Bradycardia & Conduction Delay · Acute Algorithm

Symptomatic bradycardia & AV block in adults · point-of-care reference for internal medicine

2018 ACC/AHA/HRS Bradycardia Guideline
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● Class I — recommended ● IIa — reasonable ● IIb — may consider ● III: Harm — do not use

1 First: ECG, stability & screen for reversible causes

⚠ Don't reflexively pace — treat the cause first
Hypothyroidism, hypothermia, hyperkalaemia, hypoxia, raised ICP, sleep apnoea, Lyme/endocarditis, inferior MI, β-blocker/CCB/digoxin/anti-arrhythmic therapy & cardiac surgery may all produce a transient AV block / SND. Reverse the cause before committing to a permanent pacemaker.

⚠ Atropine after heart transplant III: Harm
Denervated transplanted hearts may respond to atropine with **paradoxical AV block or sinus arrest**. Use **isoproterenol, dopamine, or aminophylline / theophylline** (6 mg/kg IV over 20–30 min); pace if refractory.

2 Acute Rx — symptomatic bradycardia

Reverse / treat the cause — I
Stop offending drugs; correct K^+, Mg^{2+}, hypoxia, hypothermia, ischaemia.

▼ if still symptomatic / unstable

Atropine 0.5–1 mg IV, repeat q3–5 min (max 3 mg) — IIa
First-line for symptomatic SND / AV block. **Avoid post-heart transplant.**

▼ refractory · drug toxicity → see Sec 3

β-/dopaminergic infusion or aminophylline — IIb
Dopamine 5–20 µg/kg/min · epinephrine 2–10 µg/min · isoproterenol 1–20 µg/min (**avoid if ischaemia**). Acute inferior MI + AV block: **aminophylline 250 mg IV**.

▼ haemodynamically unstable / refractory

Temporary pacing
Transcutaneous as immediate bridge IIb → **transvenous** RV wire or externalised PPM lead for sustained support IIa. Sedate; confirm capture by pulse / ABP.

3 Acute doses (IV)

Drug	Dose	Note
Atropine	0.5–1 mg, repeat q3–5 min, max 3 mg	avoid post-heart transplant (paradoxical block)
Dopamine	5 → 20 µg/kg/min	titrate q2 min by 5 µg/kg/min; vasoconstriction >20
Epinephrine	2–10 µg/min IV	or 0.1–0.5 µg/kg/min titrated
Isoproterenol	1–20 µg/min infusion	avoid in coronary ischaemia (↑ MVO_2)
Aminophylline	250 mg IV bolus (acute MI + AV block)	post-transplant: 6 mg/kg in 100–200 mL over 20–30 min
Glucagon	3–10 mg IV → 3–5 mg/h infusion	β-blocker or CCB overdose
Ca^{2+} chloride 10%	1–2 g IV q10–20 min	CCB overdose; or Ca gluconate 3–6 g
HD insulin	1 U/kg bolus → 0.5 U/kg/h	BB / CCB toxicity; monitor glucose & K^+
Digoxin Fab	vial-dosed to ingested amount / level	1 vial ≈ 0.5 mg digoxin; infuse over ≥30 min

4 Condition-specific pointers

RHYTHM / SETTING	RECOGNISE	ACUTE	DEFINITIVE / ONGOING
Sinus node dysfunction	Sinus brady, sinus pauses, chronotropic incompetence; symptom-rhythm correlation key	Reverse cause; atropine IIa; theophylline trial if refractory IIb	PPM only if symptoms correlate I; **atrial-based** (DDD/AAI) > VVI I; minimise V-pacing IIa
2° AV block — Mobitz I	Progressive PR lengthening then dropped QRS; usually AV-nodal, vagal	Observe if asymptomatic; atropine if symptomatic	PPM only if symptomatic / non-vagal & non-reversible IIa
2° AV block — Mobitz II	Constant PR, sudden dropped QRS; infra-Hisian — wide QRS common	Atropine often **ineffective**; transcutaneous → transvenous pacing	**PPM regardless of symptoms** if not reversible I
High-grade / 3° AV block	≥2 consecutive non-conducted P or AV dissociation with bradycardia	Atropine; isoproterenol/epinephrine; transcutaneous → transvenous pacing	**PPM regardless of symptoms** if not reversible I
Inferior MI + AV block	Usually AV-nodal, vagal-mediated; often transient (resolves <7 d)	Atropine IIa; **aminophylline 250 mg IV** IIb; pace if unstable	Defer PPM ≥ 5–7 d to allow recovery; PPM only if persistent
Drug-induced (BB / CCB / digoxin)	Symptomatic brady on therapeutic doses or overdose	CCB: **Ca^{2+} + glucagon** + **HD-insulin** all IIa; digoxin: **Fab** IIa	If GDMT essential & no alternative → PPM I
Tachy-brady (SND + AF)	Conversion pauses or slow ventricular response; syncope post-termination	Rate-control with caution; treat AF (ablation may obviate pacing)	PPM to enable AF therapy / rate control IIa
Post-cardiac surgery / TAVR	New AV block / LBBB; often early & may recover	Temporary epicardial / transvenous pacing; observe	Surveillance ECG; PPM if persistent high-grade block / new LBBB w/ PR prolongation

5 Chronic Rx — pacemaker decisions

Symptoms correlate with bradycardia → PPM — I
No minimum HR / pause defines indication in SND — **correlation is the gold standard**.

▼ SND with intact AV conduction

Atrial-based pacing (DDD or AAI) > VVI — I
Preferred mode in SND; program to **minimise V-pacing** IIa.

▼ acquired Mobitz II / high-grade / 3° AVB (non-reversible)

PPM regardless of symptoms — I
Includes alternating BBB. Exclude reversible & physiologic causes first.

▼ LVEF 36–50% + AV block expecting >40% V-pacing

CRT or His-bundle pacing (physiologic activation) — IIa
Preferred over chronic RV pacing to prevent pacing-induced HF. Oral theophylline trial IIb if PPM declined / dx uncertain.

6 Do not pace & key cautions

Asymptomatic SND / vagally-mediated pauses — III: Harm
Athletes, high vagal tone, asymptomatic Holter pauses — **no PPM**.

Sleep-related bradycardia → no PPM alone — III: Harm
Screen / treat **sleep apnoea** I; nocturnal bradycardia is not, by itself, an indication.

New LBBB → look for structural disease — I
Echocardiogram is the appropriate initial screen I — high yield for LV systolic dysfunction.

Remember
Mobitz II, high-grade & complete AV block (non-reversible) → PPM regardless of symptoms. In SND, no HR/pause threshold applies — establish **symptom-rhythm correlation**. Decisions are patient-centred: shared decision-making applies, including the right to refuse or withdraw pacing.

Decision support only — confirm doses, contraindications & interactions before prescribing.

Brady ≠ pause · v1.0

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