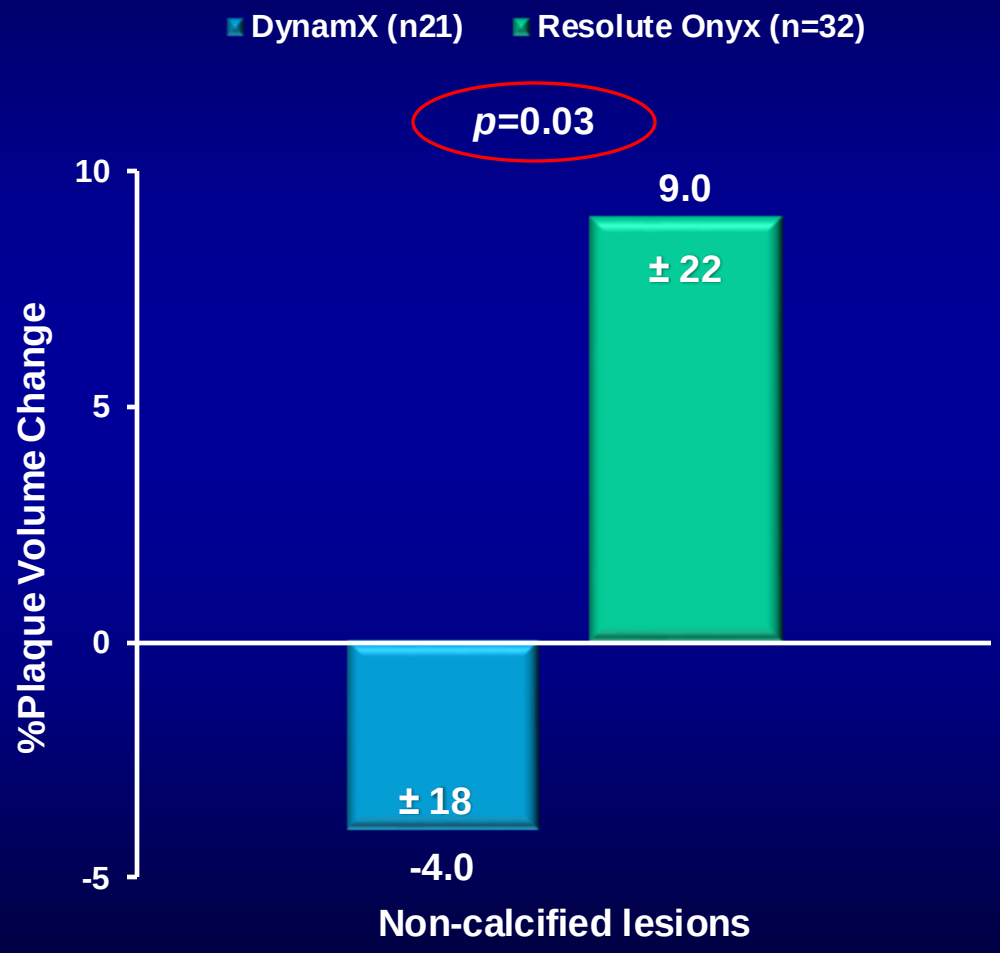
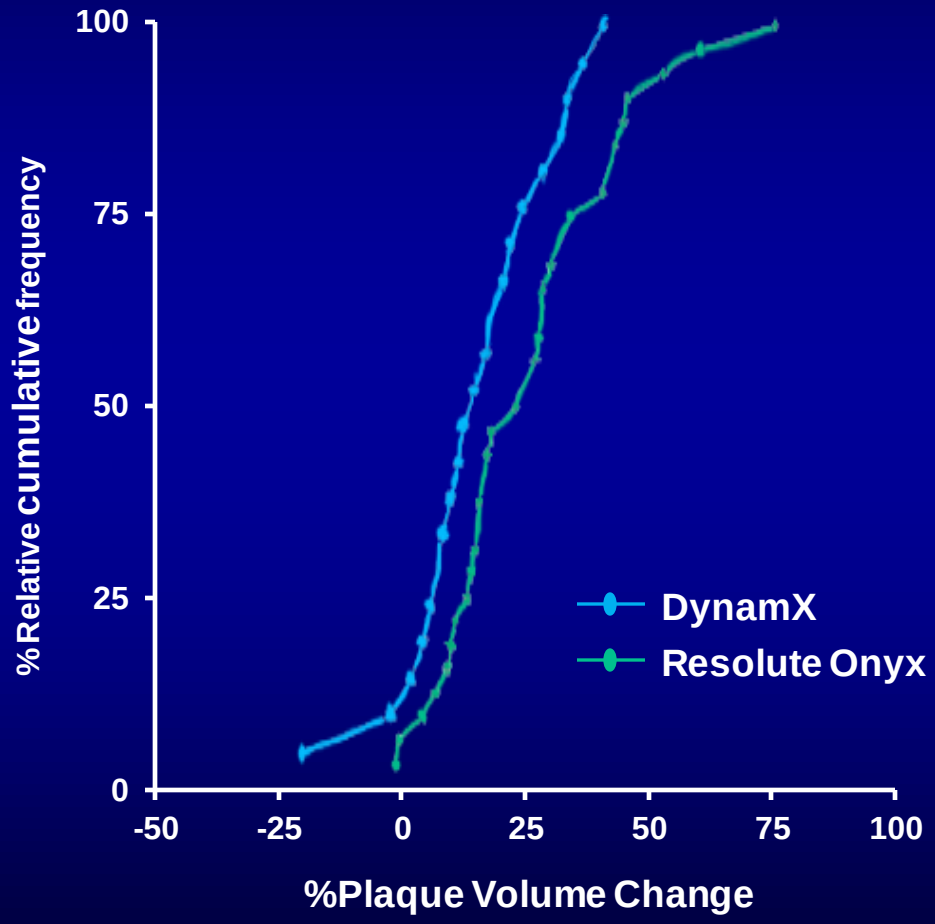
BIOADAPTOR RCT: Plaque Volume Change Behind the Device in Non-Calcified Lesions

Non-calcified Lesions





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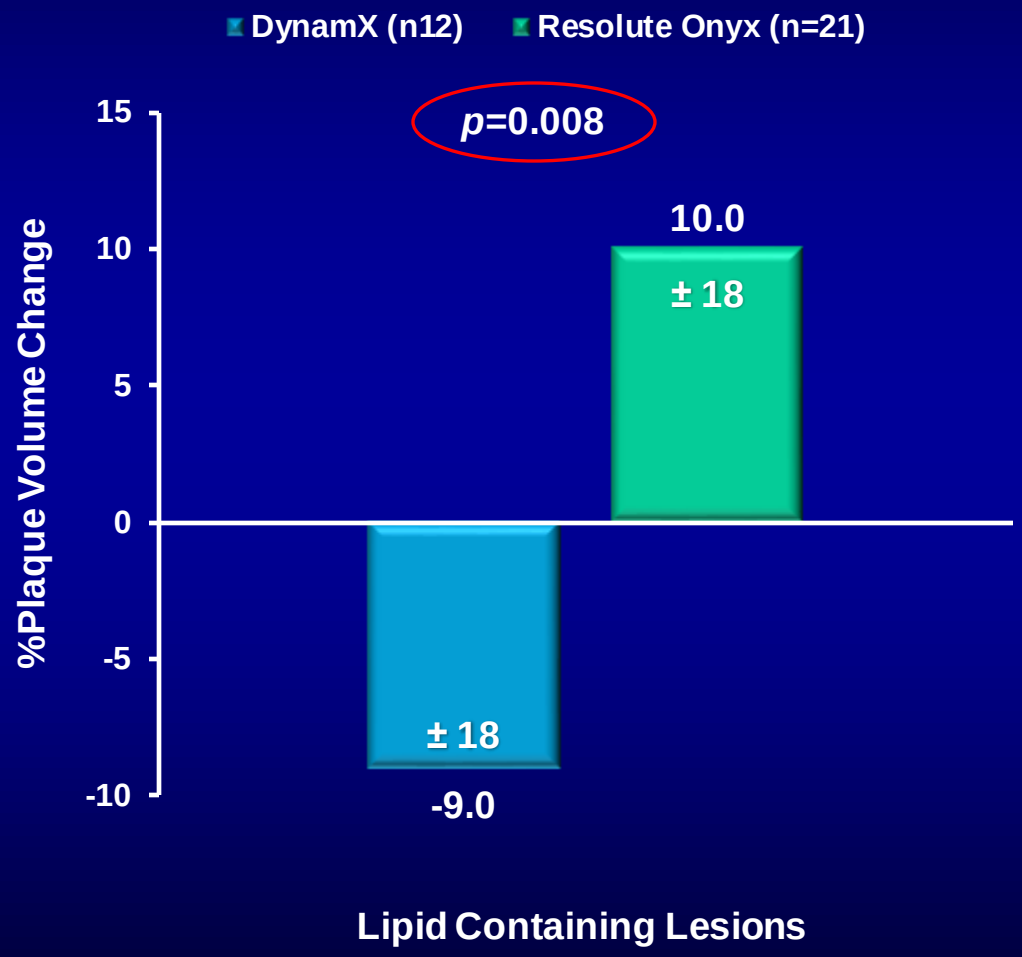
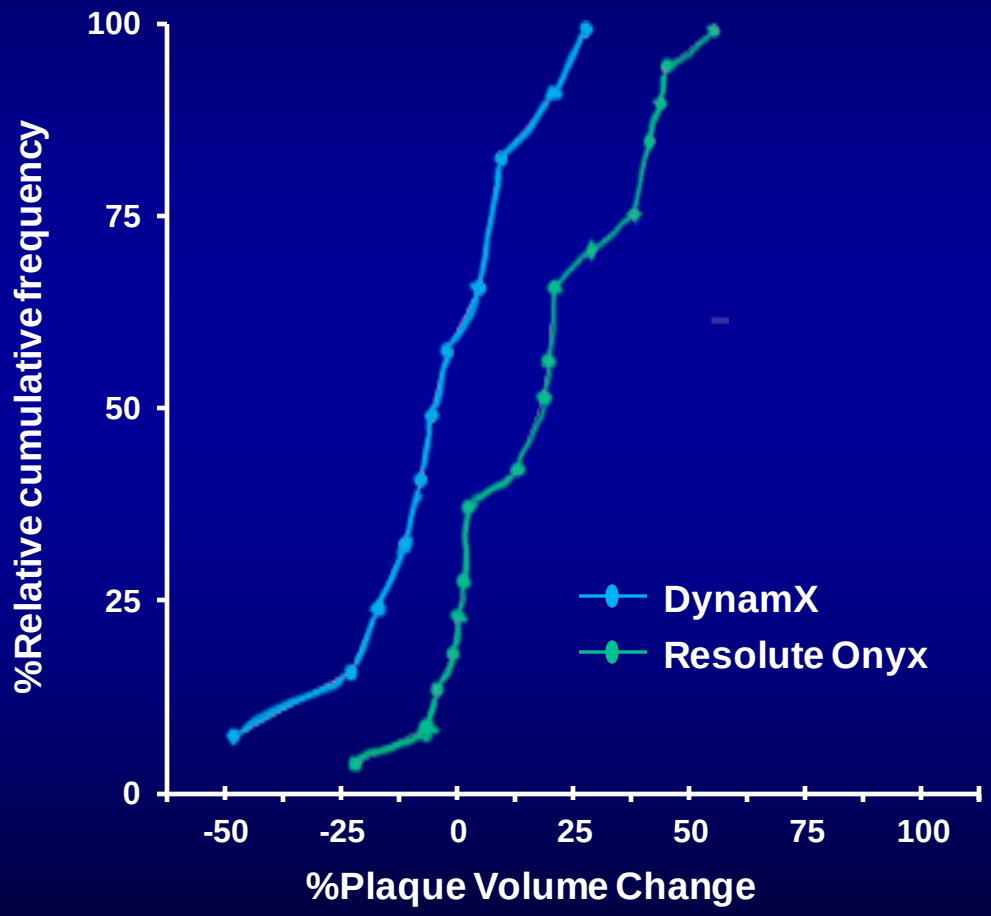
BIOADAPTOR RCT: Plaque Volume Change Behind the Device in Lipid Containing Lesions

Lipid Containing Lesions





Saito S, EuroPCR 2023

First in Human Evaluation of an Everolimus-Coated Balloon Catheter in the Treatment of Patients with Coronary In-Stent Restenosis: The CVT-ISR Trial

CVT-ISR Trial: Overview

Two main elements

1. CE-marked and FDA Approved PTCA Catheter

+

2. Safe and Proven Everolimus active pharmaceutical agent

- Guidewire compatibility: 0.014”
- Sheath compatibility: 6F
- Shaft length: 140 cm
- Size 2.0 to 3.5 mm X 15 to 28 mm

Controlled precision coating

Coating solution 100% Crystalline drug

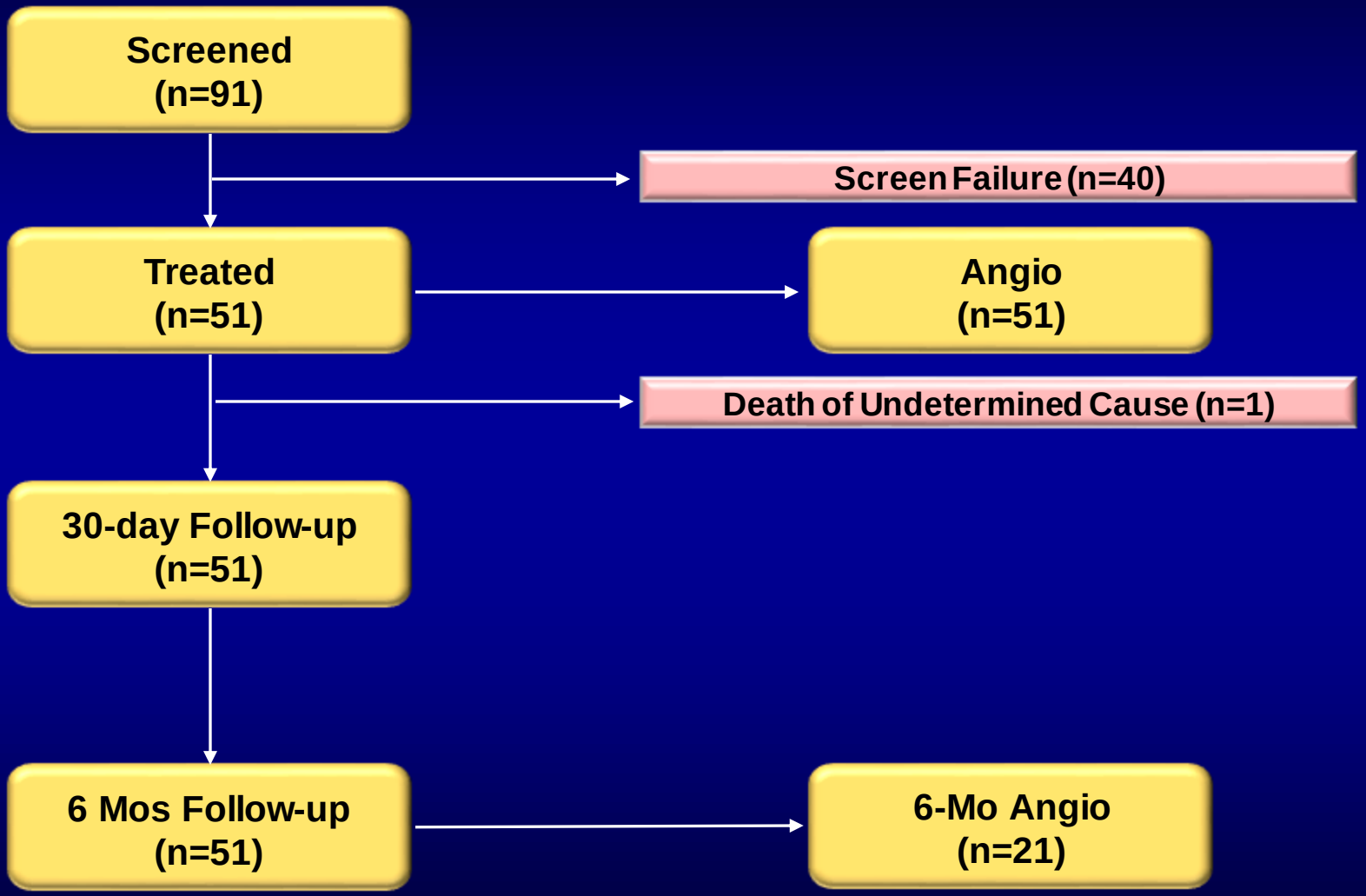
- Drug (Crystalline Everolimus 3.0 µg/mm²
- Approved Excipient
- No need for nano-particles or biodegradable carriers

CVT = Chansu Vascular Technologies

Alfonso F, EuroPCR 2023

CVT-ISR Trial: Patient Flowchart

51 subjects enrolled at 9 clinical sites across Europe (Oct 2021 – Apr 2022)



Follow-up ongoing up to 36 months

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CVT-ISR Trial: Procedural Angiographic Characteristics

Characteristic		N=51	
Arterial Access	Radial	50	98%
Vessel Location	RCA	22	43%
	LAD	19	37%
	LCX	10	20%
Lesion Location	Proximal	11	22%
	Mid	26	51%
	Distal	10	20%
	Ostial	4	8%
Stented Length (mm): Mean ± SD			37.3 ± 21.7
Eccentric:		5	10%
Bend (degrees)		20 ± 15	
Tortuosity	Mild	50	98%
Calcification	Moderate/Severe	4	8%
Mehran Classification of ISR	Type IA	0	0%
	Type IB	2	4%
	Type IC	11	22%
	Type ID	1	2%
	Type II	36	70%
	Type III	0	0%
	Type IV	0	0%
	NA	1	2%

Characteristic (by QCA)	N=51
Lesion Length (mm)	15 ± 5
RVD (mm)	3 ± 0.4
MLD in Lesion (mm)	0.8 ± 0.4
DS (%)	71 ± 13
Pre-Dilatation	
Pre-Dil. Balloon Diameter (mm)	3 ± 0.4
Pre-Dil. Balloon Length (mm)	16 ± 3
DS (%) After Pre-Dilatation	26 ± 11
DCB Procedure	
DCB Balloon Diameter (mm)	3 ± 0.3
DCB Length (mm)	19 ± 1
Device Inflation (seconds)	68 ± 22
DS (%) After DCB	16 ± 0.3
Final DS (%) *	15 ± 1

** 3 patients received post dilation*

FDA-cleared Coronary Measurement System (CMS, MEDIS, Leiden, The Netherlands) QAngio XA Version 7.3.102.0.

Alfonso F, EuroPCR 2023

CVT-ISR Trial: Primary Safety Endpoint Results

Primary safety endpoint: Freedom from TLF at 6 months based:

- A single comparison of CVT Treatment group to a safety OPC of 65% based on POBA Literature
- A positive safety endpoint result would be where the lower limit of the 95%CI exceed the OPC
- One-tailed α=0.05

Primary Safety Endpoint	n (%) [95% conf. Interval][1]
Freedom from TLF ***(cardiac death, target vessel MI, clinically driven TLR)***	**92.2% [81.1% - 97.8%]**
Cardiac Death[2]: n (%)	1 (2.0%)
Target Vessel Myocardial Infarction: n (%)	0 (0%)
Clinically Driven Target Lesion Revascularization (TLR): n (%)	3 (5.9%)

[1] By Clopper-Pearson eoact confidence interval [2] Death of undetermined origin

Primary safety endpoint 95%CI lower bound well above OPC of 65%

Primary Safety Endpoint Met ✓

* OPC = Objective Performance Criteria

Alfonso F, EuroPCR 2023

CVT-ISR Trial: Primary Effectiveness Endpoint Results

The primary effectiveness endpoint analyzed via QCA by an independent core laboratory (Yale School of Medicine Cardiovascular Research Group).

The study hypothesis was based on an assumed difference derived from published studies for only FDA- approved and routinely available catheters (POBA = 0.8 mm)

Parameter	N=21 Subjects	
Late Lumen Loss	In stent	In segment
Mean (mm)	0.40	0.40
Std. Deviation (mm)	0.48	0.48
Median (mm)	0.30	0.30
Min, Max (mm)	-0.19, 1.45	-0.19, 1.45
Statistical Comparison vs. Historical POBA Control	p=0.001	p=0.001

[1] *All lesions within stented area (stent length 37mm vs. lesion length 15mm, no balloons were outside stent margins)*

Observed mean statistically superior to the historical control (highly statistically significant p-value), thereby fulfilling the Primary Effectiveness Endpoint objective.

Primary Effectiveness Endpoint Met ✓

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CVT-ISR Trial: Conclusions

- The CVT ISR study demonstrated for the first time that an everolimus coated balloon could provide clinical benefits to treat patients with ISR.
- CVT-ISR Primary safety endpoint met with strong statistical significance.
- CVT-ISR Primary effectiveness endpoint met with strong statistical significance.
- Longer clinical follow up is ongoing to confirm current observed results at 6 months.
- A large randomized controlled trial is under preparation (EVERLAST Trial) to confirm this positive initial experience .

CORONARY INTERVENTIONS
CLINICAL RESEARCH

EuroIntervention 2023;19-published online May 2023

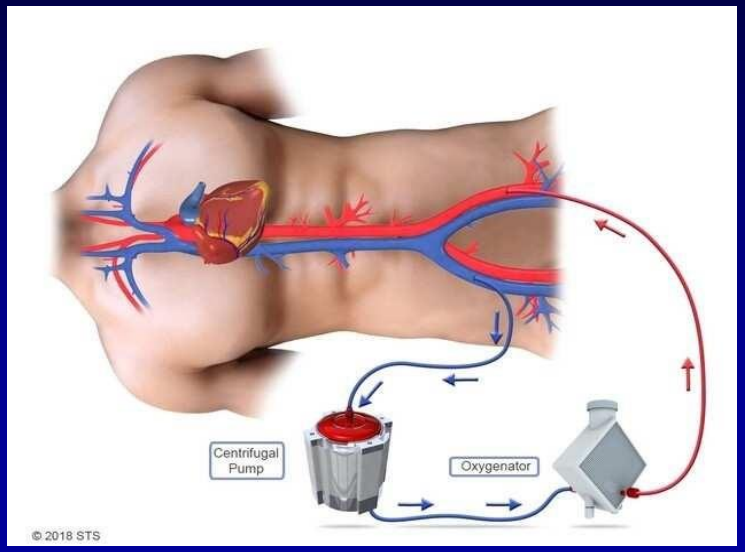
Venoarterial extracorporeal membrane oxygenation or standard care in patients with cardiogenic shock complicating acute myocardial infarction: the multicentre, randomised EURO SHOCK trial

Amerjeet S. Banning[1,2]*, BSc (Hons), MBBS, PhD, MRCP; Manel Sabaté[3], MD, PhD, FESC; Martin Orban[4], MD; Jay Gracey[2], RN, BA; Teresa López-Sobrino[3], MD; Steffen Massberg[5], MD, PhD; Adnan Kastrati[5], MD, FESC; Kris Bogaerts[6], PhD; Tom Adriaenssens[7], MD; Colin Berry[8], MB, ChB, PhD, FRCP (Glasg), FACC; Andrejs Erglis[9], MD, PhD, FESC, FACC; Steven Haine[10], MD, PhD; Truls Myrmel[11], MD, PhD; Sameer Patel[12], MBBS, MRCP, FRCA, FFICM; Irene Buera[13], MD; Alessandro Sionis[14], MD, PhD; Victoria Vilalta[15], MD, PhD; Hakeem Yusuff[1], MRCP, FRCA, FFICM; Christiaan Vrints[10], MD, PhD, FESC, FACC; David Adlam[2], BM, BCh, DPhil; Marcus Flather[16], BSc, MBBS, FRCP, MBA; Anthony H. Gershick[1,2], BSc, MBBS, FRCP

EUROSHOCK Trial: Background

- **Cardiogenic shock** (CGS) occurs in 10% of patients presenting with acute myocardial infarction (AMI), with in-hospital mortality rates of 40-50% despite revascularization.

- **Mechanical circulatory support devices** allow for hemodynamic support in patients presenting with CGS.

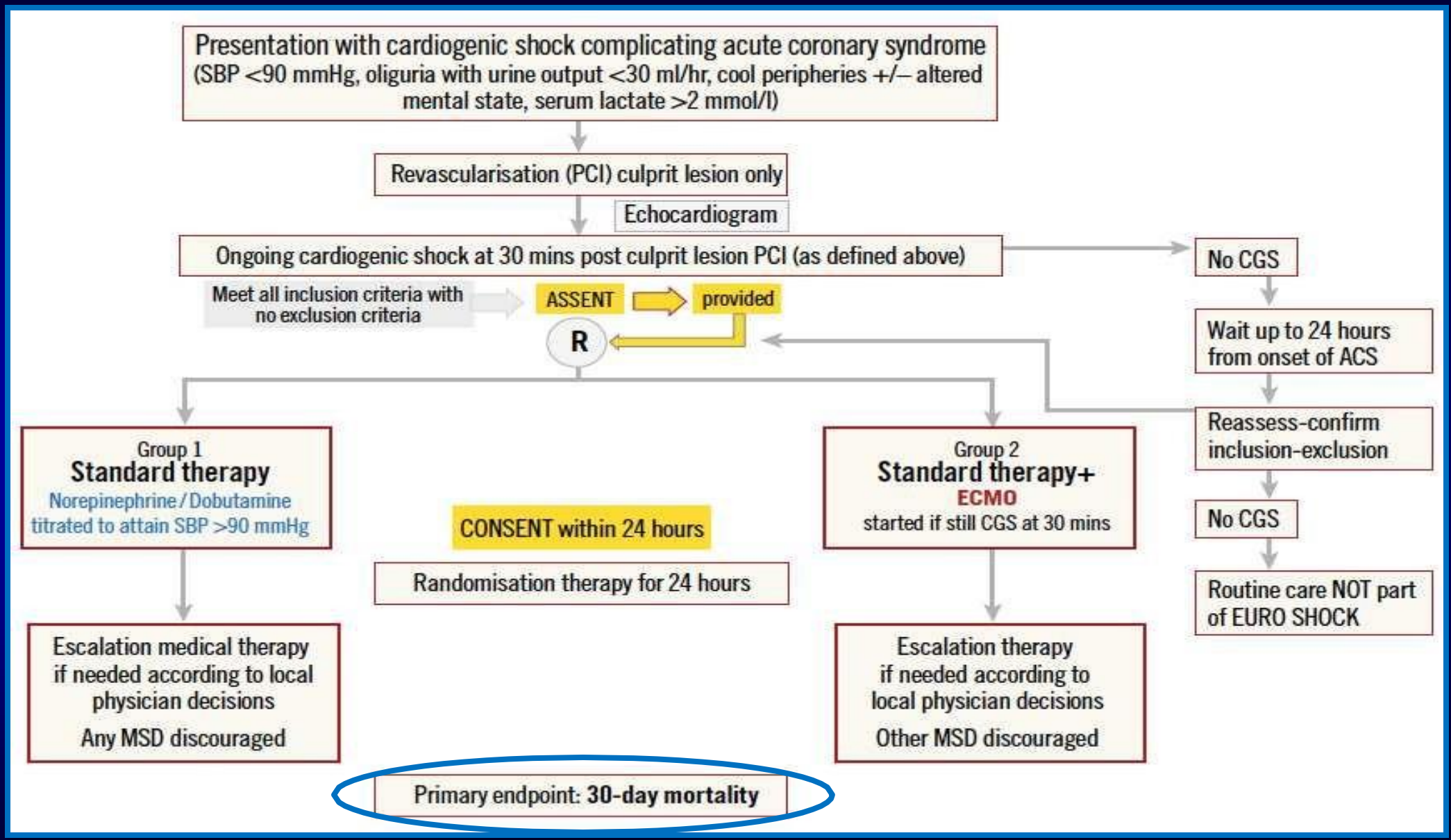


- However, there is a **lack of evidence** regarding the benefit of mechanical circulatory support devices in the context of CGS complicating AMI.

Therefore, the **EURO SHOCK trial** aimed to determine if early use of Veno-arterial Extra-Corporeal Membrane Oxygenation (**V-A-ECMO**) in patients with persistent CGS **following** primary PCI could improve outcomes.

Banning et al., EuroIntervention 2023 May 19 Epub ahead of print

EUROSHOCK Trial: Trial Design



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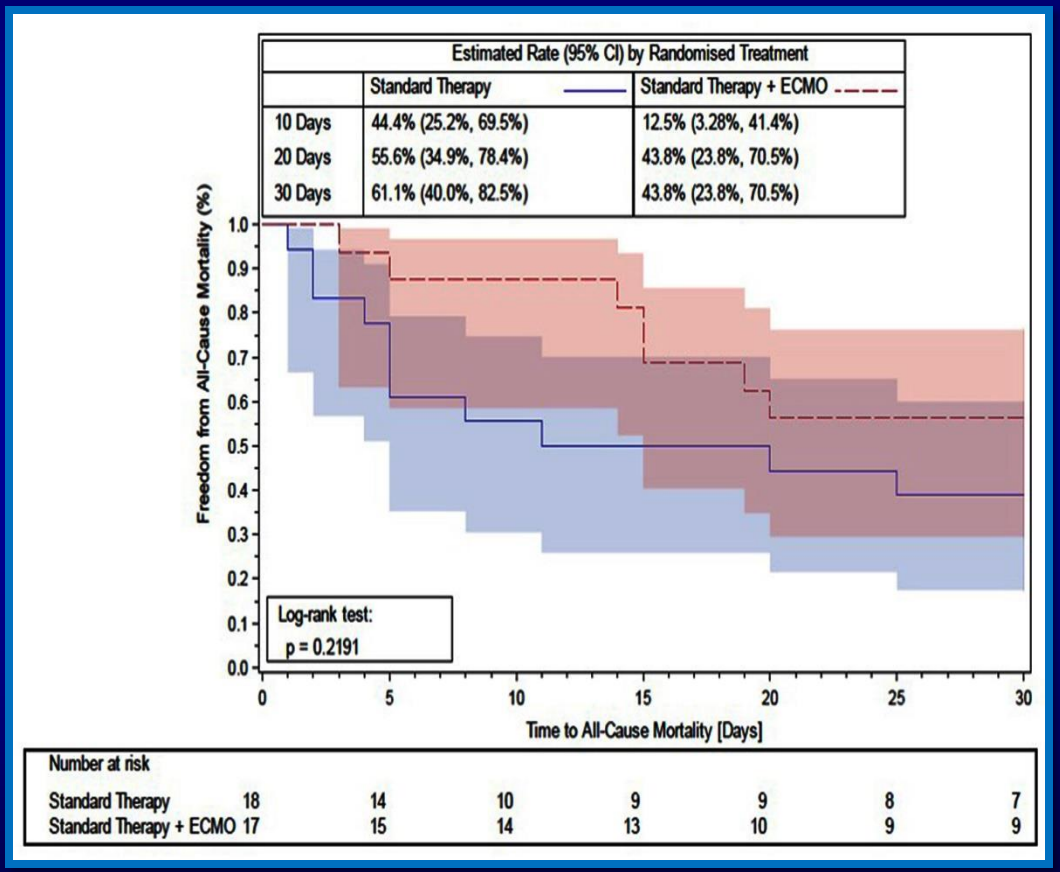
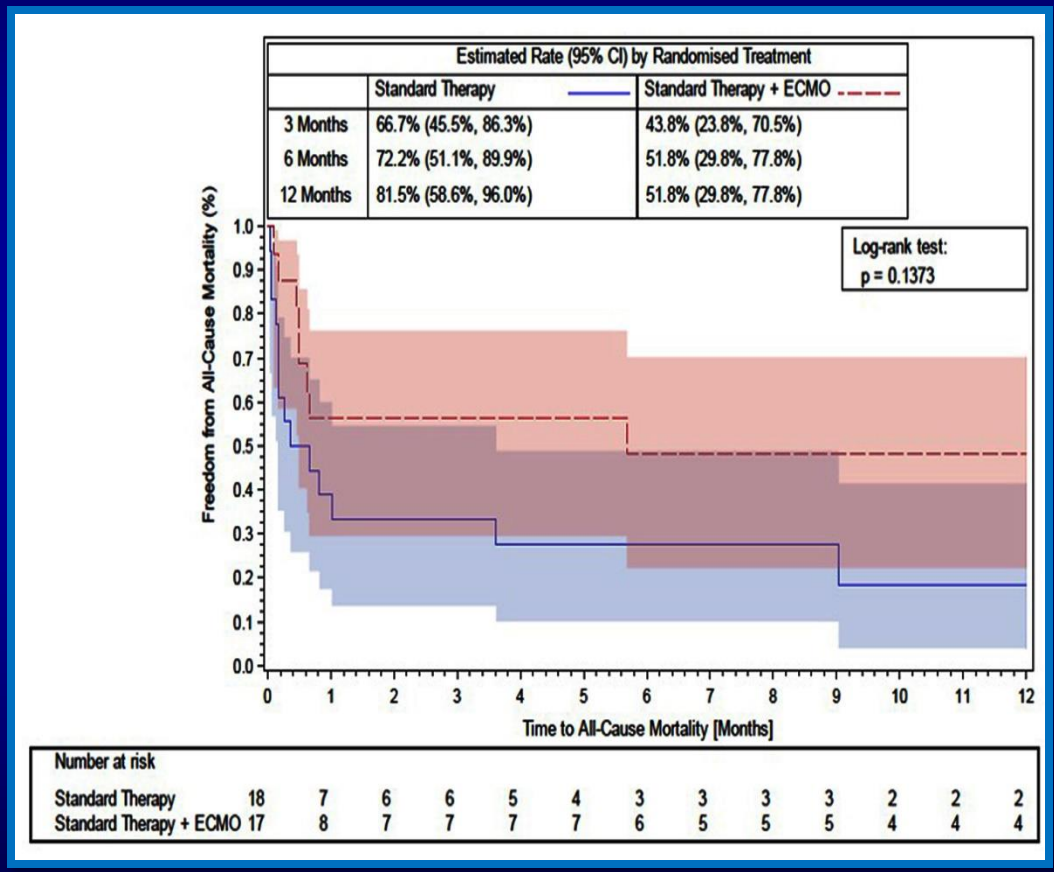
EUROSHOCK Trial: Mortality at 30-Day and 1 Year Follow-Up

30-Day Follow-Up



1 Year Follow-Up



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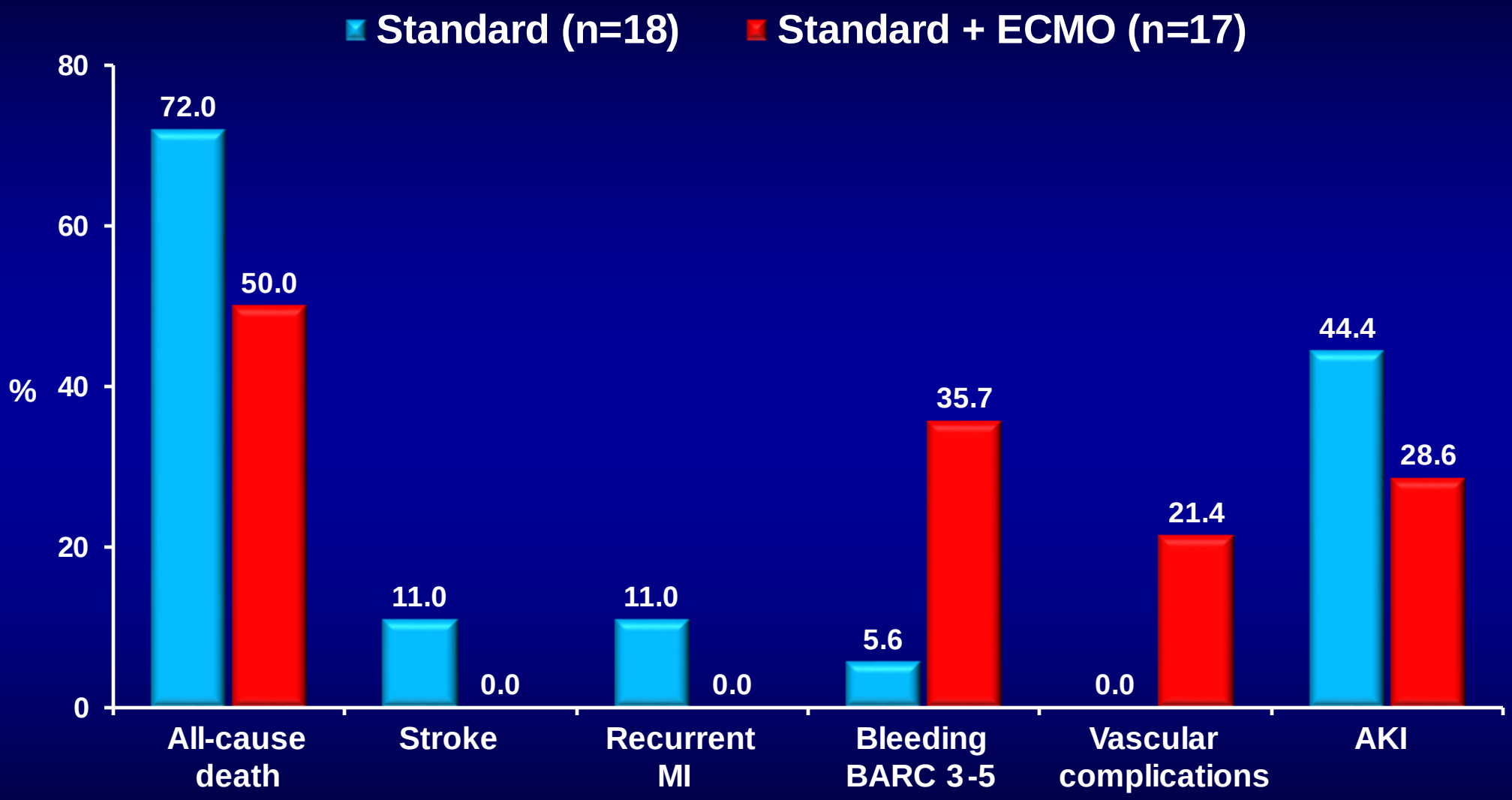
EUROSHOCK Trial: In-Hospital Complications (ITT)



Banning et al., EuroIntervention 2023 May 19 Epub ahead of print

EuroIntervention 2023;19-published online May 2023

Venoarterial extracorporeal membrane oxygenation or standard care in patients with cardiogenic shock complicating acute myocardial infarction: the multicentre, randomised EURO SHOCK trial

Conclusions: Due to the limited number of patients recruited to the trial, no definite conclusions could be drawn from the available data. Our study demonstrates the feasibility of randomising patients with CGS complicating acute MI but also illustrates the challenges. We hope these data will inspire and inform the design of future large-scale trials.

Provisional Stenting in Bifurcation Lesion: Benefit of Side Branch Intervention? KISS Study

KISS Study: Background

Provisional stenting strategy is recommanded in most of the bifurcation lesions Role of systematic side branch (SB) intervention is a matter of debate

Favoring Side Branch Intervention

- Better rheology
- Less SB occlusion
- Less peri-procedural injury
- Better relief of angina
- Less restenosis

Favoring no side branch intervention

- Shorter procedure time & exposure
- Less risk of side branch dissection
- Less need for 2nd stenting
- Impact on the risk of restenosis

Chevalier B, EuroPCR 2023

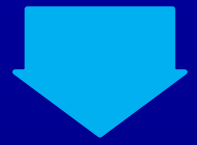
KISS Study: Design

Any de novo non-LM bifurcation lesion except Medina 001 requiring for a wire-based side branch protection

Side branch large enough to accomodate a coronary stent

Main branch stent (Resolute Onyx) sized to distal reference diameter with a systematic proximal optimisation technique

Side branch patent with no flow reduction or any sign of ongoing ischemia



Randomization

No side branch intervention

Side branch intervention Kissing balloon technique or POT/Side/POT

(Control)

Chevalier B, EuroPCR 2023

KISS Study: Endpoints

Primary endpoint: rate of periprocedural infarction/injury using ARC 2 definition within 48 hours Increase of 70 x troponine ULN of 35 x troponine ULN with additional criteria

Considering alpha=0.05 et Beta=0.8 with a rate of 15% in control group and a non-inferiority limit of 7.5%, 596 patients have to be randomized. Superiority will be tested if noninferiority is met.

Secondary procedural endpoints:
Technical success, Acute gain (QCA), Procedure time, X-ray exposure (Air kerma, Fluoro time)

Secondary clinical endpoints at 1 and 12 months:
TLF with its individual components, Def/probable stent thrombosis, Angina status

Chevalier B, EuroPCR 2023

KISS Study: Procedural Characteristics

N patients	No SB intervention	Control	p
Radial access	86,8%	90,7%	NS
Any non target PCI (before)	19,1%	23,6%	NS
Medina XX1	30,3%	38,6%	<0,05
LAD	79,5%	82,3%	NS
Proximal Main diameter	3,07+-0.53 mm	3,02+-0,57 mm	NS
Distal Main diameter	2,3+-0,42 mm	2,24+-0,46 mm	NS
SB diameter	2,01+-0,38 mm	1,93+-0,4mm	0,016
SB stenosis	32+-17 %	32,6+-18%	NS
SB lesion length	4,4+-3 mm	4,8+-3,6 mm	NS
POT	98,3%	99,3%	NS
Kissing	1,3%	43%	<0.001
SB ballooning	0,7%	57%	<0,001
SB stenting	0,3%	4,5%	<0,01

Chevalier B, EuroPCR 2023

KISS Study: Procedural Endpoint

Primary endpoint	No SB intervention	Control	p
ITT (303/313)	4,1%	5,7% (3,4% P/S/P 8,9% KBT)	<0,001 NI 0,38 Sup <0,066
Per protocol (268/272)	4,1%	5,9%	<0,001 NI 0,34 Sup
AS treated (302/314)	4%	5.7%	<0,001 NI 0,38 Sup

Chevalier B, EuroPCR 2023

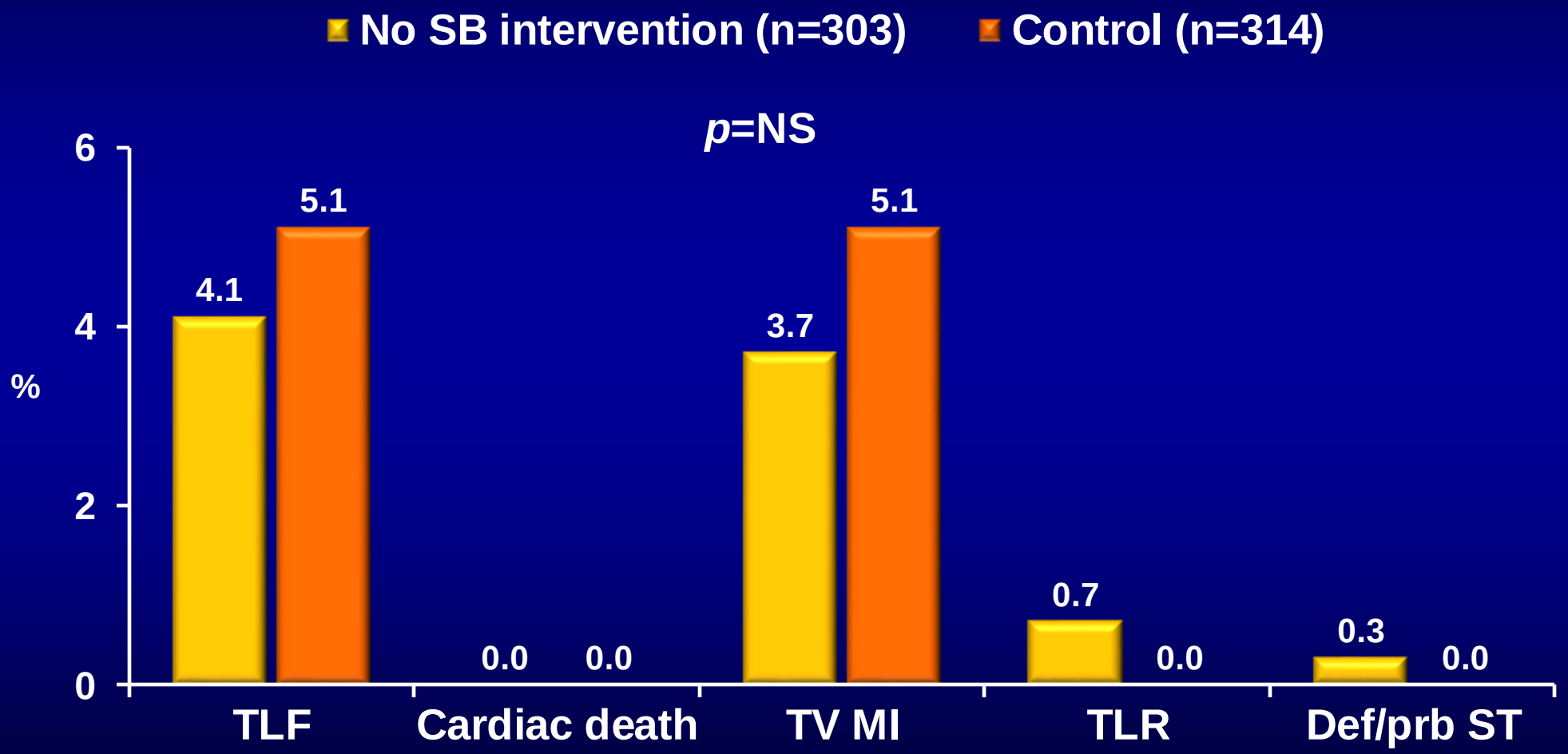
KISS Study: Secondary Procedural Endpoint

N patients	No SB intervention (n=303)	Control (n=314)	p
Technical success*	80,2%	82,1%	NS
Procedure time (median)	34 min	45 min	<0,001
Fluoro time (median)	10 min	13,2 min	<0,001
Air Kerma (median)	453 mGy	629 mGy	<0,001
Contrast volume (median)	130 ml	150 ml	<0,001
Acute gain in SB	-0,04+-0,36 mm	0,10+-0,31 mm	<0,001

**Technical success – successful stenting with residual stenosis <20% by QCA and TIMI >1 in SB*

Chevalier B, EuroPCR 2023

KISS Study: Secondary Clinical Endpoint at 30 Days



Chevalier B, EuroPCR 2023

Latest Issues in Coronary Intervention

- **Interventional Trials from EuroPCR 2023: BIOADAPTOR RCT, CVT-ISR Study, EURO EURO-SHOCK Trial, KISS Study**

Focused review of the month

- **Update in guidelines for chronic coronary disease: *2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the management of patients with chronic coronary disease (CCD, CCS in European guidelines)***

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CLINICAL PRACTICE GUIDELINE

2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the Management of Patients With Chronic Coronary Disease

A Report of the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines

Developed in Collaboration With and Endorsed by the American College of Clinical Pharmacy, American Society for Preventive Cardiology, National Lipid Association, and Preventive Cardiovascular Nurses Association

Endorsed by the Society for Cardiovascular Angiography and Interventions

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Marlene S. Williams, MD, FACC§§

*Writing committee members are required to recuse themselves from voting on sections to which their specific relationships with industry may apply; see Appendix 1 for detailed information.
†ACC/AHA representative.
‡National Lipid Association representative.
§Preventive Cardiovascular Nurses Association representative.
‖Former Joint Committee on Clinical Practice Guideline member; current member during the writing effort.
¶Patient representative/lay stakeholder.
#American Society for Preventive Cardiology representative.
**AHA/ACC Joint Committee on Clinical Practice Guidelines.
††AHA/ACC Joint Committee on Clinical Data Standards.
‡‡American College of Clinical Pharmacy representative.
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CLINICAL PRACTICE GUIDELINE

2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the Management of Patients With Chronic Coronary Disease

ABSTRACT

AIM The "2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the Management of Patients With Chronic Coronary Disease" provides an update to and consolidates new evidence since the "2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS Guideline for the Diagnosis and Management of Patients With Stable Ischemic Heart Disease" and the corresponding "2014 ACC/AHA/AATS/PCNA/SCAI/STS Focused Update of the Guideline for the Diagnosis and Management of Patients With Stable Ischemic Heart Disease."

METHODS A comprehensive literature search was conducted from September 2021 to May 2022. Clinical studies, systematic reviews and meta-analyses, and other evidence conducted on human participants were identified that were published in English from MEDLINE (through PubMed), EMBASE, the Cochrane Library, Agency for Healthcare Research and Quality, and other selected databases relevant to this guideline.

STRUCTURE This guideline provides an evidenced-based and patient-centered approach to management of patients with chronic coronary disease, considering social determinants of health and incorporating the principles of shared decision-making and team-based care. Relevant topics include general approaches to treatment decisions, guideline-directed management and therapy to reduce symptoms and future cardiovascular events, decision-making pertaining to revascularization in patients with chronic coronary disease, recommendations for management in special populations, patient follow-up and monitoring, evidence gaps, and areas in need of future research. Where applicable, and based on availability of cost-effectiveness data, cost-value recommendations are also provided for clinicians. Many recommendations from previously published guidelines have been updated with new evidence, and new recommendations have been created when supported by published data.

Top 10 Take-Home Messages for Chronic Coronary Disease

1. Emphasis is on team-based, patient-centered care that considers social determinants of health along with associated costs while incorporating shared decision-making in risk assessment, testing, and treatment.
2. Nonpharmacologic therapies, including healthy dietary habits and exercise, are recommended for all patients with chronic coronary disease (CCD).
3. Patients with CCD who are free from contraindications are encouraged to participate in habitual physical activity, including activities to reduce sitting time and to increase aerobic and resistance exercise. Cardiac rehabilitation for eligible patients provides significant cardiovascular benefits, including decreased morbidity and mortality outcomes.
4. Use of sodium glucose cotransporter 2 inhibitors and glucagon-like peptide-1 receptor agonists are recommended for select groups of patients with CCD, including groups without diabetes.
5. New recommendations for beta-blocker use in patients with CCD: (a) Long-term beta-blocker therapy is not recommended to improve outcomes in patients with CCD in the absence of myocardial infarction in the past year, left ventricular ejection fraction ≤50%, or another primary indication for beta-blocker therapy; and (b) Either a calcium channel blocker or beta blocker is recommended as first-line antianginal therapy.
6. Statins remain first line therapy for lipid lowering in patients with CCD. Several adjunctive therapies (eg, ezetimibe, PCSK9 [proprotein convertase subtilisin/kexin type 9] inhibitors, inclisiran, bempedoic acid) may be used in select populations, although clinical outcomes data are unavailable for novel agents such as inclisiran.
7. Shorter durations of dual antiplatelet therapy are safe and effective in many circumstances, particularly when the risk of bleeding is high and the ischemic risk is low to moderate.
8. The use of nonprescription or dietary supplements, including fish oil and omega-3 fatty acids or vitamins, is not recommended in patients with CCD given the lack of benefit in reducing cardiovascular events.
9. Routine periodic anatomic or ischemic testing without a change in clinical or functional status is not recommended for risk stratification or to guide therapeutic decision-making in patients with CCD.
10. Although e-cigarettes increase the likelihood of successful smoking cessation compared with nicotine replacement therapy, because of the lack of long-term safety data and risks of sustained use, e-cigarettes are not recommended as first-line therapy for smoking cessation.

Virani et al., J Am Coll Cardiol 2023 Jul 14 Epub ahead of print

PREAMBLE

Since 1980, the American College of Cardiology (ACC) and American Heart Association (AHA) have translated scientific evidence into clinical practice guidelines with recommendations to improve cardiovascular health. These guidelines, which are based on systematic methods to evaluate and classify evidence, provide a foundation for the delivery of quality cardiovascular care. The ACC and AHA sponsor the development and publication of clinical practice guidelines without commercial support, and members volunteer their time to the writing and review efforts. Guidelines are official policy of the ACC and AHA. For some guidelines, the ACC and AHA collaborate with other organizations.

Intended Use

Clinical practice guidelines provide recommendations applicable to patients with or at risk of developing cardiovascular disease (CVD). The focus is on medical practice in the United States, but these guidelines are relevant to patients throughout the world. Although guidelines may be used to inform regulatory or payer decisions, the intent is to improve quality of care and align with patients' interests. Guidelines are intended to define practices meeting the needs of patients in most, but not all, circumstances and should not replace clinical judgment.

Clinical Implementation

Management, in accordance with guideline recommendations, is effective only when followed by both practitioners and patients. Adherence to recommendations can be enhanced by shared decision-making between clinicians and patients, with patient engagement in selecting interventions on the basis of individual values, preferences, and associated conditions and comorbidities.

Methodology and Modernization

The AHA/ACC Joint Committee on Clinical Practice Guidelines (Joint Committee) continuously reviews, updates, and modifies guideline methodology on the basis of published standards from organizations, including the National Academy of Medicine (formerly the Institute of Medicine),[1,2] and on the basis of internal reevaluation. Similarly, presentation and delivery of guidelines are reevaluated and modified in response to evolving technologies and other factors to optimally facilitate dissemination of information to health care professionals at the point of care.

Virani et al., J Am Coll Cardiol 2023 Jul 14 Epub ahead of print

Evidence Review and Evidence Review Committees

In developing recommendations, the writing committee uses evidence-based methodologies that are based on all available data.[4,5] Literature searches focus on randomized controlled trials (RCTs) but also include registries, non-randomized comparative and descriptive studies, case series, cohort studies, systematic reviews, and expert opinion. Only key references are cited.

An independent evidence review committee is commissioned when there are ≥1 questions deemed of utmost clinical importance and merit formal systematic review to determine which patients are most likely to benefit from a drug, device, or treatment strategy, and to what degree. Criteria for commissioning an evidence review committee and formal systematic review include absence of a current authoritative systematic review, feasibility of defining the benefit and risk in a time frame consistent with the writing of a guideline, relevance to a substantial number of patients, and likelihood that the findings can be translated into actionable recommendations. Evidence review committee members may include methodologists, epidemiologists, clinicians, and biostatisticians. Recommendations developed by the writing committee on the basis of the systematic review are marked "SR".

Guideline-Directed Management and Therapy

The term guideline-directed management and therapy (GDMT) encompasses clinical evaluation, diagnostic testing, and both pharmacological and procedural treatments. For these and all recommended drug treatment regimens, the reader should confirm dosage with product insert material and evaluate for contraindications and interactions. Recommendations are limited to drugs, devices, and treatments approved for clinical use in the United States.

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Level of Value for Clinical Guideline Recommendations

Level of Value
High value: Better outcomes at lower cost or ICER <$50,000 per QALY gained
Intermediate value: $50,000 to <$150,000 per QALY gained
Low value: ≥$150,000 per QALY gained
Uncertain value: Value examined but data are insufficient to draw a conclusion because of no studies, low-quality studies, conflicting studies, or prior studies that are no longer relevant
Not assessed: Value not assessed by the writing committee

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Scope of the Guideline

The scope of the "2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the Management of Patients With Chronic Coronary Disease" (referred to hereafter as the "2023 CCD guideline") is to provide an update to and consolidate new evidence since the publication of the "2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS Guideline for the Diagnosis and Management of Patients With Stable Ischemic Heart Disease"[3] and the "2014 ACC/AHA/AATS/PCNA/SCAI/STS Focused Update of the Guideline for the Diagnosis and Management of Patients With Stable Ischemic Heart Disease" and will replace these prior guidelines.[4] This current document provides a patient-centered approach to management of chronic coronary disease (CCD) incorporating the principles of shared decision-making, social determinants of health (SDOH), and team-based care. Where applicable and based on availability of cost-effectiveness data, value recommendations are also provided for clinicians.

The writing committee acknowledges that care of patients with CCD is a continuum from postacute care in patients presenting with chest pain, acute coronary syndromes (ACS), or both to outpatient CCD-related management. The primary intended audience for this guideline is clinicians in primary care and cardiology specialty who care for patients with CCD in the outpatient setting. It aims to provide succinct recommendations in the domains of diagnostic evaluation, symptom relief, improvement in QOL, and reduction of future atherosclerotic cardiovascular disease (ASCVD)–related events and heart failure (HF) in patients with CCD. The recommendations provided in this guideline pertain to the chronic outpatient care of patients with CCD. Clinicians are referred to the relevant guidelines when evaluating patients with acute chest pain, ACS, or both.[5-9]

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Chronic Coronary Disease (CCD) Definition

This guideline is intended to apply to the following categories of patients in the outpatient setting:

- Patients discharged after admission for an ACS event or after coronary revascularization procedure and after stabilization of all acute cardiovascular issues.
- Patients with LV systolic dysfunction and known or suspected CAD or those with established cardiomyopathy deemed to be of ischemic origin.
- Patients with stable angina symptom (ischemic equivalents such as dyspnea or arm pain with exertion) medically managed with or without positive results of an imaging test.
- Patients with angina symptoms and evidence of coronary vasospasm or microvascular angina.
- Patients diagnosed with CCD based solely on the results of a screening study (stress test, CTA) and the treating clinician concludes that the patient has coronary disease.

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Applying the ACC/AHA Class Recommendation and LOE to Clinical Strategies, Interventions, Treatments, or Diagnostic Testing in Patient Care

Mount Sinai Heart

CLASS (STRENGTH) OF RECOMMENDATION

CLASS 1 (STRONG) — Benefit >>> Risk

Suggested phrases for writing recommendations:
- Is recommended
- Is indicated/useful/effective/beneficial
- Should be performed/administered/other
- Comparative-Effectiveness Phrases†:
  - Treatment/strategy A is recommended/indicated in preference to treatment B
  - Treatment A should be chosen over treatment B

CLASS 2a (MODERATE) — Benefit >> Risk

Suggested phrases for writing recommendations:
- Is reasonable
- Can be useful/effective/beneficial
- Comparative-Effectiveness Phrases†:
  - Treatment/strategy A is probably recommended/indicated in preference to treatment B
  - It is reasonable to choose treatment A over treatment B

CLASS 2b (WEAK) — Benefit ≥ Risk

Suggested phrases for writing recommendations:
- May/might be reasonable
- May/might be considered
- Usefulness/effectiveness is unknown/unclear/uncertain or not well-established

CLASS 3 No Benefit (MODERATE) — Benefit = Risk
(Generally, LOE A or B use only)

Suggested phrases for writing recommendations:
- Is not recommended
- Is not indicated/useful/effective/beneficial
- Should not be performed/administered/other

CLASS 3 Harm (STRONG) — Risk > Benefit

Suggested phrases for writing recommendations:
- Potentially harmful
- Causes harm
- Associated with excess morbidity/mortality
- Should not be performed/administered/other

LEVEL (QUALITY) OF EVIDENCE‡

LEVEL A
- High quality evidence from more than 1 RCT
- Meta-analyses of high-quality RCTs
- One or more RCTs corroborated by high-quality registry studies

LEVEL B-R (Randomized)
- Moderate-quality evidence‡ from 1 or more RCTs
- Meta-analyses of moderate-quality RCTs

LEVEL B-NR (Nonrandomized)
- Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies
- Meta-analyses of such studies

LEVEL C-LD (Limited Data)
- Randomized or nonrandomized observational or registry studies with limitations of design or execution
- Meta-analyses of such studies
- Physiological or mechanistic studies in human subjects

LEVEL C-EO (Expert Opinion)
- Consensus of expert opinion based on clinical experience

COR and LOE are determined independently (any COR may be paired with any LOE).

A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

- The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnosis accuracy or incremental prognostic information).

† For comparative-effectiveness recommendations (COR 1 and 2a; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

‡ The method of assessing quality is evolving, including the application of standardized, widely-used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence, NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.

Virani et al., J Am Coll Cardiol 2023 Jul 14 Epub ahead of print

U.S. Heart Disease Prevalence by Age, Race, Ethnicity, and Sex (2015 to 2018)

Population Group	Prevalence, CHD, 2015-2018, Age ≥20 y	Prevalence, MI, 2015-2018, Age ≥20 y	Prevalence, AP,* 2015-2018, Age ≥20 y
Both sexes	20.1 million (7.2% [95% CI, 6.5-7.9])	8.8 million (3.1% [95% CI, 2.7-3.6])	11 million (4.1%)
Men	11 million (8.3%)	5.8 million (4.3%)	5.3 million (4.2%)
Women	9.1 million (6.2%)	3 million (2.1%)	5.7 million (4.0%)
NH White men	8.7%	4.4%	4.5%
NH White women	6.0%	2.0%	4.0%
NH Black men	6.7%	3.9%	3.3%
NH Black women	7.2%	2.3%	4.7%
Hispanic men	6.8%	3.7%	3.5%
Hispanic women	6.4%	2.1%	4.3%
NH Asian men	5.0%	2.7%	2.1%
NH Asian women	3.2%	0.7%	2.2%
NH Native American/Alaska Native	–	–	–

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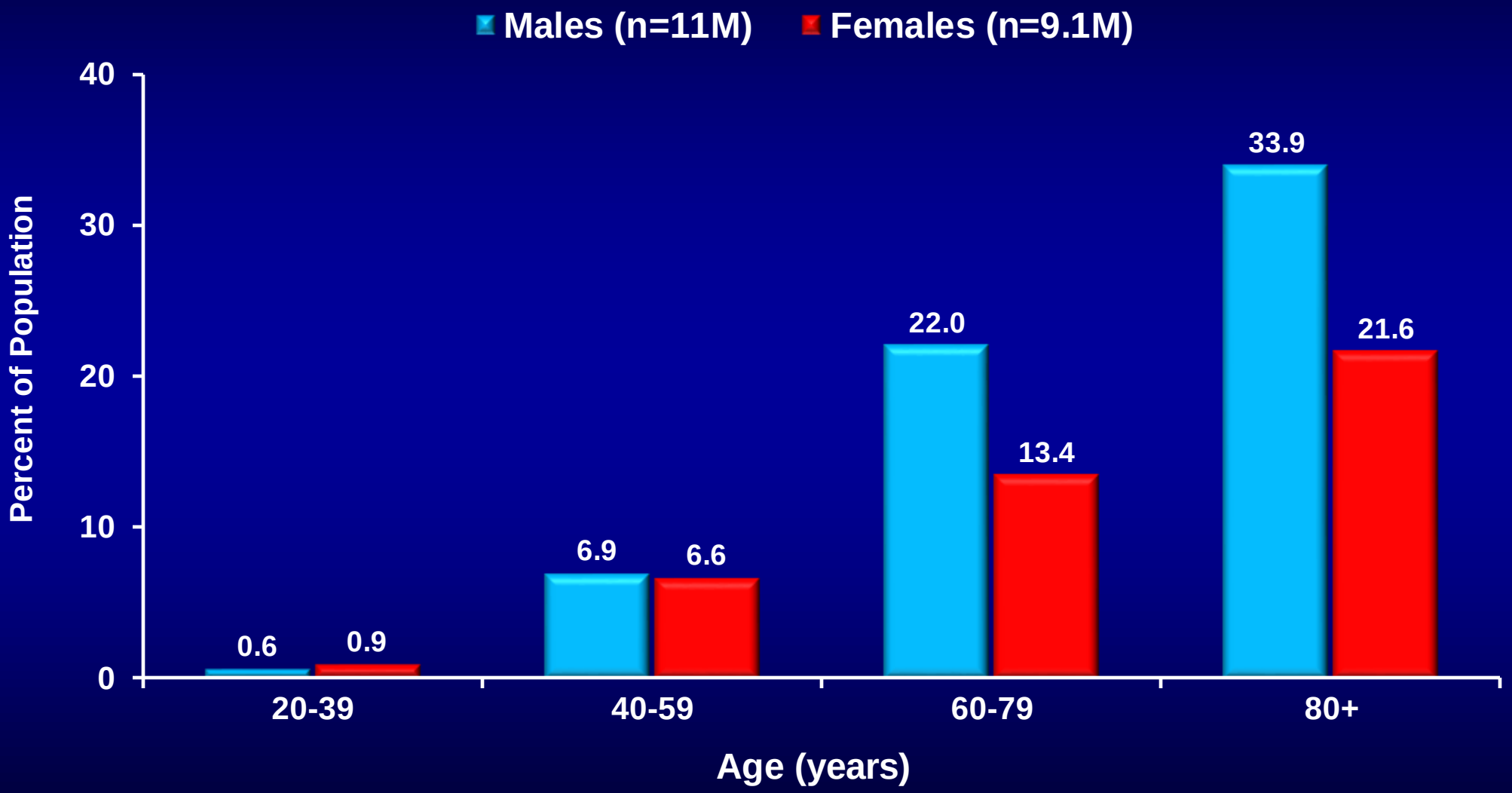
U.S. Prevalence of CHD per 100,000 by Age and Sex (NHANES 2015 to 2018)



NHANES – National Health and Nutrition Examination Survey)

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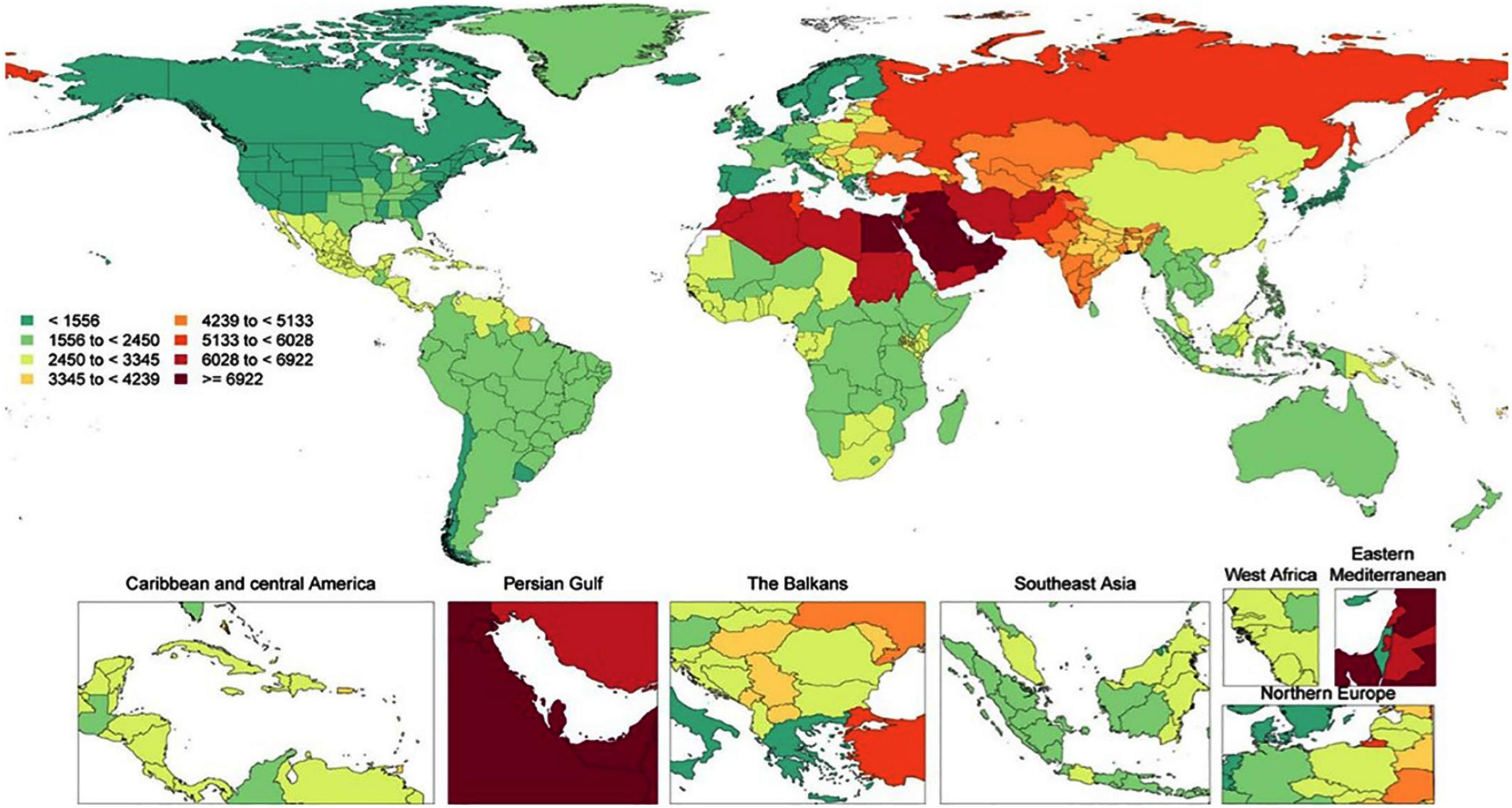
Global Age-Adjusted Prevalence of CCD per 100,000 by Sex, 2020



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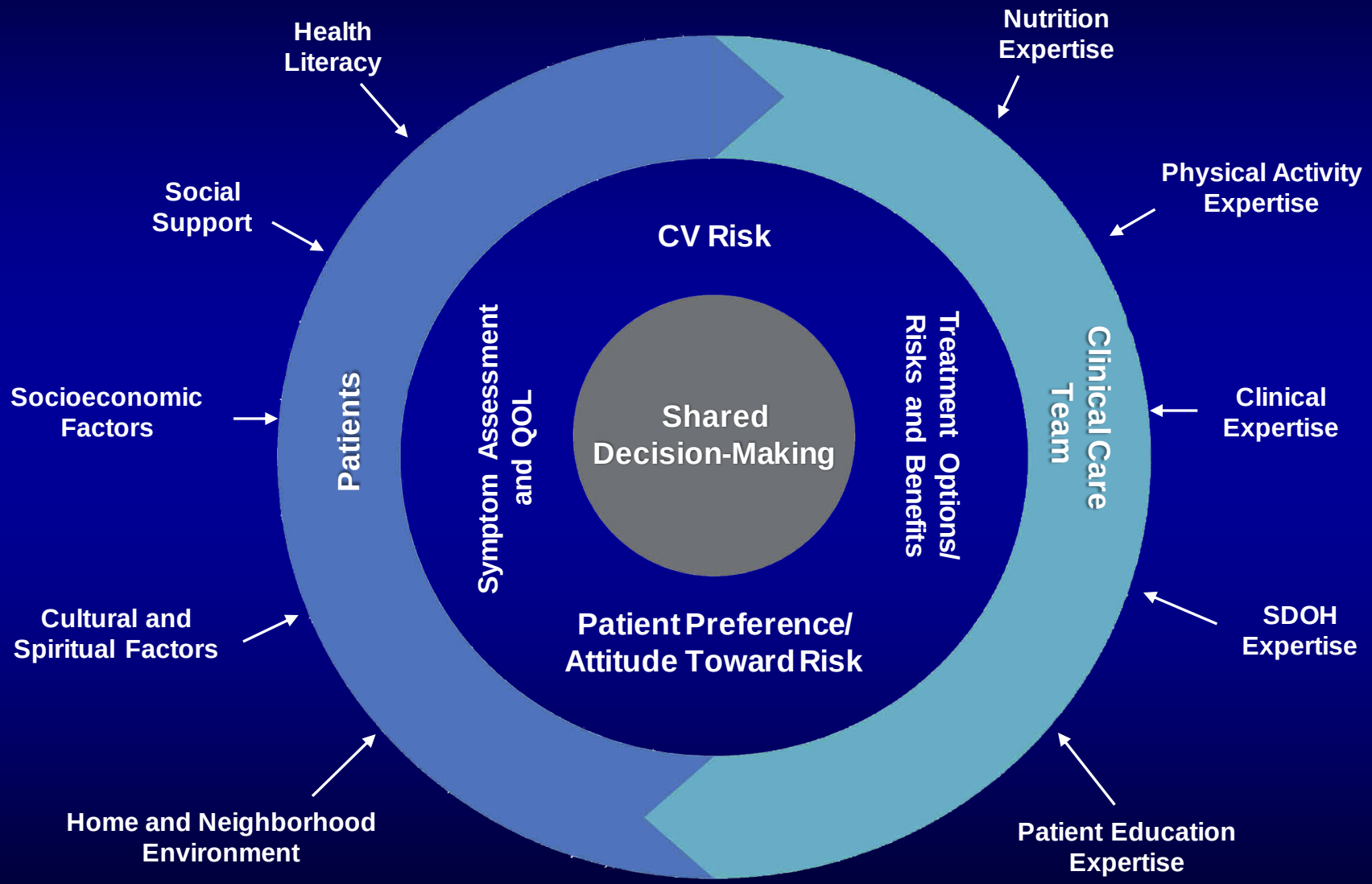
Domains to Consider When Seeing A Patient with CCD



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Recommendations for Diagnostic Evaluation

COR	LOE	RECOMMENDATIONS
1	B-NR	1. In patients with CCD and a change in symptoms or functional capacity that persists despite GDMT, stress positron emission tomography/single photon emission CT myocardial perfusion imaging (PET/SPECT MPI), cardiovascular magnetic resonance (CMR) imaging, or stress echocardiography is recommended to detect the presence and extent of myocardial ischemia, estimate risk of major adverse cardiovascular events (MACE), and guide therapeutic decision-making.*
1	B-R	2. In patients with CCD and a change in symptoms or functional capacity that persists despite GDMT, invasive coronary angiography (ICA) is recommended for guiding therapeutic decision-making with the goal of improving anginal symptoms.*
2a	B-R	3. In patients with CCD and a change in symptoms or functional capacity that persists despite GDMT, when selected for rest/stress nuclear MPI, PET is reasonable in preference to SPECT, if available, to improve diagnostic accuracy and decrease the rate of nondiagnostic test results.*
2a	B-NR	4. In patients with CCD and a change in symptoms or functional capacity that persists despite GDMT, exercise treadmill testing can be useful to determine whether the symptoms are consistent with angina pectoris, assess the severity of symptoms, evaluate functional capacity, and guide management.*
2a	B-NR	5. In patients with CCD undergoing stress PET MPI or stress CMR imaging, the addition of myocardial blood flow reserve (MBFR) can be useful to improve diagnostic accuracy and enhance risk stratification.*
2a	B-NR	6. In patients with CCD and a change in symptoms or functional capacity that persists despite GDMT, and who have had previous coronary revascularization, coronary CT angiography (CCTA) is reasonable to evaluate bypass graft or stent patency (for stents ≥3 mm).*

*Modified from the 2021 AHA/ACC/Multisociety Guideline for the Evaluation and Diagnosis of Chest Pain.

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Recommendations for Risk Stratification and Relationship to Treatment Selection

COR	LOE	RECOMMENDATIONS
		Risk Stratification and Prognosis
1	B-NR	1. In patients with CCD, it is recommended that risk stratification incorporate all available information, including noninvasive, invasive, or both cardiovascular diagnostic testing results or use validated risk scores to classify patients as low (<1%), intermediate (1%-3%), or high (>3%) yearly risk for cardiovascular death or nonfatal MI.
		Relationship to Treatment
1	A	2. In patients with CCD, optimization of GDMT is recommended to reduce MACE.*
1	A	3. In patients with CCD with newly reduced LV systolic function, clinical heart failure, or both, ICA is recommended to assess coronary anatomy and guide potential revascularization.
3: No benefit	A	4. In patients with CCD, ICA for risk stratification is not routinely recommended in patients without LV systolic dysfunction, heart failure, stable chest pain refractory to GDMT, and/or noninvasive testing suggestive of significant (>50%) left main disease.

*Modified from the 2021 AHA/ACC/Multisociety Guideline for the Evaluation and Diagnosis of Chest Pain.

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Potential Features Associated with a Higher Risk of MACE Among Patients with Established CCD

Demographics and Socioeconomic Status (also see Section 4.1.4, "Social Determinants of Health")
Age
Male sex
Poor social support
Poverty or lack of health care access
Past or Concurrent Medical, Mental Health Conditions
Elevated body mass index
Previous MI, PCI, or CABG
HF
Atrial fibrillation or flutter
Diabetes
Dyslipidemia
Chronic kidney disease
Current or former smoker
Peripheral artery disease
Depression
Poor adherence with goal-directed pharmacotherapy
Ancillary Cardiac Testing or Imaging
Inability to exercise
Angina with stress
ECG: left bundle branch block, left ventricular hypertrophy, higher resting heart rate
Echocardiography: reduced left ventricular ejection fraction, left ventricular hypertrophy

Demographics and Socioeconomic Status (also see Section 4.1.4, "Social Determinants of Health")
EST: higher DTS, higher resting heart rate, achieved heart rate <85% predicted
Exercise or dobutamine stress echocardiography: higher DTS, lower exercise workload, peak rate-pressure product <15,000, coronary flow reserve <2, no change or increase in left ventricular end-systolic volume, reduced ejection fraction, ischemic electrocardiographic changes with stress
SPECT or PET: Percentage fixed myocardium on SPECT, transient ischemic dilation with stress, reduced coronary flow reserve, ischemic electrocardiographic changes with stress
Higher calcium score: alone and in addition to functional imaging
CCTA: total plaque burden, high-risk plaque (positive remodeling [remodeling index >1.1], low attenuation [mean CT number <30 HU], or napkin-ring sign), reduced CT-fractional flow reserve
CMR: reduced left and/or right ventricular ejection fraction, left ventricular hypertrophy, scar or infarct, reduced myocardial perfusion reserve, myocardial blood flow at stress
Biomarkers
High-sensitivity troponin, B-type natriuretic peptide

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Recommendations for General Approach to Treatment Decisions

COR	LOE	RECOMMENDATIONS
1	C-LD	1. In patients with CCD, clinical follow-up at least annually is recommended to assess for symptoms, change in functional status, adherence to and adequacy of lifestyle and medical interventions, and monitoring for complications of CCD and its treatments.
2b	B-NR	2. In patients with CCD, use of a validated CCD-specific patient-reported health status measure may be reasonable to assess symptoms, functional status, and QOL.

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Treatment Approaches

Recommendation for Team-Based Approach
Referenced studies that support the recommendation are summarized in the Online Data Supplement.

COR	LOE	RECOMMENDATION
1	A	1. In patients with CCD, a multidisciplinary team-based approach is recommended to improve health outcomes, facilitate modification of ASCVD risk factors, and improve health service utilization.*

*Modified from the 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease.

Recommendations for Patient Education
Referenced studies that support the recommendations are summarized in Online Data Supplement.

COR	LOE	RECOMMENDATIONS
1	C-LD	1. Patients with CCD should receive ongoing individualized education on symptom management, lifestyle changes, and SDOH risk factors to improve knowledge and facilitate behavior change.
1	C-LD	2. Patients with CCD should receive ongoing individualized education on medication adherence to improve knowledge and facilitate behavior change.

Recommendations for Shared Decision-Making
Referenced studies that support the recommendations are summarized in the Online Data Supplement.

COR	LOE	RECOMMENDATIONS
1	C-LD	1. Patients with CCD and their clinicians should engage in shared decision-making particularly when evidence is unclear on the optimal diagnostic or treatment strategy, or when a significant risk or benefit tradeoff exists.
2b	B-R	2. For patients with CCD and angina on GDMT who are engaged in shared decision-making regarding revascularization, a validated decision aid may be considered to improve patient understanding and knowledge about treatment options.

Recommendation for SDOH
Referenced studies that support the recommendation are summarized in the Online Data Supplement.

COR	LOE	RECOMMENDATION
1	B-R	1. In patients with CCD, routine assessment by clinicians and the care team for SDOH is recommended to inform patient-centered treatment decisions and lifestyle change recommendations.*

*Modified from the 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease.

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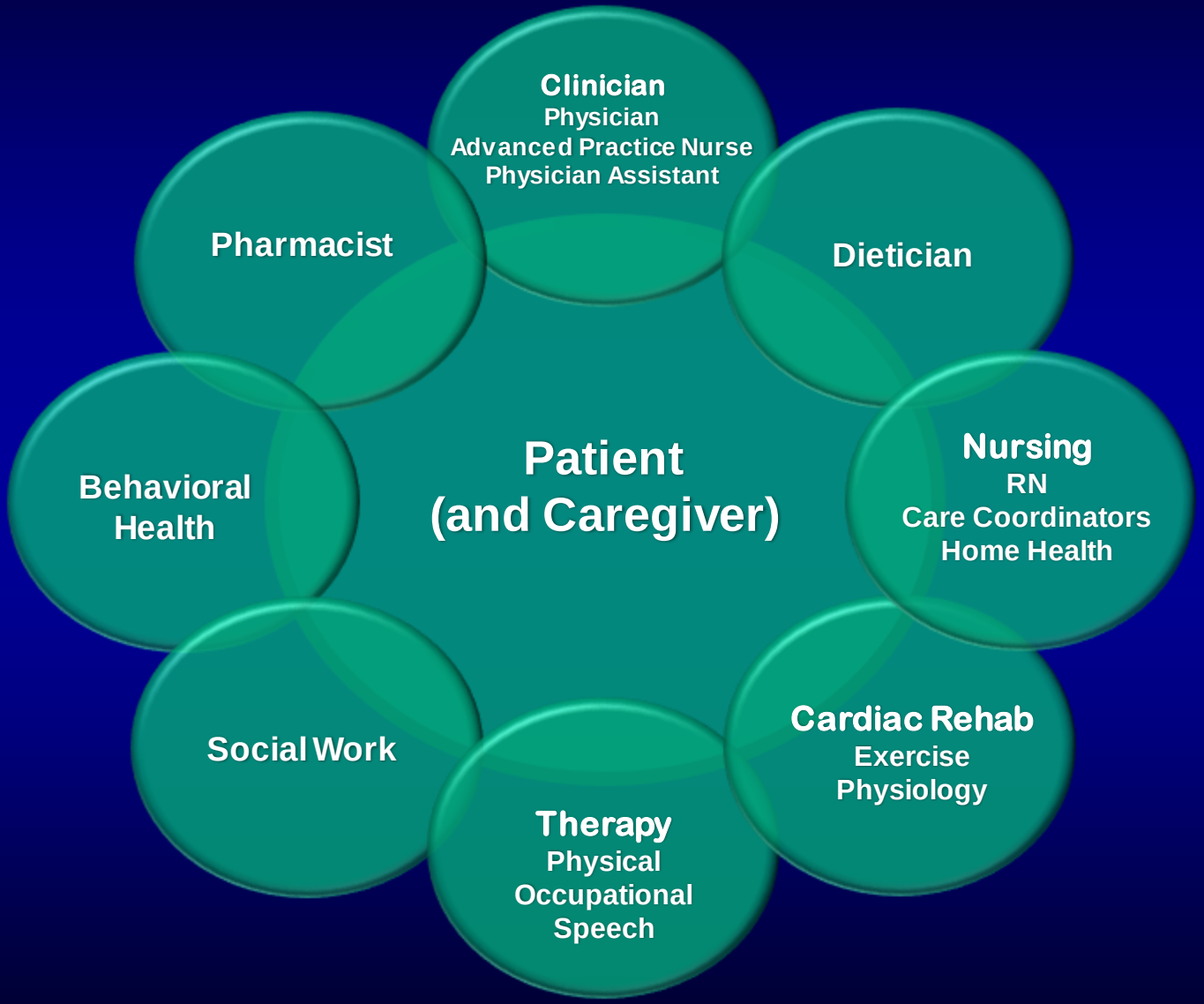
Team-Based Approach Reflective of Interconnectedness and Communication



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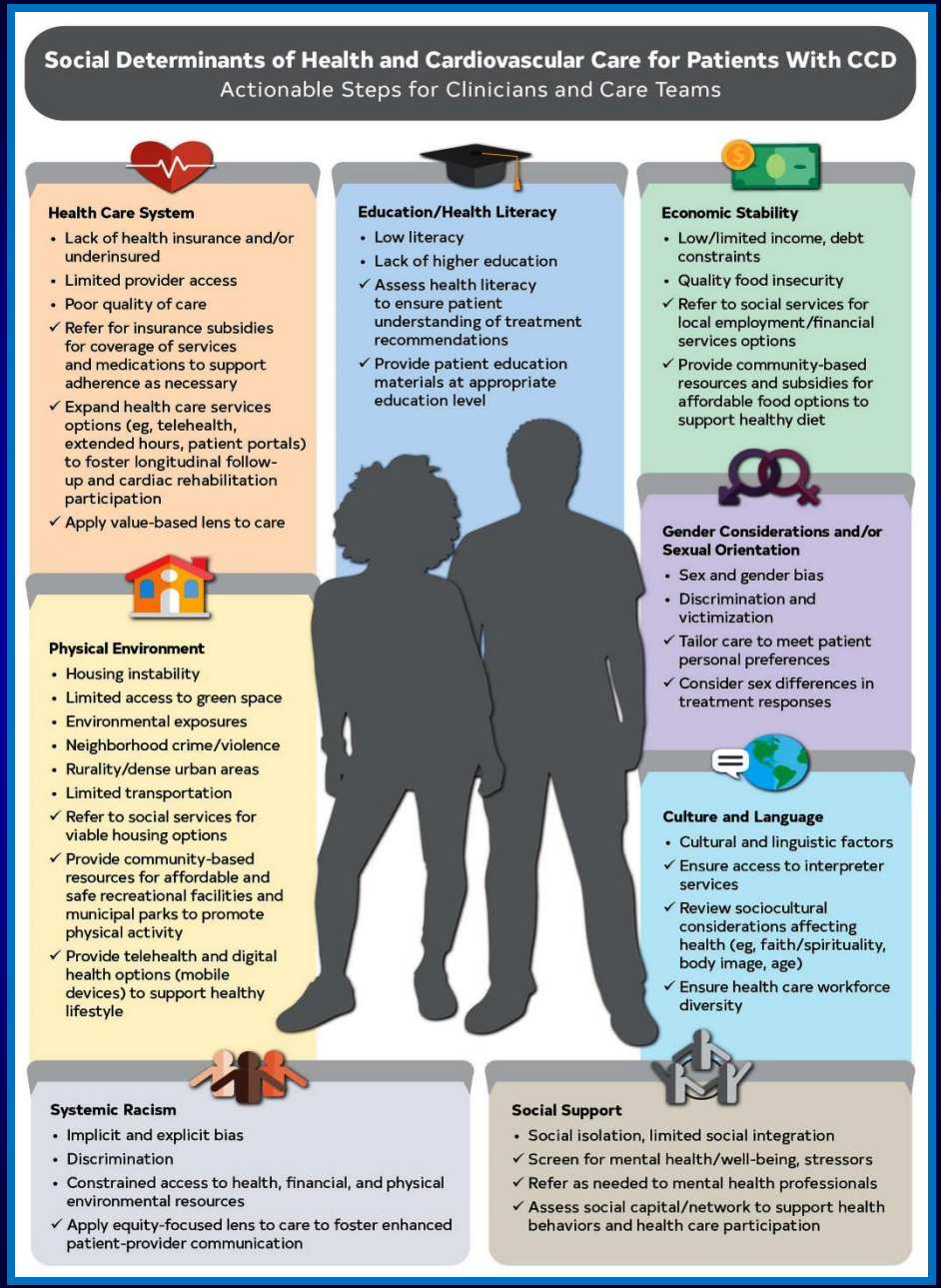
Social Determinants of Health and CV Care for Pts with CCD



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Recommendations for Nutrition, Including Supplements

COR	LOE	Nutrition
1	B-R	1. In patients with CCD, a diet emphasizing vegetables, fruits, legumes, nuts, whole grains, and lean protein is recommended to reduce the risk of CVD events.*
2a	B-NR	2. In patients with CCD, reducing the percentage of calories from saturated fat (<6% of total calories) and replacing with dietary monounsaturated and polyunsaturated fat, complex carbohydrates, and dietary fiber can be beneficial to reduce the risk of CVD events.*
2a	B-NR	3. In patients with CCD, minimization of sodium (<2,300 mg/d; optimally 1,500 mg/d) and minimization of processed meats (eg, cured bacon, hot dogs) can be beneficial to reduce the risk of CVD events.*
2a	B-NR	4. In patients with CCD, limiting refined carbohydrates (eg, containing <25% whole grain by weight, including refined cold ready-to-eat breakfast cereal, white bread, white rice), and sugar-sweetened beverages (eg, soft drinks, energy drinks, fruit drinks with added sugars) can be beneficial to reduce the risk of CVD events.*
3: Harm	B-NR	5. In patients with CCD, the intake of *trans* fat should be avoided because *trans* fat is associated with increased morbidity and mortality rates.*
		Nutrition Supplements
3: No Benefit	B-NR	6. In patients with CCD, the use of nonprescription or dietary supplements, including omega-3 fatty acid, vitamins C, D, E, beta-carotene, and calcium, is not beneficial to reduce the risk of acute CVD events.

*Modified from the 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease.

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Recommended Nutrition

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Mental Health Conditions

Recommendations for Mental Health Conditions
Referenced studies that support the recommendations are summarized in the Online Data Supplement.

COR	LOE	RECOMMENDATIONS
2a	B-R	1. In patients with CCD, targeted discussions and screening for mental health is reasonable for clinicians to assess and to refer for additional mental health evaluation and management.
2a	B-R	2. In patients with CCD, treatment for mental health conditions with either pharmacologic or non-pharmacologic therapies, or both, is reasonable to improve cardiovascular outcomes.

TABLE 6 Suggested Screening Tool to Assess Psychological Distress: Patient Health Questionnaire-2 Depression Screen

Over the past 2 weeks, how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
Little interest or pleasure in doing things	0	1	2	3
Feeling down, depressed, or hopeless	0	1	2	3

Total score of ≥3 warrants further assessment for depression.

Data derived from Kroenke et al. and Levine et al. Reprinted with permission from Levine GN et al. Copyright 2021 American Heart Association, Inc.

TABLE 7 Suggested Screening Questions to Assess Psychological Health

Well-being parameter	Question
Health-related optimism	How do you think things will go with your health moving forward?
Positive affect	How often do you experience pleasure or happiness in your life?
Gratitude	Do you ever feel grateful about your health? Do you ever feel grateful about other things in your life?

Data derived from Levine GN et al. Reprinted with permission from Levine GN et al. Copyright 2021 American Heart Association, Inc.

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Recommendations for Tobacco Products

COR	LOE	RECOMMENDATIONS
1	A	1. In patients with CCD, tobacco use should be assessed at every health care visit to facilitate identification of those who may benefit from behavioral or pharmacologic interventions.*
1	A	2. Patients with CCD who regularly smoke tobacco should be advised to quit at every visit.*
1	A	3. In patients with CCD who regularly smoke tobacco, behavioral interventions are recommended to maximize cessation rates in combination with pharmacotherapy, including bupropion, varenicline, or combination long- and short-acting nicotine replacement therapy (NRT).*
2b	B-R	4. In patients with CCD who regularly smoke tobacco, varenicline may be considered versus bupropion or NRT to increase cessation rates.
2b	B-R	5. In patients with CCD who regularly smoke tobacco, the short-term use of nicotine-containing e-cigarettes may be considered to aid smoking cessation, although the risk of sustained use and unknown long-term safety may outweigh the benefits.
3: Harm	B-NR	6. Patients with CCD should avoid secondhand smoke exposure to reduce risk of cardiovascular events.*

*Modified from the 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease.

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Behavioral Resources for Smoking Cessation

Resource	Description
Telephone-based: Quitline English: 1-800-QUIT-NOW (1-800-784-8669) Spanish: 1-855-DÉJELO-YA (1-855-335-3569) Mandarin and Cantonese: 1-800-838-8917 Korean: 1-800-556-5564 Vietnamese: 1-800-778-8440	Counseling by telephone from a trained tobacco coach who offers support via a series of scheduled telephone calls before and after a smoker's quit date. Patients can self-refer to the Quitline, or clinicians can refer patients, with their consent, proactively. Quitline services vary by state, can include text messaging and web coaching support, and may provide free samples of nicotine replacement therapy. State-by-state information about Quitline services is available at https://www.cdc.gov/tobacco/patient-care/quitlines-other/index.html
Web-based: American Lung Association Freedom From Smoking https://www.lung.org/quit-smoking/join-freedom-from-smoking	Created by the American Lung Association to support smoking cessation in persons who want to quit. The program also provides information about nicotine replacement therapy and pharmacotherapy. Multiple modes of support available to patients, including group clinics, a telephone-based "Lung HelpLine," a self-help guide, and a web-based interactive customized program. Interactive program available for computer, tablet, or smartphone interface.
Web-based: National Cancer Institute English: Smokefree.gov Spanish: https://espanol.smokefree.gov/Spanish	Supported by the US Department of Health and Human Services and National Institutes of Health, created by the National Cancer Institute. Website contains information about quitting and resources for quitting and allows users to create a personalized quit plan. Specific websites are also available for women, teens, Veterans, and those >60 y of age. Programs available through the website include: SmokefreeTXT (text messaging program), QuitGuide, and quitSTART (mobile phone apps).
Web-based: Asian Smokers' Quitline Mandarin, Cantonese, Korean, and Vietnamese Speakers https://www.asiansmokersquitline.org/	Operated by the Moores Cancer Center at the University of California, San Diego, funded by a grant from the US Centers for Disease Control and Prevention. Created to support tobacco cessation for persons who speak Mandarin, Cantonese, Korean, and Vietnamese across the United States. Some participants may be eligible for a 2-wk starter kit of nicotine patches. Telephone counseling developed to deliver a quit plan and support quitting, and printed self-help materials sent to participants.
Web-based: BecomeAnEX Available in English and Spanish https://www.becomeanex.org	Created by the Truth Initiative, a nonprofit public education in partnership with the Mayo Clinic Nicotine Dependence Center. Website with information about cessation of smoking, vaping, or use of smokeless tobacco, with resources to build an individualized quit plan. Includes support from experts and an online community, and a text message–based program for quitting vaping focused on teens and young adults, "This is Quitting." An employer-based program, the EX Program, is also available through the Truth Initiative.

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Recommendations for Alcohol and Substance Abuse

COR	LOE	RECOMMENDATIONS
1	C-LD	1. Patients with CCD should be routinely asked and counseled about substance use to reduce ASCVD events.
2a	B-NR	2. In patients with CCD who consume alcohol, it is reasonable to limit alcohol intake (≤1 drink/d for women, ≤2 drinks/d for men) to reduce cardiovascular and all-cause death.
3: No Benefit	B-NR	3. Patients with CCD should not be advised to consume alcohol for the purpose of cardiovascular protection.

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Substances With Abuse Potential and Adverse Cardiovascular Effects for Patients With CCD

Substance	Potential Adverse Cardiovascular Effects
Alcohol	■ J-shaped relationship between alcohol intake and cardiovascular risk in observational studies but limited by confounding. ■ Heavy alcohol use and binge drinking associated with increased morbidity and mortality rates. ■ May increase serum triglycerides. ■ Potential drug-drug interactions with cardiovascular therapies.
Cocaine, methamphetamine	■ Stimulation of the sympathetic nervous system. ■ Platelet activation and aggregation. ■ Increased myocardial oxygen demand. ■ Can present with cocaine-associated chest pain. ■ MI risk independent of route of administration.
Opioids	■ Possible association with risk of MI in chronic use. ■ High potential for dependence and abuse with chronic use. ■ Potential for drug-drug interactions with cardiovascular therapies.
Marijuana	■ Stimulation of the sympathetic nervous system. ■ Platelet activation. ■ Endothelial dysfunction. ■ Carbon monoxide toxicity from smoking and inhalatation. ■ Route of administration may impact toxicity, with edible products associated with fewer acute cardiovascular symptoms.

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Recommendations for Sexual Health Activity

COR	LOE	RECOMMENDATIONS
2a	B-NR	1. In patients with CCD, it is reasonable to individualize resumption of sexual activity based on type of sexual activity, exercise capacity, and postprocedural healing.*
2a	B-NR	2. In patients with CCD, cardiac rehabilitation and regular exercise can be useful to reduce the risk of cardiovascular complications with sexual activity.*
3: Harm	B-NR	3. In patients with CCD, phosphodiesterase type 5 inhibitors should not be used concomitantly with nitrate medications because of risk for severe hypotension.*

*Modified from the 2012 AHA Scientific Statement on Sexual Activity and Cardiovascular Disease.

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Recommendations for Lipid Management

COR	LOE	RECOMMENDATIONS
1	A	1. In patients with CCD, high-intensity statin therapy is recommended with the aim of achieving a ≥50% reduction in LDL-C levels to reduce the risk of MACE.*
1	A	2. In patients in whom high-intensity statin therapy is contraindicated or not tolerated, moderate-intensity statin therapy is recommended with the aim of achieving a 30% to 49% reduction in LDL-C levels to reduce the risk of MACE.*
1	A	3. In patients with CCD, adherence to changes in lifestyle and effects of lipid-lowering medication should be assessed by measurement of fasting lipids in 4 to 12 weeks after statin initiation or dose adjustment and then every 3 to 12 months thereafter based on need to assess response or adherence to therapy.*
Cost Value Statement: High Value	B-NR	4. In patients with CCD, the use of generic formulations of maximally tolerated statin therapy is projected to be cost saving.
2a	B-R	5. In patients with CCD who are judged to be at very high risk (Table 10) and on maximally tolerated statin therapy with an LDL-C level ≥70 mg/dL (≥1.8 mmol/L), ezetimibe can be beneficial to further reduce the risk of MACE.*
Cost Value Statement: High Value	B-NR	6. In patients with CCD, addition of generic ezetimibe to maximally tolerated statin therapy in appropriately selected patients is projected to be of high economic value at US prices.
2a	A	7. In patients with CCD who are judged to be at very high risk (Table 10) and who have an LDL-C level ≥70 mg/dL (≥1.8 mmol/L), or a non–high-density lipoprotein cholesterol (HDL-C) level ≥100 mg/dL (≥2.6 mmol/L), on maximally tolerated statin and ezetimibe, a PCSK9 monoclonal antibody can be beneficial to further reduce the risk of MACE.*
Cost Value Statement: Uncertain	B-NR	8. In patients with CCD who are very high risk, the use of PCSK9 monoclonal antibodies is projected to be of uncertain economic value at US prices
2b	B-R	9. In patients with CCD on maximally tolerated statin therapy with an LDL-C level <100 mg/dL (<2.6 mmol/L) and a persistent fasting triglyceride level of 150 to 499 mg/dL (1.7–5.6 mmol/L) after addressing secondary causes, icosapent ethyl may be considered to further reduce the risk of MACE and cardiovascular death.
2b	B-R	10. In patients with CCD who are not at very high risk and on maximally tolerated statin therapy with an LDL-C level ≥70 mg/dL (≥1.8 mmol/L), it may be reasonable to add ezetimibe to further reduce the risk of MACE.*
2b	B-R	11. In patients with CCD on maximally tolerated statin therapy who have an LDL-C level ≥70 mg/dL (≥1.8 mmol/L), and in whom ezetimibe and PCSK9 monoclonal antibody are deemed insufficient or not tolerated, it may be reasonable to add bempedoic acid or inclisiran (in place of PCSK9 monoclonal antibody) to further reduce LDL-C levels.
3: No Benefit	B-R	12. In patients with CCD receiving statin therapy, adding niacin, or fenofibrate or dietary supplements containing omega-3 fatty acids, are not beneficial in reducing cardiovascular risk.

*Modified from the 2018 AHA/ACC/Multisociety Guideline on the Management of Blood Cholesterol.

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Very High-Risk of Future ASCVD Events

Definition of Very High-Risk*
History of multiple major ASCVD events
OR
One major ASCVD event **AND** ≥2 high-risk conditions
Major ASCVD Events
Recent ACS (within the past 12 mo)
History of MI (other than recent ACS events listed above)
History of ischemic stroke
Symptomatic peripheral artery disease (history of claudication with ABI <0.85, or previous revascularization or amputation)
High-Risk Conditions
Age ≥65 y
Familial hypercholesterolemia†
History of previous coronary artery bypass graft surgery or percutaneous coronary intervention outside of the major ASCVD event(s)
Diabetes
Hypertension
Chronic kidney disease (eGFR, 15–59 mL/min/1.73 m^2)
Current tobacco smoking
Persistently elevated LDL-C ≥100 mg/dL despite maximally tolerated statin therapy and ezetimibe
History of congestive heart failure

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*Very high-risk includes a history of multiple major ASCVD events or 1 major ASCVD event and multiple high-risk conditions.

†Management of patients with familial hypercholesterolemia often requires combination lipid lowering therapy and referral to a lipid specialist, and possibly lipoprotein apheresis.

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High-, Moderate-, and Low-Intensity Statin Therapy

	High Intensity	Moderate Intensity	Low Intensity
LDL-C Lowering†	≥50%	30%-49%	<30%
Statins	**Atorvastatin (40 mg‡), 80 mg** **Rosuvastatin 20 mg (40 mg)**	**Atorvastatin 10 mg** (20 mg) **Rosuvastatin** (5 mg) **10 mg** **Simvastatin 20-40 mg§**	Simvastatin 10 mg
		Pravastatin 40 mg (80 mg) **Lovastatin 40 mg** (80 mg) Fluvastatin XL 80 mg **Fluvastatin 40 mg BID** Pitavastatin 1-4 mg	**Pravastatin 10-20 mg** **Lovastatin 20 mg** Fluvastatin 20-40 mg

Percent LDL-C reductions with the primary statin medications used in clinical practice (atorvastatin, rosuvastatin, simvastatin) were estimated using the median reduction in LDL-C from the VOYAGER database.[11] Reductions in LDL-C for other statin medications (fluvastatin, lovastatin, pitavastatin, pravastatin) were identified according to FDA-approved product labeling in adults with hyperlipidemia, primary hypercholesterolemia, and mixed dyslipidemia. **Boldface type** indicates specific statins and doses that were evaluated in RCTs and the Cholesterol Treatment Trialists' 2010 meta-analysis. These RCTs demonstrated a reduction in major cardiovascular events. Reprinted with permission from Grundy SM, et al. Copyright 2019 American Heart Association, Inc., and American College of Cardiology Foundation.

*Percent reductions are estimates from data across large populations. Individual responses to statin therapy varied in the RCTs and should be expected to vary in clinical practice.[11]

†LDL-C lowering that should occur with the dosage listed below each intensity.

‡Evidence from 1 RCT only: down titration if unable to tolerate atorvastatin 80 mg in the IDEAL (Incremental Decrease through Aggressive Lipid Lowering) study.[61]

§Although simvastatin 80 mg was evaluated in RCTs, initiation of simvastatin 80 mg or titration to 80 mg is not recommended by the FDA because of the increased risk of myopathy, including rhabdomyolysis.

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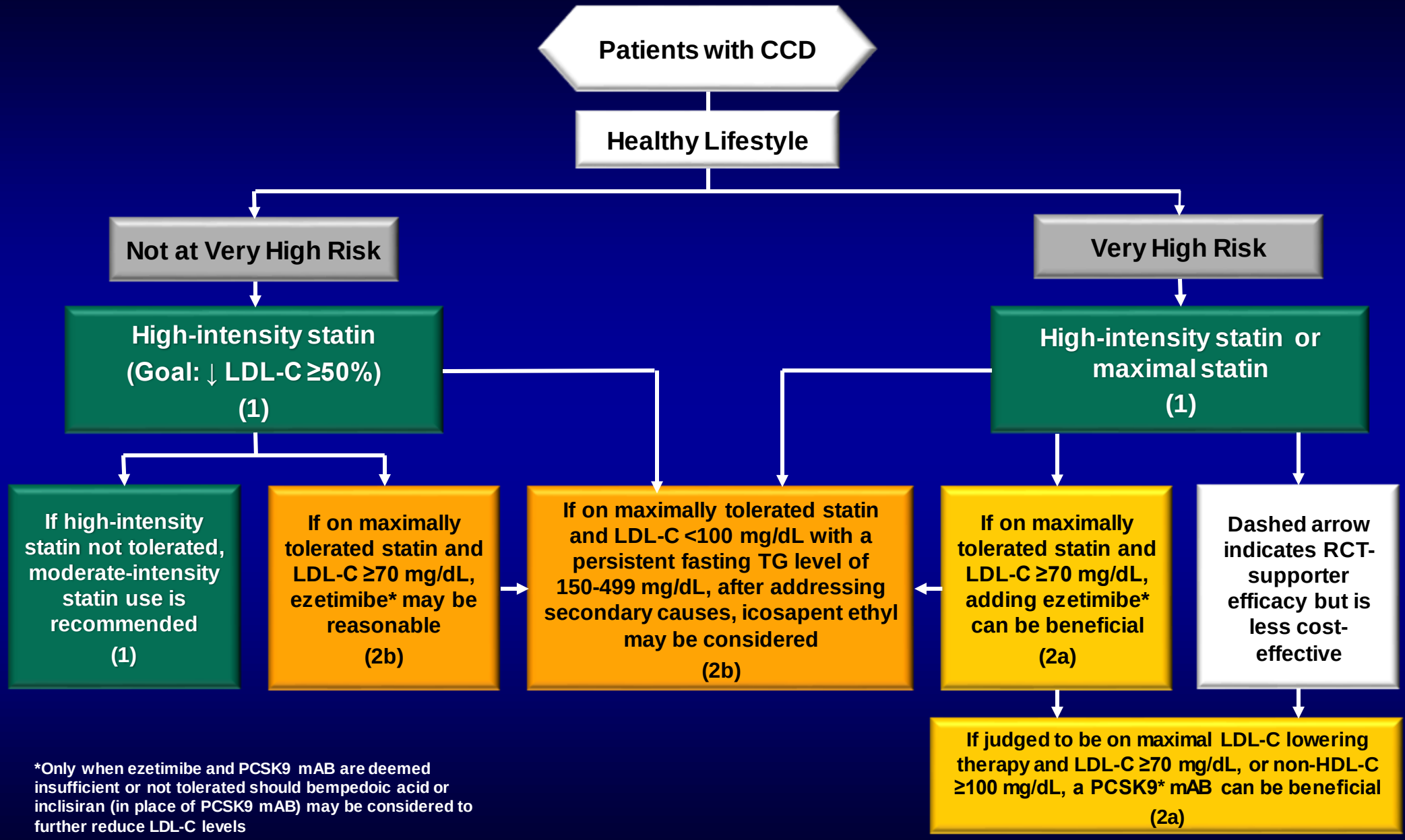
Lipid Management in Patients with CCD



*Only when ezetimibe and PCSK9 mAB are deemed insufficient or not tolerated should bempedoic acid or inclisiran (in place of PCSK9 mAB) may be considered to further reduce LDL-C levels

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Nonpharmacologic Strategies for Blood Pressure Management

Nonpharmacologic Intervention		Dose	Approximate Impact on SBP		
			Hypertension	Normotension	Reference
Weight loss	Weight/body fat	Best goal is ideal body weight but aim for at least a 1-kg reduction in body weight for most adults who are overweight. Expect about 1 mm Hg for every 1-kg reduction in body weight.	−5 mm Hg	−2/3 mm Hg	5
Healthy diet	DASH dietary pattern	Consume a diet rich in fruits, vegetables, whole grains, and low-fat dairy products, with reduced content of saturated and total fat.	−11 mm Hg	−3 mm Hg	2,3
Reduced intake of dietary sodium	Dietary sodium	Optimal goal is <1,500 mg/d but aim for at least a 1,000-mg/d reduction in most adults.	−5/6 mm Hg	−2/3 mm Hg	29,30
Enhanced intake of dietary potassium	Dietary potassium	Aim for 3,500-5,000 mg/d, preferably by consumption of a diet rich in potassium.	−4/5 mm Hg	−2 mm Hg	35
Physical activity	Aerobic	■ 90-150 min/wk ■ 65%-75% heart rate reserve	−5/8 mm Hg	−2/4 mm Hg	4,8
	Dynamic resistance	■ 90-150 min/wk ■ 50%-80% of 1 repetition maximum ■ 6 exercises, 3 sets/exercise, 10 repetitions/set	−4 mm Hg	−2 mm Hg	4
	Isometric resistance	■ 4×2 min (hand grip), 1 min rest between exercises, 30%-40% maximum voluntary contraction, 3 sessions/wk ■ 8-10 wk	−5 mm Hg	−4 mm Hg	36,37
Moderation in alcohol intake	Alcohol consumption	In individuals who drink alcohol, limit alcohol† to: ■ Men: ≤2 drinks daily ■ Women: ≤1 drink daily	−4 mm Hg	−3 mm Hg	6

Resources: Your Guide to Lowering Your Blood Pressure With DASH—How Do I Make the DASH? Available at: https://www.nhlbi.nih.gov/files/docs/public/heart/new_dash.pdf. Modified with permission from Whelton PK, et al.[19] Copyright 2018 American Heart Association, Inc., and American College of Cardiology Foundation.

*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension.

†In the United States, 1 "standard" drink contains roughly 14 g of pure alcohol, which is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol).

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Recommendations for Blood Pressure Management

COR	LOE	RECOMMENDATIONS
1	A	1. In adults with CCD, nonpharmacologic strategies are recommended as first-line therapy to lower BP in those with elevated BP (120-129/<80 mm Hg) (see Table 12).*
1	B-R	2. In adults with CCD who have hypertension, a BP target of <130/<80 mm Hg is recommended to reduce CVD events and all-cause death.*
1	B-R	3. In adults with CCD and hypertension (systolic BP ≥130 and/or diastolic BP ≥80 mm Hg), in addition to nonpharmacological strategies, GDMT angiotensin-converting enzyme (ACE) inhibitors, angiotensin-receptor blockers (ARB), or beta blockers are recommended as first-line therapy for compelling indications (eg, recent MI or angina), with additional antihypertensive medications (eg, dihydropyridine calcium channel blockers [CCB], long-acting thiazide diuretics, and/or mineralocorticoid receptor antagonists) added as needed to optimize BP control.*

*Modified from the 2017 ACC/AHA Multisociety Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults.

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Recommendations for Use of SGLT2 Inhibitors and GLP-1 Receptor Agonists

COR	LOE	RECOMMENDATIONS
1	A	1. In patients with CCD who have type 2 diabetes, the use of either an SGLT2 inhibitor or a GLP-1 receptor agonist with proven cardiovascular benefit is recommended to reduce the risk of MACE.
Cost Value Statement: High Value	B-NR	2. In patients with CCD and type 2 diabetes, addition of a GLP-1 receptor agonist at US prices is projected to be of high value compared with standard of care.
Cost Value Statement: Intermediate Value	B-NR	3. In patients with CCD and type 2 diabetes, addition of an SGLT2 inhibitor at US prices is projected to be of intermediate value compared with standard of care.
1	A	4. In patients with CCD and heart failure with LVEF ≤40%, use of an SGLT2 inhibitor is recommended to reduce the risk of cardiovascular death and heart failure hospitalization and to improve QOL, irrespective of diabetes status.*
Cost Value Statement: Intermediate Value	B-NR	5. In patients with CCD and heart failure with LVEF ≤40%, addition of an SGLT2 inhibitor to GDMT, irrespective of diabetes status, is projected to be of intermediate value at US prices.
2a	B-R	6. In patients with CCD and heart failure with LVEF >40%, use of an SGLT2 inhibitor can be beneficial in decreasing heart failure hospitalizations and to improve QOL, irrespective of diabetes status.
Cost Value Statement: Intermediate Value	B-NR	7. In patients with CCD and heart failure with LVEF >40%, addition of an SGLT2 inhibitor to GDMT, irrespective of diabetes status, is projected to be of uncertain value at US prices.

*Modified from the 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure.

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Recommendations for Weight Management

COR	LOE	RECOMMENDATIONS
1	C-EO	1. In patients with CCD, assessment of BMI with or without waist circumference is recommended during routine clinical follow-up.
1	B-NR	2. Patients with CCD and overweight or obesity should receive counseling on diet, lifestyle, and goals for weight loss.
2a	B-R	3. For patients with CCD and overweight or obesity in whom pharmacologic therapy is warranted for further weight reduction, a GLP-1 receptor agonist can be beneficial in addition to counseling for diet and physical activity, and it is reasonable to choose semaglutide over liraglutide.
2a	B-NR	4. In patients with CCD and severe obesity who have not met weight loss goals with lifestyle and pharmacologic intervention, and who have acceptable surgical risk, referral for consideration of a bariatric procedure is reasonable for weight loss and cardiovascular risk factor reduction.
3: Harm	B-R	5. In patients with CCD, use of sympathomimetic weight loss drugs is potentially harmful.

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Core Components of Cardiac Rehabilitation

TABLE 13 Core Components of CR

- Patient assessment
- Nutritional counseling
- Weight management
- Blood pressure management
- Lipid management
- Diabetes management
- Tobacco cessation
- Psychosocial management
- Physical activity counseling
- Exercise training

Recommendation for Cardiac Rehabilitation
Referenced studies that support the recommendation are summarized in the Online Data Supplement.

COR	LOE	RECOMMENDATION
1	A* B-R† C-LD‡	1. All patients with CCD and appropriate indications*†‡ should be referred to a cardiac rehabilitation program to improve outcomes.

*After recent MI, PCI, or CABG. †With stable angina or after heart transplant. ‡After recent spontaneous coronary artery dissection event.

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Recommendations for Physical Activity

COR	LOE	RECOMMENDATIONS
1	A	1. For patients with CCD who do not have contraindications, an exercise regimen is recommended, including ≥150 minutes/wk of moderate-intensity aerobic activities or ≥75 minutes/wk of higher-intensity aerobic activities to improve functional capacity and QOL, and to reduce hospital admission and mortality rates.
1	B-R	2. For patients with CCD who do not have contraindications, resistance (strength) training exercises are recommended on ≥2 days/wk to improve muscle strength, functional capacity, and cardiovascular risk factor control.
2a	B-NR	3. For patients with CCD who do not have contraindications, lower-intensity lifestyle activities (eg, walking breaks at work) to reduce sedentary behavior (ie, sitting time) are reasonable to improve functional capacity and reduce cardiovascular risk, especially in individuals with low levels of habitual leisure time physical activity.

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Recommendations for Antiplatelet Therapy

COR	LOE	RECOMMENDATIONS
		Antiplatelet Therapy Without Oral Anticoagulants
1	A	1. In patients with CCD and no indication for oral anticoagulant therapy, low-dose aspirin 81 mg (75-100 mg) is recommended to reduce atherosclerotic events.*
1	A	2. In patients with CCD treated with PCI, dual antiplatelet therapy (DAPT) consisting of aspirin and clopidogrel for 6 months post PCI followed by single antiplatelet therapy (SAPT) is indicated to reduce MACE and bleeding events.*
2a	A	3. In select patients with CCD treated with PCI and a drug-eluting stent (DES) who have completed a 1- to 3-month course of DAPT, P2Y12 inhibitor monotherapy for at least 12 months is reasonable to reduce bleeding risk.
2b	A	4. In patients with CCD who have had a previous MI and are at low bleeding risk, extended DAPT beyond 12 months for a period of up to 3 years may be reasonable to reduce MACE.*
2b	B-R	5. In patients with CCD and a previous history of MI without a history of stroke, transient ischemic attack (TIA), or ICH, vorapaxar may be added to aspirin therapy to reduce MACE.
2b	B-R	6. In patients with CCD, the use of DAPT after CABG may be useful to reduce the incidence of saphenous vein graft occlusion.
3: No benefit	A	7. In patients with CCD without recent ACS or a PCI-related indication for DAPT, the addition of clopidogrel to aspirin therapy is not useful to reduce MACE.*
3: Harm	A	8. In patients with CCD and previous stroke, TIA, or ICH, vorapaxar should not be added to DAPT because of increased risk of major bleeding and ICH.
3: Harm	B-R	9. In patients with CCD and previous stroke, TIA, or ICH, prasugrel should not be used because of risk of significant or fatal bleeding.
3: Harm	B-R	10. In patients with CCD, chronic nonsteroidal anti-inflammatory drugs should not be used because of increased cardiovascular and bleeding complications.

*Modified from the 2016 ACC/AHA Guideline Focused Update on DAPT. †Modified from the 2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization.

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Recommendations for Antiplatelet Therapy and Oral Anticoagulants

COR	LOE	RECOMMENDATIONS
		Antiplatelet Therapy With Direct Oral Anticoagulant (DOAC)
1	B-R	11. In patients with CCD who have undergone elective PCI and who require oral anticoagulant therapy, DAPT for 1 to 4 weeks followed by clopidogrel alone for 6 months should be administered in addition to DOAC.†
2a	B-R	12. In patients with CCD who have undergone PCI and who require oral anticoagulant therapy, continuing aspirin in addition to clopidogrel for up to 1 month is reasonable if the patient has a high thrombotic risk and low bleeding risk.*
2b	B-R	13. In patients with CCD who require oral anticoagulation and have a low atherothrombotic risk, discontinuation of aspirin therapy with continuation of DOAC alone may be considered 1 year after PCI to reduce bleeding risk.*
2b	C-LD	14. In patients with CCD who require oral anticoagulation, DOAC monotherapy may be considered if there is no acute indication for concomitant antiplatelet therapy.
		Antiplatelet Therapy and Low-Dose DOAC
2a	B-R	15. In patients with CCD without an indication for therapeutic DOAC or DAPT and who are at high risk of recurrent ischemic events but low-to-moderate bleeding risk, the addition of low-dose rivaroxaban 2.5 mg twice daily to aspirin 81 mg daily is reasonable for long-term reduction of risk for MACE.
		DAPT and Proton Pump Inhibitor (PPI)
2a	B-R	16. In patients with CCD on DAPT, the use of a PPI can be effective in reducing gastrointestinal bleeding risk.*

*Modified from the 2016 ACC/AHA Guideline Focused Update on DAPT. †Modified from the 2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization.

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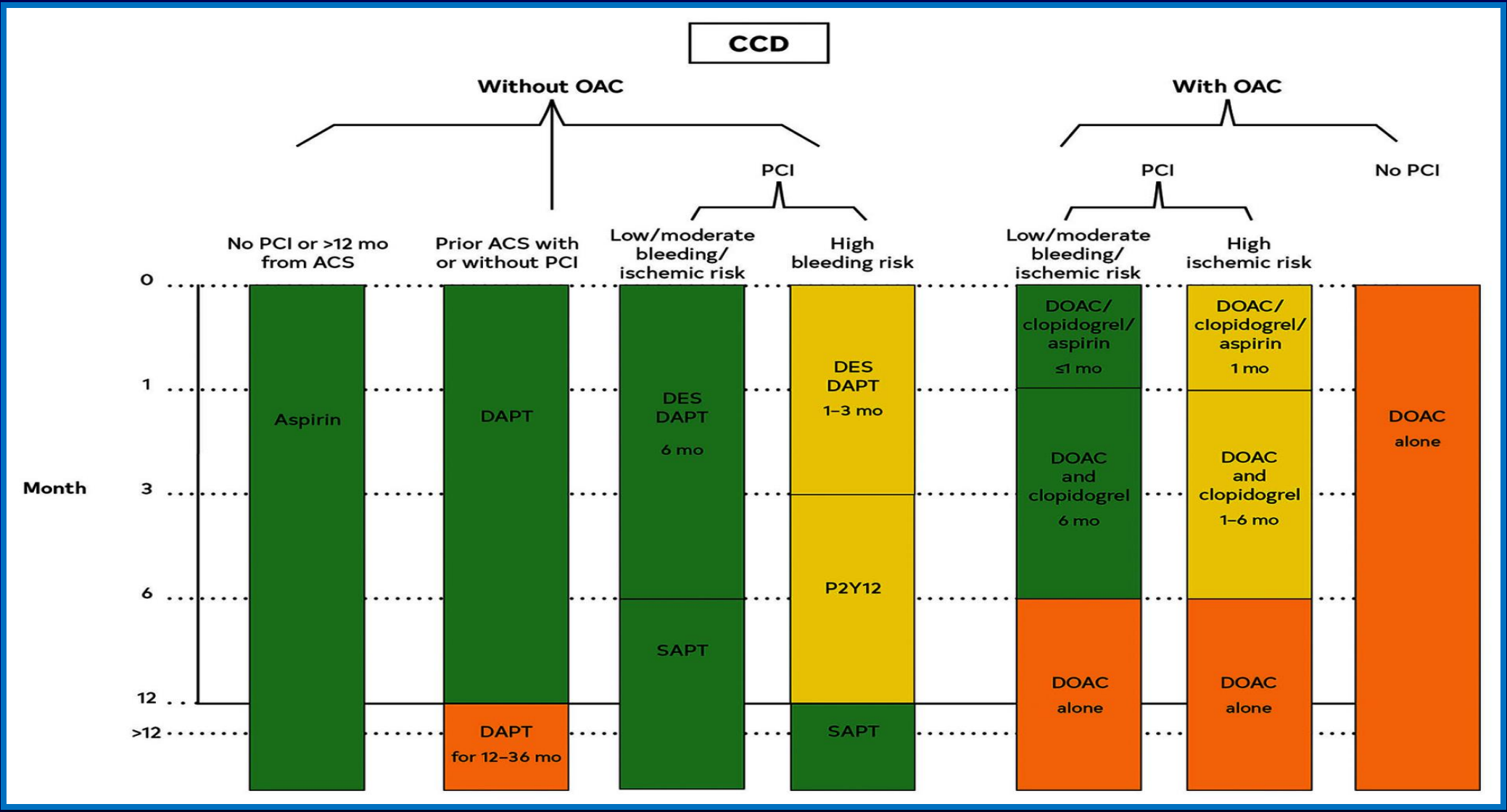
Recommended Duration of Antiplatelet Therapy



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Medical Therapy to Prevent CV Events and Manage Symptoms

Recommendations for Beta Blockers
Referenced studies that support the recommendations are summarized in the Online Data Supplement.

COR	LOE	RECOMMENDATIONS
1	A	1. In patients with CCD and LVEF ≤40% with or without previous MI, the use of beta-blocker therapy is recommended to reduce the risk of future MACE, including cardiovascular death.
1	A	2. In patients with CCD and LVEF <50%, the use of sustained release metoprolol succinate, carvedilol, or bisoprolol with titration to target doses is recommended in preference to other beta blockers.*
2b	B-NR	3. In patients with CCD who were initiated on beta-blocker therapy for previous MI without a history of or current LVEF ≤50%, angina, arrhythmias, or uncontrolled hypertension, it may be reasonable to reassess the indication for long-term (>1 year) use of beta-blocker therapy for reducing MACE.
3: No Benefit	B-NR	4. In patients with CCD without previous MI or LVEF ≤50%, the use of beta-blocker therapy is not beneficial in reducing MACE, in the absence of another primary indication for beta-blocker therapy.†

*Modified from the 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure. †Adapted from the 2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization.

Recommendations for Renin-Angiotensin-Aldosterone Inhibitors
Referenced studies that support the recommendations are summarized in the Online Data Supplement.

COR	LOE	RECOMMENDATIONS
1	A	1. In patients with CCD who also have hypertension, diabetes, LVEF ≤40%, or CKD, the use of ACE inhibitors, or ARBs if ACE inhibitor-intolerant, is recommended to reduce cardiovascular events.
2b	B-R	2. In patients with CCD without hypertension, diabetes, or CKD and LVEF >40%, the use of ACE inhibitors or ARBs may be considered to reduce cardiovascular events.

Recommendation for Colchicine
Referenced studies that support the recommendation are summarized in the Online Data Supplement.

COR	LOE	RECOMMENDATION
2b	B-R	1. In patients with CCD, the addition of colchicine for secondary prevention may be considered to reduce recurrent ASCVD events.

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Recommendations for Medical Therapy for Relief of Angina

COR	LOE	RECOMMENDATIONS
1	B-R	1. In patients with CCD and angina, antianginal therapy with either a beta blocker, CCB, or long-acting nitrate is recommended for relief of angina or equivalent symptoms.*
1	B-R	2. In patients with CCD and angina who remain symptomatic after initial treatment, addition of a second antianginal agent from a different therapeutic class (beta blockers, CCB, long-acting nitrates) is recommended for relief of angina or equivalent symptoms.*
1	B-R	3. In patients with CCD, ranolazine is recommended in patients who remain symptomatic despite treatment with beta blockers, CCB, or long-acting nitrate therapies.*
1	B-NR	4. In patients with CCD, sublingual nitroglycerin or nitroglycerin spray is recommended for immediate short-term relief of angina or equivalent symptoms.*
3: Harm	B-R	5. In patients with CCD and normal LV function, the addition of ivabradine to standard anti-anginal therapy is potentially harmful.*

*Modified from the 2012 ACC/AHA Multisociety Guideline for the Diagnosis and Management of Patients With SIHD.

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Recommendations for Management of Refractory Angina

COR	LOE	RECOMMENDATION
2b	B-R	1. In patients with CCD, refractory angina, and no other treatment options, enhanced external counter-pulsation may be considered for relief of symptoms.*

*Modified from the 2012 ACC/AHA Multisociety Guideline for the Diagnosis and Management of Patients With SIHD.

Chelation Therapy

Synopsis

Chelation therapy refers to the therapeutic use of intravenous infusions of disodium EDTA. Chelation has been used since the 1950s as a treatment for CCD, based until recently on anecdotal reports of benefit. EDTA avidly combines with biologically active heavy metal polyvalent cations, such as lead and cadmium, to form soluble complexes that can then be excreted. Very small trials conducted in patients with intermittent claudication and with CCD failed to show clinically relevant benefits. The first adequately powered trial of this intervention, TACT (Trial to Assess Chelation Therapy), randomized 1,708 patients with previous MI to 40 infusions of chelation or placebo. The primary composite endpoint of total mortality, recurrent MI, stroke, coronary revascularization, or hospitalization for angina occurred in 222 (26%) patients in the chelation group and 261 (30%) patients in the placebo group (hazard ratio, 0.82 [95% CI, 0.69–0.99]; $P=0.035$). Among the 633 TACT patients with diabetes, chelation reduced the primary composite endpoint by 41% reduction (hazard ratio, 0.59 [95% CI, 0.44–0.79]; $P=0.02$ for interaction). EDTA is currently not approved by the FDA for preventing or treating cardiovascular disease. TACT2 (Trial to Assess Chelation Therapy 2) has randomized 1,000 patients with diabetes and previous MI using the same treatment regimen as TACT and will report results in 2024.

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Recommendations for Revascularization

COR	LOE	RECOMMENDATIONS
		Goals of Revascularization
1	A	1. In patients with CCD and lifestyle-limiting angina despite GDMT and with significant coronary artery stenoses amenable to revascularization, revascularization is recommended to improve symptoms.*
1	B-R	2. In patients with CCD who have significant left main disease or multivessel disease with severe LV dysfunction (LVEF ≤ 35%), CABG in addition to medical therapy is recommended over medical therapy alone to improve survival.*
Cost Value Statement: Intermediate Value	B-NR	3. In patients with CCD and multivessel disease with severe LV dysfunction, CABG added to optimal medical therapy is of intermediate economic value compared with medical therapy alone.
2a	B-R	4. In patients with CCD and multivessel CAD appropriate for either CABG or PCI, revascularization in addition to GDMT is reasonable to lower the risk of cardiovascular events such as spontaneous MI, unplanned urgent revascularizations, or cardiac death.*
2a	B-NR	5. In selected patients with CCD and significant left main stenosis for whom PCI can provide equivalent revascularization to that possible with CABG, PCI is reasonable to improve survival.*
		Decision-Making for Revascularization
1	A	6. In patients with CCD who have angina or an anginal equivalent, no previous evaluation for ischemia, and angiographically intermediate stenoses, the use of FFR or other proven nonhyperemic pressure ratios (eg, iFR) is recommended before proceeding with PCI.*
Cost Value Statement: High Value	B-NR	7. In patients with CCD undergoing coronary angiography without previous stress testing, the use of invasive FFR to evaluate angiographically intermediate coronary stenoses before proceeding with PCI is a high economic value intervention.
1	B-NR	8. In patients with CCD with complex 3-vessel disease or for whom the optimal treatment strategy is unclear, a Heart Team approach that includes representatives from interventional cardiology and cardiac surgery is recommended to improve patient outcomes.*

*Modified from the 2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization.

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Recommendations for Revascularization: PCI vs CABG

COR	LOE	RECOMMENDATIONS
		Patients With CCD
1	B-R	1. In patients with CCD who require revascularization for significant left main involvement associated with high-complexity CAD, CABG is recommended in preference to PCI to improve survival.*
2a	B-R	2. In patients with CCD who require revascularization for multivessel CAD with complex and diffuse CAD (eg, SYNTAX score >33), it is reasonable to choose CABG over PCI to improve survival.*
		Patients With CCD at High Surgical Risk
2a	B-NR	3. In patients with CCD who are appropriate for revascularization but poor candidates for surgery, it is reasonable to choose PCI over CABG to improve symptoms and reduce MACE.
		Patients With CCD and Diabetes
1	A	4. In patients with CCD, diabetes, and multivessel CAD with involvement of the left anterior descending artery who are appropriate candidates for CABG, CABG (with a left internal mammary artery to the left anterior descending artery) is recommended in preference to PCI to reduce mortality and repeat re-vascularizations.*
2b	B-R	5. In patients with CCD and diabetes who have left main stenosis and low- or intermediate-complexity CAD (eg, SYNTAX score ≤33), PCI may be considered as an alternative to CABG to reduce MACE.*

*Modified from the 2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization.

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Ischemia with Nonobstructive Coronary Arteries

Recommendation for INOCA
Referenced studies that support the recommendation are summarized in the Online Data Supplement.

COR	LOE	RECOMMENDATION
2a	B-R	1. In symptomatic patients with nonobstructive CAD, a strategy of stratified medical therapy guided by invasive coronary physiologic testing can be useful for improving angina severity and QOL.

TABLE 15 Clinical Criteria for Suspecting Microvascular Angina*

Criteria	Evidence	Diagnostic Parameters
1	Symptoms of myocardial ischemia	Effort or rest angina; exertional dyspnea
2	Absence of obstructive CAD (<50% diameter reduction or FFR >0.80)	Coronary CTA; invasive coronary angiography
3	Objective evidence of myocardial ischemia	Ischemic changes on ECG during an episode of chest pain; stress-induced chest pain and/or ischemic changes on ECG in the presence or absence of transient/reversible abnormal myocardial perfusion and/or wall motion abnormality
4	Evidence of impaired coronary microvascular function	Impaired coronary flow reserve (cut-off value depending on methodology between ≤0.20 and ≤0.25); coronary microvascular spasm, defined as reproduction of symptoms, ischemic shifts on ECG but no epicardial spasm during acetylcholine testing; abnormal coronary microvascular resistance indices (eg, IMR >25); coronary slow flow phenomenon, defined as TIMI frame count >25

Suspected microvascular angina is diagnosed if symptoms of ischemia are present (criteria 1) with no obstructive CAD (criteria 2) but only (a) objective evidence of myocardial ischemia (criteria 3) or (b) evidence of impaired coronary microvascular function (criteria 4) alone. Adapted with permission from Ong P, et al. Copyright 2018, with permission from Elsevier.
*Definitive microvascular angina is only diagnosed if all 4 criteria are present for a diagnosis of microvascular angina.

TABLE 16 Diagnostic Criteria for Vasospastic Angina

Nitrate-responsive angina: during spontaneous episode, *with at least 1* of the following:

- Rest angina, especially between night and early morning
- Marked diurnal variation in exercise tolerance, reduced in morning
- Hyperventilation can precipitate an episode
- Calcium channel blockers (not beta blockers) suppress episodes

Transient ischemic electrocardiographic changes: during spontaneous episode, including any of the following *in at least 2* contiguous leads:

- ST segment elevation ≥0.1 mV
- ST segment depression ≥0.1 mV
- New negative U waves

Coronary artery spasm: defined as transient total or subtotal coronary artery occlusion (>90% constriction) with angina and ischemic electrocardiographic changes either spontaneously or in response to a provocative stimulus (typically acetylcholine, ergot, or hyperventilation)

"Definitive" vasospastic angina is diagnosed if nitrate-responsive angina is evident during spontaneous episodes and either the transient ischemic ECG changed during the spontaneous episodes or coronary artery spasm criteria are fulfilled. "Suspected" vasospastic angina is diagnosed if nitrate-responsive angina is evident during spontaneous episodes but transient ischemic electrocardiographic changes are equivocal or unavailable and coronary artery spasm criteria are equivocal. Modified from Beltrame JF, et al. by permission of Oxford University Press, copyright 2017; and by permission of The Author, copyright 2015.

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Invasive Coronary Function Testing Definition and Linked Pharmacotherapy for INOCA Endotypes

Endotype		Disorder of Coronary Artery Function	Linked Pharmacotherapy
Microvascular angina (nonobstructive CAD and proven CMD)	↑ **Microvascular resistance**	IMR ≥25. IMR is a quantitative method for specifically assessing microvascular function independent resting hemodynamics. IMR is distal coronary pressure* transmit time (average time for 3 saline bolus runs at hyperemia).	**Baseline therapy:** Consider aspirin, statin, and ACEi therapy in all patients. Sublingual nitroglycerin as needed. Smoking cessation and lifestyle changes. **Antianginal Rx** **First line: Beta blocker** (eg, carvedilol 6.25 mg BID uptitrated) **Second line: CCB** substituted (non DHP [eg, verapamil 40 mg BID titrated]) where beta blockers are not tolerated or ineffective. **Third line: Add-in therapy** **CCB-DHP** (eg, amlodipine)-only for those on beta blockers **Nicorandil*** (5 mg BID, uptitrated) **Ranolazine** (375 mg BID, uptitrated)
	↓ **Coronary vasorelaxation**	CFR by thermodilution <2.0. This reflects the inability to increase coronary flow above 2 times the resting flow.	
	↓ **Microvasodilator capacity**	Resistive reserve ratio <2.0. This reflects the vasodilator capacity of the microcirculation to change from baseline to hyperemia (resistance at rest divided by resistance at hyperemia).	
	Microvascular spasm	Angina during acetylcholine infusion or bolus with typical ischemic ST-segment changes and epicardial coronary constriction <90% reduction in epicardial coronary artery diameter. Represents inappropriate susceptibility microvascular constriction.	
Vasospastic angina	**Epicardial spasm**	Epicardial coronary artery spasm is defined as reduction in coronary diameter >90% after intracoronary acetylcholine in comparison with baseline resting condition after intracoronary glyceryl trinitrate (nitroglycerin) administration in any epicardial coronary artery segment together with symptoms and ST-segment deviation on the ECG.	**Baseline therapy**: If atherosclerosis or endothelial impairment, aspirin and statin should be considered. Sublingual nitroglycerin as needed. Smoking cessation and lifestyle changes. **Antianginal Rx** **First line: CCB** (eg, verapamil 40 mg BID uptitrated) **Second line: Add long-acting nitrate** (eg, isosorbide monotitrate 10 mg BID) **Third line: Change nitrate to nicorandil*** (eg, nicorandil 5 mg BID)
Mixed MVA/VSA	**CMD and epicardial vasospasm**	Epicardial spasm plus any abnormality of: ■ Microvascular resistance ■ Coronary vasorelaxation ■ Microvasodilator capacity	**Baseline therapy:** Consider aspirin, statin and ACEi therapy in all patients. Sublingual nitroglycerin as needed.
Obstructive CAD		>50% lesion by diameter stenosis in epicardial artery >2.5 mm or a FFR ≤0.80	**Baseline therapy**: If atherosclerosis or endothelial impairment, patients should be considered for aspirin, statin, and ACEi. Consideration of revascularization, antianginal therapy as per guidelines
Noncardiac	**None**	Exclusion of diffuse or obstructive epicardial coronary disease (FFR >0.8) without any of the after abnormalities of coronary function: CFR <2.0, IMR ≥25 or functional angina/spasm during acetylcholine.	Cessation of antianginal therapy. Stop antiplatelet and statins unless other indication. Consider noncardiac investigation or referral where appropriate (eg, psychology, gastroenterology)

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*Currently unavailable in the United States.

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Recommendations for Young Adult Patients with CCD

Recommendation for Young Adults
Referenced studies that support the recommendation are summarized in the Online Data Supplement.

COR	LOE	RECOMMENDATION
2a	C-LD	1. In young adults with CCD, after optimization of traditional cardiovascular risk factors, a comprehensive evaluation and treatment of nontraditional cardiovascular risk factors can be beneficial in reducing the risk of cardiovascular events.

TABLE 18 Traditional and Nontraditional Risk Factors Associated With CCD in Young Adults

Traditional Risk Factors	Nontraditional Risk Factors
Hypertension ("Blood Pressure Management")	HIV and ART ("HIV/Autoimmune Disorders")
Obesity and metabolic syndrome ("Weight Management")	Recreational substance use (cocaine and marijuana) ("Alcohol and Substance Use")
Diabetes ("Sodium Glucose Cotransporter 2 Inhibitors and Glucagon Peptide-1 Receptor Agonists")	Systemic inflammatory disorders (IBD, SLE, RA, gout, PsA, AS) and vasculitides
Unhealthy diet and physical inactivity ("Nutrition, including Supplements," and physical activity)	Pregnancy-related complications (IUGR, HDP, gestational diabetes) ("Women, Including Pregnancy and Hormone Therapy")
Hyperlipidemia (LDL-C, Lp(a)) ("Lipid Management")	Familial hypercholesterolemia
Tobacco use ("Tobacco Products")	Miscellaneous (psychological well-being, sleep quality, social determinants of health ("Social Determinants of Health," and "Mental Health")
Family history of premature CAD	History of chest radiation

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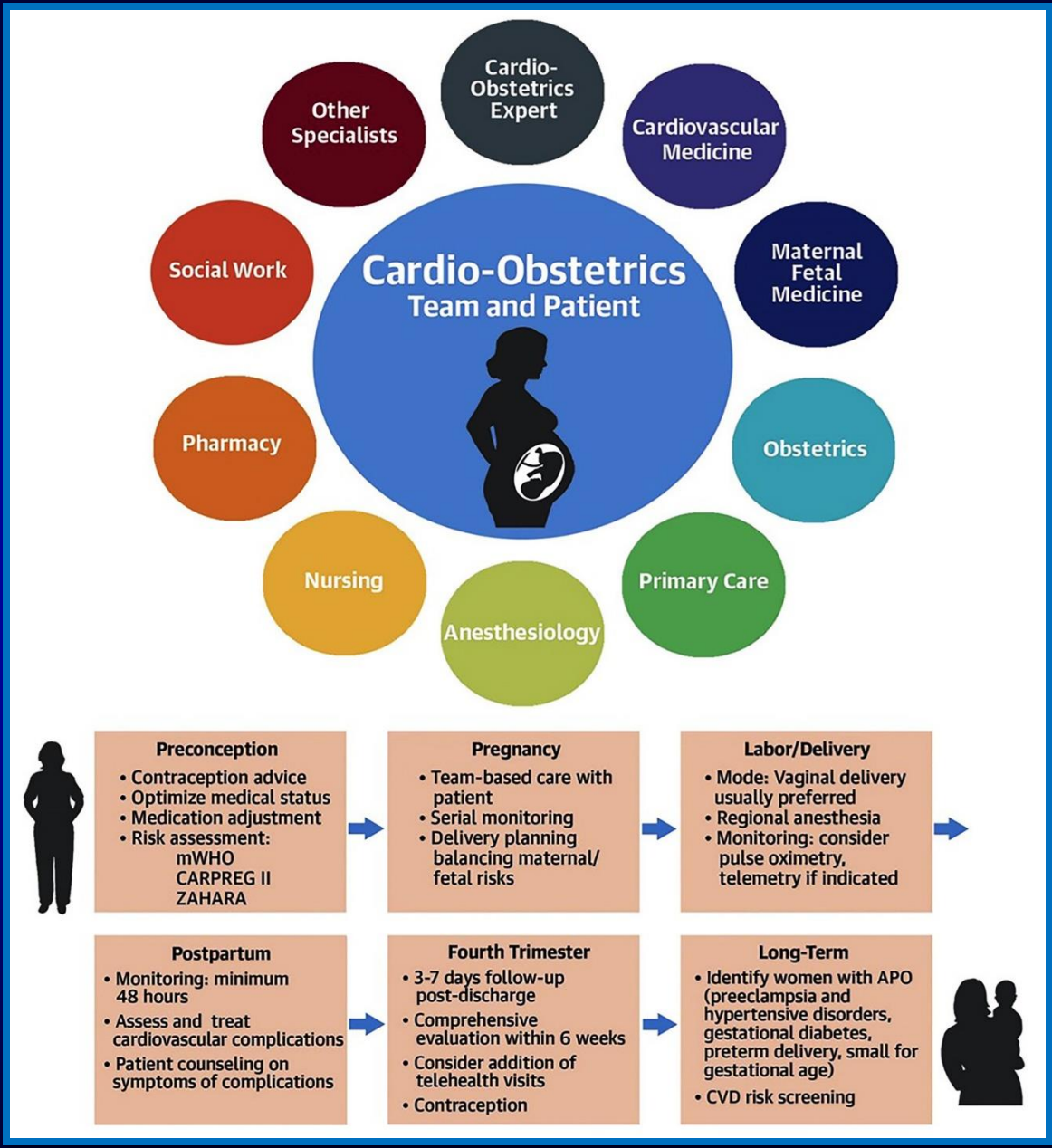
Team-Based Cardio-Obstetrics Model of Care



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The Geriatric 5 Ms

MIND	**Mentation, dementia, delirium, depression**
MOBILITY	**Impaired gait and balance, fall injury prevention**
MEDICATIONS	**Polypharmacy, deprescribing, optimal prescribing** **Adverse medication effects and medication burden**
MULTICOMPLEXITY	**Multimorbidity** **Complex biopsychosocial situations**
MATTERS MOST	**Each individual's own meaningful health outcome goals and care preferences**

Adapted with permission from Molnar et al., Can Fam Physician 2019;65:39

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Recommendations for Follow-Up Plan and Testing in Stable Patients

COR	LOE	RECOMMENDATIONS
2b	B-R	1. In stable patients with CCD and with previous ACS or coronary revascularization, referral to telehealth programs, community-based programs, or both for lifestyle interventions may be reasonable as an adjunct to usual care to improve management of cardiovascular risk factors.
3: No benefit	B-R	2. In patients with CCD without a change in clinical or functional status on optimized GDMT, routine periodic testing with coronary CTA or stress testing with or without imaging is not recommended to guide therapeutic decision-making.
3: No benefit	B-R	3. In patients with CCD without a change in clinical or functional status, routine periodic reassessment of LV function is not recommended to guide therapeutic decision-making.
3: Harm	B-NR	4. In patients with CCD without a change in clinical or functional status, routine periodic invasive coronary angiography should not be performed to guide therapeutic decision-making.

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Evidence Gaps and Areas of Future Research Needs

Although the past decade has seen numerous advancements in the diagnosis and treatment of patients with CCD, several gaps still exist in our understanding. These gaps should serve as areas of future research and are described below.

- With an evolving definition of patients who have CCD, research is needed to determine how advances in noninvasive imaging technology (ie, allowing sensitive detection and quantification of calcified and noncalcified atherosclerotic plaque burden) may affect identification of patients with CCD, their prognostication, and their eligibility for preventive therapies.
- Comprehensive risk scores need to be developed and validated for MACE in patients with CCD in the contemporary era that include patient demographics, medical information, social determinants, and data from noninvasive test results, or invasive test results, or both.
- Although studies have shown deficiencies with clinician-estimation of patient's symptoms, research is needed to understand whether routine use of patient-reported measures in clinical care improve patient-centered outcomes.
- Decision aids that are tested and validated in diverse populations are needed to support shared decision-making in patients with CCD.
- High-quality studies are needed to assess the effect of various substances, including marijuana, on cardiovascular outcomes in patients with CCD.
- With several therapies available to treat symptoms or improve outcomes in patients with CCD, research is needed on how to sequence GDMT in patients with CCD (ie, how to judge relative importance of different components of GDMT in specific patients).
- Randomized trials with longer-term cardiovascular outcomes are needed to determine the effectiveness of interventions that limit sedentary time.
- Research is needed to understand whether the efficacy of therapies used in patients with CCD is uniform across men and women with CCD and across various racial and ethnic groups of patients with CCD that have traditionally been underrepresented in clinical trials.
- Further research is needed to assess the use of personalized medicine approaches, including the assessment of the use of artificial intelligence, text messaging, wearable technology, genomics, and proteomics to improve risk assessment and treatment approaches in diverse populations of patients with CCD.
- Additional research is needed to assess the effect of hybrid CR, as well as home-based CR, on longer-term clinical outcomes and on outcomes for various population subgroups, including women, older adults, and those from underrepresented racial and ethnic groups.
- Future research is needed on patients with CCD on the long-term effect of treatment of mental health conditions (namely depression): (1) patients with a previous (known) diagnosis of mental health condition and concomitant CCD, or (2) patients with a new diagnosis of a mental health condition after MI.
- Future research is needed on the long-term risk of e-cigarette use on cardiovascular health in patients with CCD.
- Further research is needed on whether there is utility for the use of GLP-1 receptor agonists in patients with CCD but not type 2 diabetes for cardiovascular risk reduction. Research is also needed to determine whether there is utility for the combined use of SGLT2 inhibitors and GLP-1 receptor agonists in patients with CCD.

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Take Home Message:
Interventional Trials from EuroPCR 2023 and Updated Guidelines for Management of Pts with Chronic Coronary Disease (CCD)

- ✓ Sirolimus eluting Bioadaptor scaffold @ 1 year: 
- ✓ Evorolimus coated balloon for ISR: 
- ✓ Routine use of ECMO in Cardiogenic Shock: 
- ✓ Routine side-branch intervention in BL: 
- ✓ Recent guidelines for management of stable CAD, now called chronic coronary disease (CCD) have heavily emphasized on the overall management of the pt with emphasis on aggressive risk factor modification and improved physical/mental health along with up scaled GDMT. Revascularization is recommended for pts who failed GDMT and choice (PCI vs CABG) to be decided by complexity of CAD/LM & LV function (Syntax score is down graded to 2b).

Question # 1

Following statement is false regarding the 1 year results of BIOADAPTOR Sirolimus scaffold vs DES RCT;

A. Lower TLF in Scaffold group vs DES
B. Similar TLR in Scaffold group vs DES
C. Higher Scaffold thrombosis vs DES
D. Lower late loss in Scaffold group vs DES
E. Higher pulsatility in Scaffold group vs DES

The correct answer is C

Question # 2

Following statement is false regarding the results of EURO-SHOCK trial comparing ECMO vs Standard of care;

A. Similar overall primary endpoints between 2 groups

B. Numerical lower mortality in ECMO group

C. Numerically lower MI rates in ECMO group

D. Similar AKI in two groups

E. Similar vascular complications between two groups

The correct answer is E

Question # 3

KISS study comparing no side-branch intervention with routine side-branch intervention (control gp) resulted in the following except;

A. Higher contrast use in control gp

B. Higher fluoro time in control gp

C. Similar TLF between 2 groups

D. Lower MI rates in control groups

E. Similar ST between 2 groups

The correct answer is D

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EST Time	April 18-19 (Tuesday/Wednesday)	Local Time
8pm - 10pm	HARBIN, CHINA - THE FIRST AFFILIATED HOSPITAL OF HARBIN MEDICAL UNIVERSITY - Yue Li, MD	8:00 am
10pm-12am	NANJING, CHINA - NANJING FIRST HOSPITAL Shao-Liang Chen, MD, PhD	10:00 am
12am - 2am	CHENNAI, INDIA - MADRAS MEDICAL MISSION Ajit Mullasari, MD	9:30 am
2am - 4am	PUNE, INDIA - RUBY HALL Shirish Hiremath, MD	11:30 am
4am - 6am	COPENHAGEN, DENMARK - RIGSHOSPITALET Lars Sondergaard, MD	10:00 am
6am - 7am	MADRID, SPAIN - HOSPITAL LA PAZ Alfonso Jurado Román, MD	12:00 pm
7am - 8am	BORDEAUX, FRANCE - CHU DE BORDEAUX Thomas Modine, MD	1:00 pm
8am - 9am	MADRID, SPAIN - HOSPITAL LA PAZ Alfonso Jurado Román, MD	2:00 pm
9am - 10am	BORDEAUX, FRANCE - CHU DE BORDEAUX Thomas Modine, MD	3:00 pm
10am - 12pm	SÃO PAULO, BRAZIL - INSTITUTO DANTE PAZZANESE Fausto Feres, MD	11:00 am
12pm - 2pm	BUENOS AIRES, ARGENTINA - FUNDACION FAVALORO Oscar Mendiz, MD	1:00 pm
2pm - 4pm	MONTREAL, CANADA - INSTITUT DE CARDIOLOGIE DE MONTRÉAL - Anita Asgar, MD	2:00 pm
4pm - 6pm	NEW YORK, NY - MOUNT SINAI HOSPITAL Samin Sharma, MD, Annapoorna Kini, MD, Prakash Krishnan, MD	4:00 pm
6pm - 8pm	THOUSAND OAKS, CALIFORNIA - LOS ROBLES HEALTH SYSTEM - Saibal Kar, MD	3:00 pm

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Alfonso Jurado, MD

Oscar Mendiz, MD

Saibal Kar, MD

Ricardo Costa, MD

Mount Sinai, New York – New York, USA

Samin Sharma, MD

Annapoorna Kini, MD

Prakash Krishnan, MD

Mount Sinai Hospital is ranked 6th nationally for Cardiology & Heart Surgery by U.S. News & World Report. The hospital is one of the best training institutions in the country for Fellowship in Interventional Cardiology. Dr. Samin Sharma serves as the President of Mt. Sinai Heart, overseeing the entire Interventional Cardiology operations of Mt. Sinai Hospital and its affiliates. In 2009, Dr. Sharma co-founded ccclivecases.org with Dr. Sameer Mehta. The program is now watched in 184 countries, leading to the creation of MedStream360. Considered one of the world's most experienced Interventional cardiologists, Dr. Sharma is also the patron of Eternal Heart Hospital in Jaipur, India.

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