

CARDIOVASCULAR · DIAGNOSTIC PROCEDURE

Cardiac *Catheterization*

An invasive diagnostic and therapeutic procedure where a catheter is threaded through a peripheral artery (radial or femoral) into the heart and coronary arteries — used to visualize blockages, measure pressures, and place stents.

NGN NCLEX 2026

Clinical Judgment

Priority Interventions

Pre/Post-Op Care

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Definition & Overview

WHAT IT IS & WHY IT MATTERS

- ▶ **Invasive procedure** — a long, thin catheter is inserted into a peripheral artery (radial preferred) or vein, then advanced to the heart under fluoroscopy.
- ▶ **Contrast dye (iodine-based)** is injected to visualize the coronary arteries, valves, and chamber pressures.
- ▶ **Diagnostic + therapeutic** — confirms CAD, MI, valve disease; can also deliver **PCI** (percutaneous coronary intervention) with balloon angioplasty & stent placement.

Why It's Done

- ▶ Confirm coronary artery disease (CAD)
- ▶ Identify the **culprit lesion** in STEMI/NSTEMI
- ▶ Evaluate chest pain of unclear cause
- ▶ Assess valve function & cardiac output
- ▶ Pre-op evaluation for cardiac surgery

KEY PEARL

The **radial approach** is now preferred over femoral — fewer bleeding complications, faster ambulation, and better patient comfort. Femoral is still used for complex interventions.

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Procedure Flow

STEP-BY-STEP PATHOPHYSIOLOGY OF THE CATHETER'S JOURNEY

1

Sterile prep & local anesthetic at access site (radial or femoral)

2

Sheath inserted into artery; catheter threaded retrograde toward aorta

3

Catheter advanced to coronary ostia under fluoroscopy

4

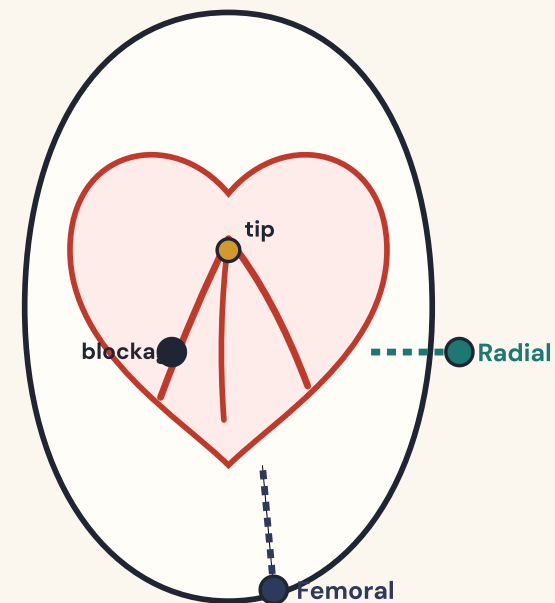
Iodinated contrast dye injected → coronary angiogram captured

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If blockage found: balloon angioplasty + stent placed (PCI)

6

Catheter removed; manual or device pressure applied; patient to recovery



Catheter routes: **radial (preferred)** & **femoral**, terminating at coronary ostia.

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Pre-Procedure Priorities

ASSESSMENTS & PREPARATION BEFORE THE CATH LAB

Critical Assessments

- ▶ **Allergies** — iodine, shellfish, contrast dye (premedicate w/ Benadryl + steroids if allergic)
- ▶ **Renal function** — BUN & creatinine; contrast is nephrotoxic
- ▶ **Coagulation** — PT/INR, aPTT, platelets
- ▶ **Baseline VS & peripheral pulses** — mark dorsalis pedis & posterior tibial with X (femoral) or check radial & ulnar (Allen test for radial approach)
- ▶ **Height, weight, ECG, labs** documented

Preparation Checklist

- ▶ **Informed consent** verified before sedation
- ▶ **NPO 6–8 hours** before procedure
- ▶ **Hold metformin 24–48 hrs** before & 48 hrs after — risk of **lactic acidosis** with contrast
- ▶ Hold anticoagulants per HCP order (warfarin, DOACs)
- ▶ IV access established; void before procedure
- ▶ Remove jewelry, dentures; gown only

 **RED FLAG** If creatinine is elevated or eGFR < 60, notify HCP — pre-hydration with IV fluids and possible **N-acetylcysteine** (Mucomyst) may be ordered to prevent **contrast-induced nephropathy (CIN)**.

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Post-Procedure Nursing Priorities

ABCS · SAFETY · BLEEDING PREVENTION

Femoral Approach	Radial Approach
Bedrest 4–6 hours (or per protocol)	Ambulate sooner — usually within 2 hours
Keep affected leg straight ; HOB $\leq 30^\circ$	Keep wrist straight & immobilized ; arm elevated
Sandbag or pressure device over site	TR Band compression device on wrist
Check dorsalis pedis & posterior tibial pulses	Check radial pulse , capillary refill, hand color/warmth

✅ DO — Priority Interventions

- ▶ **Assess insertion site** for bleeding/hematoma **q15min × 1 hr**, then q30min × 2 hr, then q1h
- ▶ Check **distal pulses, color, temp, sensation, movement** with each VS check (5 P's)
- ▶ Monitor VS — watch for **↓BP + ↑HR** (early shock from bleeding)
- ▶ **Push IV & PO fluids** to flush contrast dye from kidneys
- ▶ Continuous cardiac monitoring — watch for dysrhythmias
- ▶ Monitor urine output (≥ 30 mL/hr)

❌ DO NOT

- ▶ Do NOT bend the affected extremity
- ▶ Do NOT raise HOB $> 30^\circ$ (femoral)
- ▶ Do NOT let patient strain, cough, or sneeze without applying pressure to site
- ▶ Do NOT ignore back/flank pain (retroperitoneal bleed)
- ▶ Do NOT restart metformin until renal function confirmed safe

5 Complications & Red Flags

RECOGNIZE & ACT FAST

⚠ Early Warning Signs

- ▶ **Bleeding/hematoma** at insertion site — apply **direct pressure ABOVE** site
- ▶ Oozing or expanding bruise
- ▶ Diminished or absent distal pulse
- ▶ Cool, pale, mottled extremity
- ▶ Numbness, tingling, or pain in extremity
- ▶ Vasovagal reaction — bradycardia, hypotension, nausea

🚨 LIFE-THREATENING Red Flags

- ▶ **Retroperitoneal bleed** — flank/back pain, ↓BP, ↑HR, ↓Hgb (femoral approach)
- ▶ **Chest pain** — possible reocclusion or stent thrombosis → ECG STAT
- ▶ **Stroke symptoms** — dysphagia, weakness, slurred speech (embolic)
- ▶ **Lethal dysrhythmias** — V-tach, V-fib
- ▶ **Anaphylaxis** — wheezing, hives, hypotension
- ▶ **Cardiac tamponade** — Beck's triad: ↓BP, JVD, muffled heart sounds
- ▶ **Contrast-induced nephropathy** — ↑creatinine, ↓UO 24–48 hr post

🚨 **RED FLAG** **Femoral bleeding:** apply **firm pressure 1–2 inches ABOVE the puncture site** (over the artery, not the puncture itself).

Notify HCP, prepare for fluid resuscitation, draw type & cross.

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Pharmacology

DRUGS AROUND THE CATH LAB

Aspirin

ANTIPLATELET · PRE & POST

MOA: blocks COX-1 → ↓ thromboxane A2 → ↓ platelet aggregation

Side fx: GI bleed, tinnitus

Nursing: give with food; lifelong after stent

Clopidogrel (Plavix)

P2Y12 INHIBITOR · DAPT

MOA: blocks ADP receptor → ↓ platelet aggregation

Side fx: bleeding, bruising, TTP (rare)

Nursing: dual antiplatelet therapy 6–12 mo after DES

Heparin

ANTICOAGULANT · INTRA-PROCEDURE

MOA: activates antithrombin III → inhibits thrombin & factor Xa

Side fx: bleeding, HIT

Nursing: monitor aPTT; antidote = **protamine sulfate**

Iodinated Contrast Dye

RADIOGRAPHIC AGENT

MOA: opacifies vessels under fluoroscopy

Side fx: warm flushing sensation, allergy, **nephrotoxicity**

Nursing: hydrate before/after; hold metformin

Midazolam (Versed)

BENZODIAZEPINE · CONSCIOUS SEDATION

MOA: GABA enhancer → sedation, amnesia

Side fx: respiratory depression, hypotension

Nursing: monitor SpO₂; antidote = **flumazenil**

Nitroglycerin

VASODILATOR · AS NEEDED

MOA: dilates coronary & systemic veins → ↓ preload, relieves spasm

Side fx: headache, hypotension, reflex tachycardia

Nursing: hold if SBP < 90; relieves coronary artery spasm during cath

N-Acetylcysteine (Mucomyst)

RENAL PROTECTANT

MOA: antioxidant; protects renal tubules from contrast

Side fx: nausea, smells like rotten eggs

Nursing: may be given pre/post in CKD pts to prevent CIN

Metformin — HOLD

BIGUANIDE · NOT GIVEN PERI-PROCEDURE

Why hold: contrast + metformin = risk of **lactic acidosis**

Hold: 24–48 hr *before* & 48 hr *after*

Resume: only after creatinine confirmed normal

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NCLEX Test Traps

WHERE STUDENTS LOSE POINTS

✗ TRAP: "Apply pressure directly to the puncture site for femoral bleeding."

✓ CORRECT: Apply firm pressure 1–2 inches **ABOVE** the puncture (over the artery itself).

✗ TRAP: Patient reports back pain post-cath → "give pain medication."

✓ CORRECT: Back/flank pain = suspect **retroperitoneal bleed** → assess BP/HR, notify HCP STAT.

✗ TRAP: Diabetic patient on metformin — "give as scheduled morning of cath."

✓ CORRECT: **HOLD metformin** 24–48 hrs before & 48 hrs after to prevent **lactic acidosis**.

✗ TRAP: Patient says "I felt warm/flushed when dye was injected" — "stop the procedure."

✓ CORRECT: Warm/flushing sensation is **normal** with contrast injection. Reassure patient.

✗ TRAP: Post-cath diet — "advance to regular diet immediately."

✓ CORRECT: **Push fluids** (PO + IV) to flush contrast through the kidneys.

✗ TRAP: HOB elevation post-femoral cath — "raise to 60° for comfort."

✓ CORRECT: HOB $\leq 30^\circ$ for femoral approach to prevent puncture site disruption.

✗ TRAP: First action if pulses absent below femoral site → "elevate the leg."

✓ CORRECT: Notify HCP **immediately** — possible arterial occlusion/thrombosis.

✗ TRAP: Patient on Coumadin scheduled for cath — "give as ordered."

✓ CORRECT: Verify anticoagulant orders — warfarin is typically **held**; INR must be at goal.

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NCJMM • Clinical Judgment Framework

NCSBN'S 6-STEP CLINICAL REASONING MODEL

STEP 1

Recognize Cues

Vital signs, insertion site, distal pulses, urine output, pain location, level of consciousness, cardiac rhythm.

STEP 2

Analyze Cues

Hypotension + tachycardia + flank pain → **retroperitoneal bleed**. Cool/pale extremity → **arterial occlusion**. Chest pain → **stent reocclusion**.

STEP 3

Prioritize Hypothesis

Apply ABCs & Maslow:
airway/breathing/circulation first. Active bleeding > potential CIN. Unstable rhythm > pain.

STEP 4

Generate Solutions

Apply pressure above site, fluid resuscitation, notify HCP, prepare for OR/blood products, immobilize extremity, ECG, labs.

STEP 5

Take Action

Hold pressure, position supine, start NS bolus, draw labs (Hgb, type & cross), administer O₂, continuous monitoring.

STEP 6

Evaluate Outcomes

BP stabilized? Pulses returned? Hgb stable?
Urine output ≥ 30 mL/hr? Pain resolved? Site dry & intact?

9 Patient & Family Education

TEACHING FOR SAFE DISCHARGE



At-Home Activity

- ▶ **No heavy lifting** (> 10 lbs) for 1 week
- ▶ No driving for 24–48 hrs
- ▶ No strenuous exercise, sex, or stair climbing for 24–48 hrs
- ▶ Avoid hot tubs, baths, swimming for 1 week (showers OK after 24 hrs)
- ▶ Keep site clean & dry; small bruise is normal



CALL HCP / 911 IF...

- ▶ **Active bleeding** from site that won't stop with pressure (5–10 min) — **911**
- ▶ **Chest pain**, shortness of breath — **911**
- ▶ Cold, pale, numb extremity
- ▶ Increasing swelling, hard lump, or expanding bruise at site
- ▶ Fever > 101°F (infection)
- ▶ Drainage, redness, or warmth at puncture site



Medication Adherence

- ▶ **Take aspirin + clopidogrel exactly as prescribed** — DO NOT stop without HCP order (risk of stent thrombosis = MI)
- ▶ Resume metformin only when HCP confirms kidneys are OK
- ▶ Carry medication list at all times
- ▶ Tell all dental/surgical providers about stent



Fluid & Lifestyle

- ▶ **Drink plenty of fluids** (1.5–2 L/day) for 24–48 hrs to flush dye
- ▶ Heart-healthy diet: low sodium, low saturated fat, DASH style
- ▶ Smoking cessation — refer to resources
- ▶ Cardiac rehab referral encouraged
- ▶ Manage HTN, diabetes, cholesterol aggressively

10 Memory Boosters & Mnemonics

PATTERN RECOGNITION SHORTCUTS

5 P's — Distal Pulse Check

- P** **Pulse**— present, strong, equal bilaterally
- P** **Pallor**— color pink, not pale/mottled
- P** **Pain**— assess for ischemic pain
- P** **Paresthesia**— numbness, tingling
- P** **Paralysis**— movement intact

CATH — Pre-Procedure Checks

- C** **Consent** & Creatinine (renal function)
- A** **Allergies** (iodine, shellfish, contrast)
- T** **Type** & cross; **NPO Time** (6–8 hr)
- H** **Hold** metformin & anticoagulants

BLEED — Site Complications

- B** **BP** drop (early shock)
- L** **Lump**/hematoma at site
- E** **Extremity** cool, pale, pulseless
- E** **Ecchymosis** spreading
- D** **Discomfort**: back/flank = retroperitoneal bleed

SAFE — Post-Procedure Bedrest

- S** **Straight** leg (or wrist) — no bending
- A** **Assess** site & pulses q15min × 1 hr
- F** **Fluids**— push to flush dye
- E** **Elevation** HOB ≤ 30° (femoral)

 KEY PEARL

Pattern recognition: If you see the words "**back pain**" + "**post-cardiac cath**" on the NCLEX → think **retroperitoneal bleed**, not back strain. This is a near-guaranteed test trap.

Cardiac Catheterization · NGN NCLEX 2026 Study Reference

Diane's NCLEX Library · For educational use · Always follow facility protocols & current evidence-based practice