

Care Coordination

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Disclosures

- **Beavers, Craig** No relevant relationships with commercial interests to disclose.
- **Bagai, Jayant** No relevant relationships with commercial interests to disclose.

Care Coordination with Referring Physicians

Purpose

- **To provide education to the referring physician** on common pre- and post-procedural issues in patients undergoing invasive/interventional procedures in the cardiac cath lab
- **To foster a collaborative effort** regarding our mutual patients in the important area of aftercare

Intended Audience

- **Primary Care/Referring physicians, interventionalists, nurses, advanced practice providers, SCAI QIT Champions**

Objectives

- Discuss risk factors for contrast nephropathy following cardiac catheterization
- Describe current recommendations on duration of withholding anticoagulation prior to cardiac catheterization
- Summarize current recommendations on duration of dual antiplatelet therapy after percutaneous coronary intervention (PCI)
- Manage patients who require both oral anticoagulation and dual antiplatelet therapy post-PCI

Contrast-induced acute kidney injury (CI-AKI)

- Identify patients at increased risk for CI-AKI using [Mehran Score](#)
- Assess appropriateness of cardiac cath in patients at high risk, i.e. Mehran score > 10 (example- age > 75 + diabetes + anemia + eGFR 40-60= Mehran score 11)
- Hold ACE inhibitor, NSAID and diuretic 24-48 hour pre-cath in patients with renal insufficiency/ increased risk of CI-AKI
- Hold metformin 24 hours pre- and resume 48 hours post cardiac cath (check Cr prior to restarting if pre-existing renal insufficiency)
- N-acetyl-L-cysteine (mucomyst) is no longer recommended

Recommended durations for withholding DOACs

Drug	Cr Cl (ml/min)	Hold time for low bleeding risk (diagnostic cardiac cath via radial access)	Hold time for uncertain, moderate or high bleeding risk (diagnostic cardiac cath via femoral access, any PCI)
Apixaban or Rivaroxaban	> 30	≥ 24 hours	48 hours
	15-29	≥ 36 hours	No data, consider holding ≥ 72 hours
	< 15	No data, consider holding ≥ 48 hours	
Dabigatran	> 80	≥ 24 hours	≥ 48 hours
	50-79	≥ 36 hours	≥ 72 hours
	30-49	≥ 48 hours	≥ 96 hours
	15-29	≥ 72 hours	≥ 120 hours
	< 15	No data, consider holding ≥ 96 h	No data

Hold warfarin 5 days prior to cardiac cath aiming for INR < 1.7 on day of procedure

Tomaselli GF et al. JACC. 2017;70(24):3042-3067
Zukoor, Choudhury [Pre-procedural DOAC guidance](#)

Elective Percutaneous Coronary Intervention or Acute Coronary Syndrome and Need for Anticoagulation

Concern about thrombotic risk prevailing (PCI for acute coronary syndrome, complex PCI, h/o stent thrombosis, high DAPT score)

Concerns about high bleeding risk prevailing (HAS-BLED score ≥ 3)

Average thrombotic and bleeding risk (PCI for stable CAD)

Triple therapy (oral anticoagulant + aspirin 81mg + clopidogrel) x 1 month	Dual therapy (clopidogrel + oral anticoagulant) x 6 months	Dual therapy (clopidogrel + oral anticoagulant) x 6 months
Dual therapy (oral anticoagulant plus clopidogrel) for additional 11 months		
Oral anticoagulant alone after 12 months	Oral anticoagulant alone after 6 months	Oral anticoagulant + 81 mg aspirin after 6 months
		Oral anticoagulant alone after 12 month

DOAC preferred over warfarin. Do not use prasugrel as component of triple therapy



Dual Antiplatelet Therapy (DAPT) Duration

Stable Coronary Artery Disease	High Bleeding Risk	1 month of DAPT at minimum, ideally up to 3 months
	Low Bleeding Risk	3-6 months of DAPT at minimum, consider longer if high thrombotic risk
Non-ST Segment Elevation MI	High Bleeding Risk, Low Thrombotic Risk	6 months of DAPT at minimum
	Low Bleeding Risk, High Thrombotic Risk	12 months of DAPT at minimum
	High Bleeding Risk, High Thrombotic risk	3 months DAPT with aspirin + ticagrelor followed by 9 months ticagrelor alone*
ST Segment Elevation MI	High Bleeding Risk	6 months of DAPT at minimum of , ideally up to 12 months
	Low Bleeding Risk	12 months of DAPT at minimum

*Angiolillo DJ, et al. Ticagrelor With Aspirin or Alone in High-Risk Patients After Coronary Intervention TWILIGHT. JACC 2020



Use of prolonged DAPT therapy > 12 months

- In patients with ACS treated with PCI, who have tolerated DAPT without bleeding complication for 12 months, and who are not at high bleeding risk (prior bleeding on DAPT, coagulopathy, oral anticoagulant use) continuation of DAPT for > 12 months may be reasonable (Class IIB recommendation)
- DAPT score ≥ 2 - **favorable** risk-benefit ratio for prolonged DAPT
- DAPT score < 2- **unfavorable** risk-benefit ratio for prolonged DAPT

Components of DAPT score

Variable	Points
Age ≥ 75	-2
Age 65 to < 75	-1
Age < 65	0
Current smoker	1
Diabetes	1
MI at presentation	1
Prior PCI or MI	1
Stent diameter < 3 mm	1
Paclitaxel eluting stent	1
CHF or LVEF < 30%	2
PCI of bypass graft	2

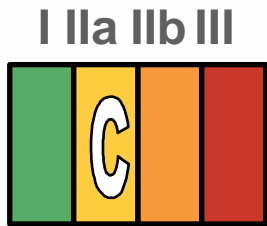
Interruption of DAPT for surgery

- P2Y12 inhibitors (clopidogrel, prasugrel, ticagrelor) can be interrupted for surgery **after 6 months** of therapy post-PCI
- Interruption of P2Y12 inhibitors for elective surgery can be considered **after 3 months and before 6 months** of therapy post-PCI, if risk of bleeding during surgery > risk of stent thrombosis
- Low dose aspirin should be continued in peri-operative period (i.e. patient should not suddenly stop all antiplatelet therapy)
- The timing of restarting clopidogrel, prasugrel or ticagrelor depends on risk of surgical bleeding
- There are emerging data suggesting safety of 1 month DAPT after PCI with drug eluting stents (DES) for stable CAD and 6 months DAPT after PCI with DES for ACS

Proton Pump Inhibitors (PPIs) and Antiplatelet Therapy



PPI should be used in patients with history of prior GI bleeding who require DAPT



PPI use is reasonable in patients with increased risk of gastrointestinal bleeding (advanced age, concomitant use of warfarin, steroids, nonsteroidal anti-inflammatory drugs, H. pylori infection) who require DAPT



No Benefit

Routine use of a PPI is not recommended for patients at low risk of gastrointestinal bleeding, who have much less potential to benefit from prophylactic therapy



Question 1- A 64-year-old woman (68kg) is scheduled for diagnostic left heart catheterization via radial artery . Her CHA2DS2VASc is 3 (diabetes, female) and she takes apixaban 5mg twice daily (CrCL 100mL/min, SCr 1.0mg/dL). Which of the following is the recommended duration for holding anticoagulation based on ACC guidelines?

- a. Stop apixaban 48 hours prior to procedure
- b. Stop apixaban 24 hours prior to procedure
- c. Stop apixaban 12 hours prior to procedure
- d. Stop apixaban 12 hours prior to procedure and administer andexanet alfa

Correct Answer: B

- Diagnostic coronary angiography via radial access is considered to have a low risk of bleeding, and therefore holding apixaban for 24 hours prior to the procedure is supported [2017 ACC expert consensus decision pathway for periprocedural management](#)
- It is important to be aware that patients may require femoral access for coronary angiography in the event of failure of radial access.
- Femoral access carries a moderate to high risk of bleeding and requires a 48 hour hold in patients with normal renal function.
- The same applies to patients who may need PCI as opposed to just diagnostic angiography.

Question 2- A 45-year-old patient underwent PCI and DES placement in the mid right coronary artery for stable angina. She is placed on clopidogrel 75mg daily and aspirin 81mg daily. The patient is considered to have both low thrombotic and bleeding risk. Which duration best represents the recommended duration of DAPT based on current guidelines?

- a. 1 month.
- b. 3 months.
- c. 6 months.
- d. 12 months

Correct Answer: C

- Given the patient's low bleeding risk, low thrombotic risk and stenting for an elective procedure, the minimum recommended duration of therapy based on the [2016 ACC/AHA focused update on duration of DAPT](#) is 6 months (Answer C).
- If her bleeding risk were higher, a shorter DAPT duration of 3 months may be reasonable.
- Had the PCI been performed due to ACS, the recommended duration would have been 12 months for both a DES and bare metal stent (BMS).
- A 1 month duration of DAPT is recommended if the patient had received a BMS for stable angina.

Question 3- Which of the following is the most appropriate recommendation prior to elective coronary angiography in an anemic patient with abnormal renal function?

- a. Administer N-acetyl-L-cysteine prior to and after catheterization
- b. Administer sodium bicarbonate prior to catheterization
- c. Hold metformin 24 hours pre- and 48 hours post-catheterization
- d. Administer 1 unit of packed red blood cells

Correct Answer: C

- Holding metformin for 24 hours before and 48 hours after exposure to iodinated contrast is recommended due to the potential for lactic acidosis in the event of severe renal failure due to CI-AKI.
- Several well-designed clinical trials have yet to elucidate the benefit of N-acetyl-L-cysteine nor sodium bicarbonate in prevention of contrast induced nephropathy (Answers a and b are incorrect).
- There has been no data routinely providing packed red blood cells prevents CKI (Answer d is incorrect).

Question 4- A 70-year-old patient with DM and prior MI who underwent PCI with DES placement for ACS angina 18 months ago wants you to refill his prescription for clopidogrel. He also takes daily low dose aspirin. He informs you that he was told by his Cardiologist that he need to take clopidogrel “for the rest of his life”. What is current evidence regarding prolonged DAPT beyond the recommended 12 months in ACS patients?

- a. Current guidelines do not support DAPT beyond 12 months under any scenario
- b. Current guidelines state that continuation of DAPT beyond 12 months may be reasonable in patients who have not experienced bleeding on DAPT and are low risk for bleeding
- c. Long term DAPT is not associated with increased risk of bleeding
- d. Prolonged DAPT should be considered in patients with a DAPT score < 2

Correct answer: B

- Prolongation of DAPT beyond 12 months can be considered in patients who are at low risk of bleeding and have not experienced bleeding while on DAPT. Answer a is therefore incorrect.
- On the basis of studies of DAPT in post-MI patients, extended DAPT for approximately 18 to 36 months leads to an absolute decrease in ischemic complications of ~1-3% and an absolute increase in bleeding complications of ~1%. (Answer c is therefore incorrect.) Currently there is no data to support “lifelong” DAPT in such patients.
- The DAPT score is a useful tool to determine the risk-benefit of extended DAPT. Patients who are younger (< 65 years), and increased ischemic risk (history of MI, diabetes, CHF, CABG) with a DAPT score ≥ 2 have a favorable risk-benefit ratio for prolonged DAPT. (Answer d is therefore incorrect.)

Question 5- A 70-year-old patient with a CHA₂DS₂-VASc score = 4, HAS-BLED score = 3 on long-term anticoagulation for atrial fibrillation (AF) undergoes PCI with a DES for ACS. What is the recommended combination of antiplatelet and anticoagulant therapy?

- a. Aspirin+ clopidogrel + warfarin x 12 months
- b. Apixaban + clopidogrel x 6 months, followed by apixaban + aspirin x 6 months
- c. Aspirin + clopidogrel + Warfarin x 6 months
- d. Aspirin + prasugrel + apixaban x 6 months, then apixaban + aspirin x 6 months

Correct answer- b

- This patient has both high ischemic (stroke and MI) and bleeding risk. In the AUGUSTUS trial, patients with AF and recent ACS or PCI for stable angina treated with a **P2Y₁₂ inhibitor (clopidogrel in > 90%) + apixaban** without aspirin for 6 months resulted in less bleeding (7.3%) and fewer hospitalizations, without significant differences in the incidence of ischemic events, than a combination of **P2Y₁₂ inhibitor (usually clopidogrel) + warfarin + aspirin** for 6 months (bleeding rate 18.7%). The combination of apixaban + clopidogrel was also associated with less bleeding compared with warfarin + clopidogrel. Answer b is therefore correct and Answer c is incorrect.
- Triple therapy with aspirin + clopidogrel + warfarin x 12 months is associated with a very high risk (44% in the WOEST trial) of bleeding and not recommended in this patient with high risk of bleeding at baseline. (Answer a is therefore incorrect)
- Prasugrel should not be used as a component of “triple therapy” due to high risk of bleeding. Answer d is therefore incorrect.

Lopez et al. NEJM. 2019;380:1509-24

Dewilde WJ et al. Lancet. 2013;381(9872):1107-15