Alternative sites for CRPacing

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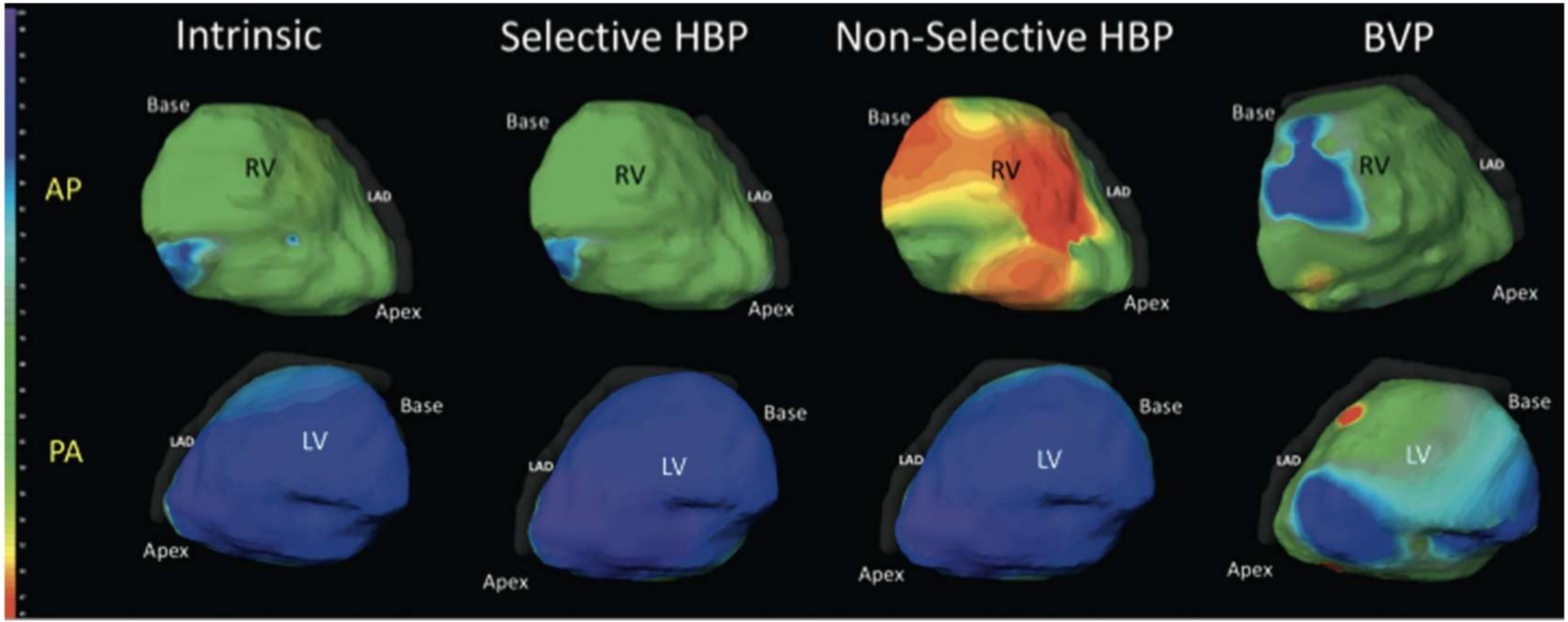
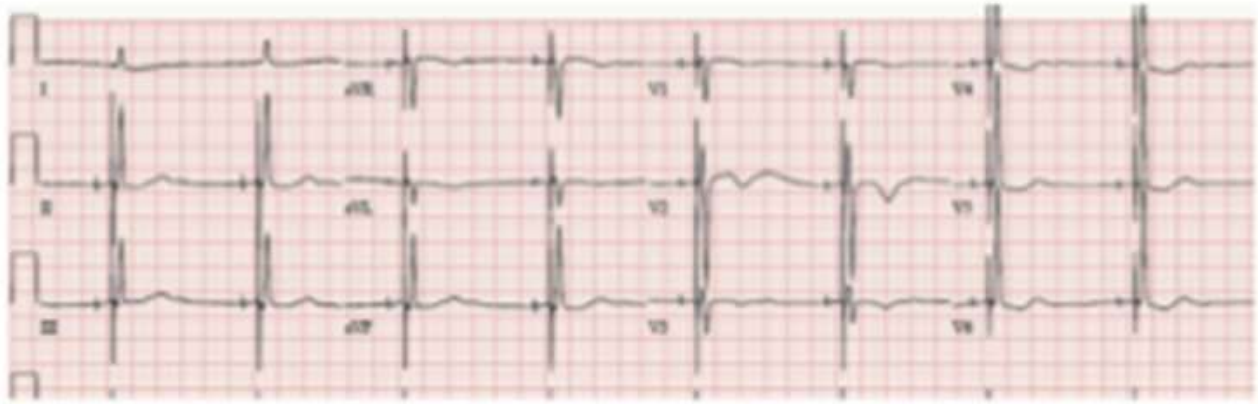
WHY?

NEWS FROM THE HEART RHYTHM SOCIETY

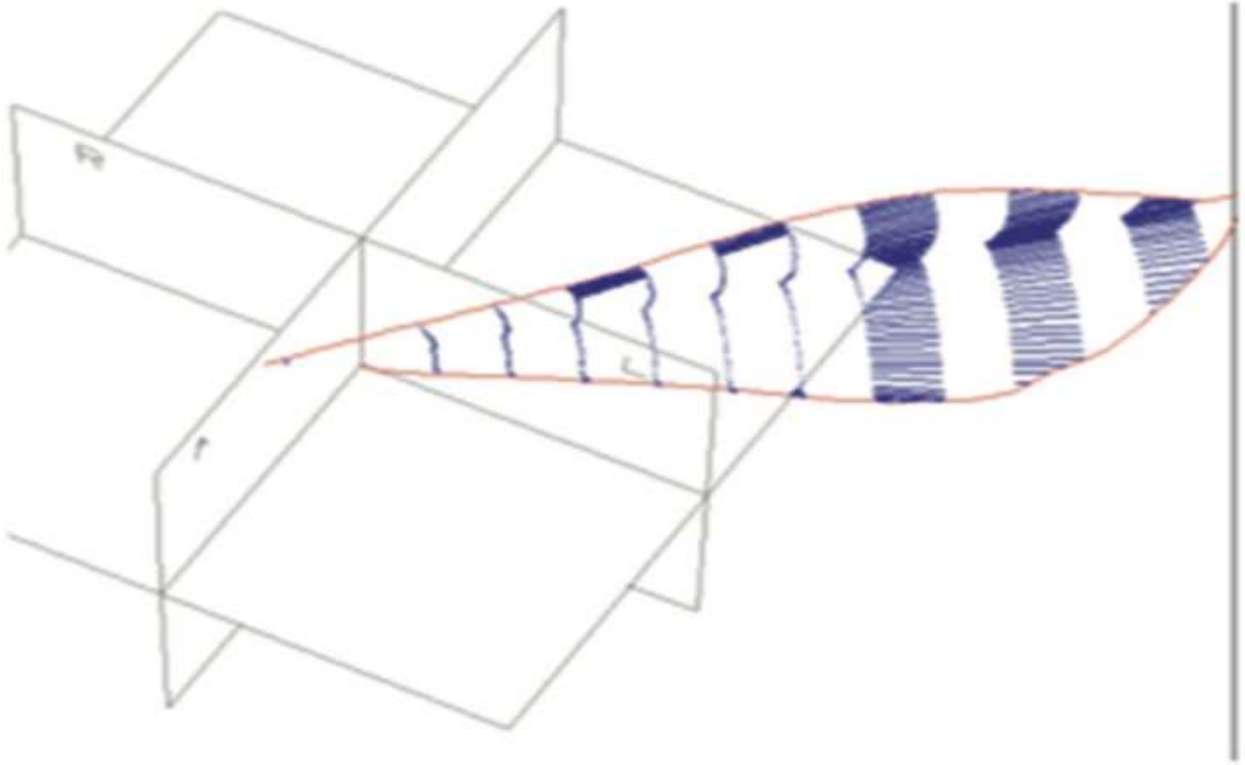
2023 HRS/APHRS/LAHRS guideline on cardiac physiologic pacing for the avoidance and mitigation of heart failure



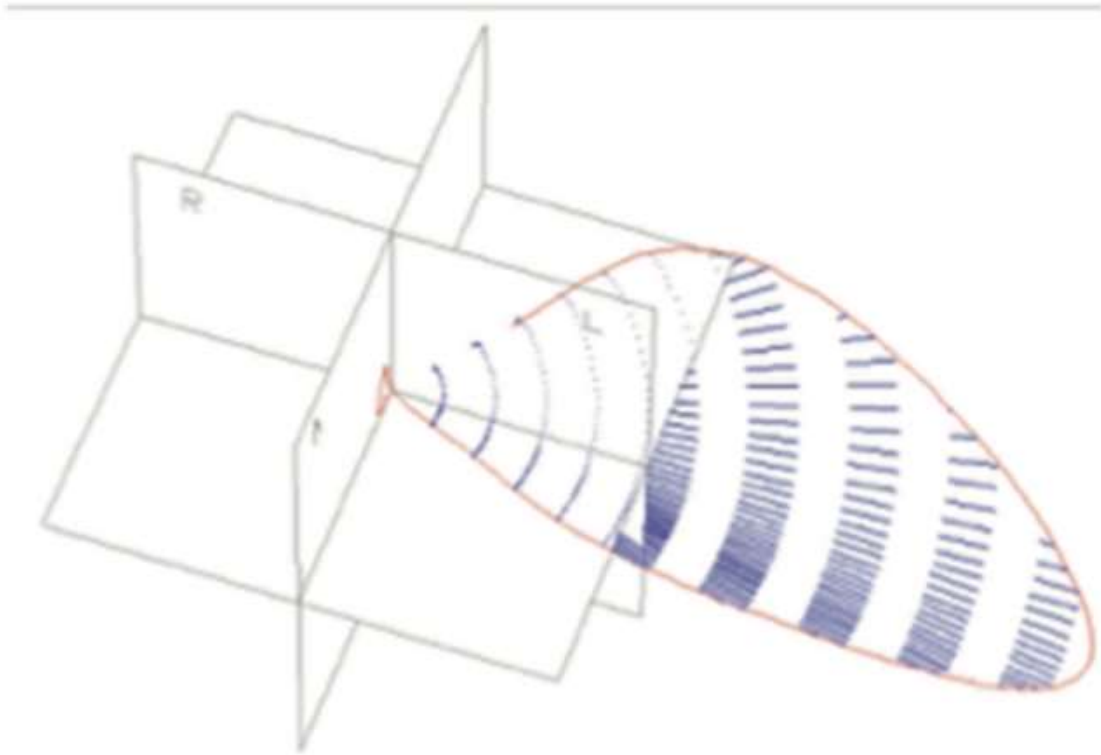
From **left to right**, ECG Imaging epicardial activation maps for intrinsic QRS, selective His bundle pacing, nonselective His bundles pacing and biventricular pacing (BVP) in a single patient with a normal QRS duration and morphology. Above are maps of the right ventricle (RV) and below of the left ventricle (LV). The **color scale** on the left indicates the activation times. Selective HBP activates both ventricles identically to intrinsic rhythm. Nonselective HBP pacing activates the LV identical to selective HBP and intrinsic rhythm but on the RV maps there is evidence of early **(red)** activation in the basal and mid ventricle, indicate capture of local right ventricular myocardium alongside the bundle of His. Biventricular pacing activates the heart with an entirely different pattern with earliest activation **(red)** in the LV. Courtesy of Ahran Arnold and Zachary Whinnett, Imperial College London, United Kingdom.



3D vectorcardiogram in LBBB



3D vectorcardiogram during NS-HBP



WHAT?

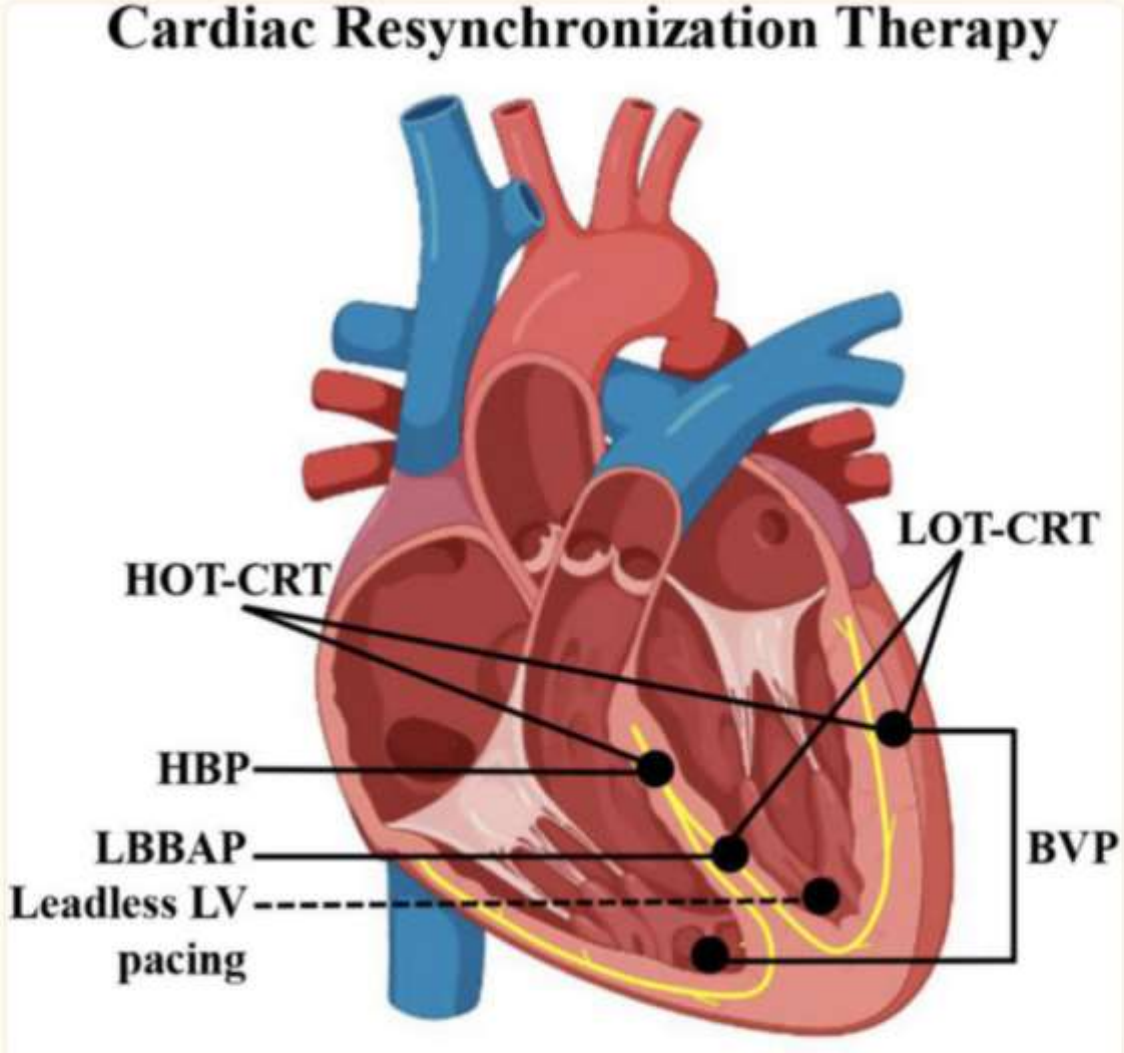


FIGURE 1

Schematic diagram of pacing electrode positions of different CRT modalities. BVP, biventricular pacing; CRT, cardiac resynchronization therapy; HBP, His bundle pacing; HOT-CRT, His-optimized CRT; LBBAP, left bundle branch area pacing; LOT-CRT, LBBAP-optimized CRT.

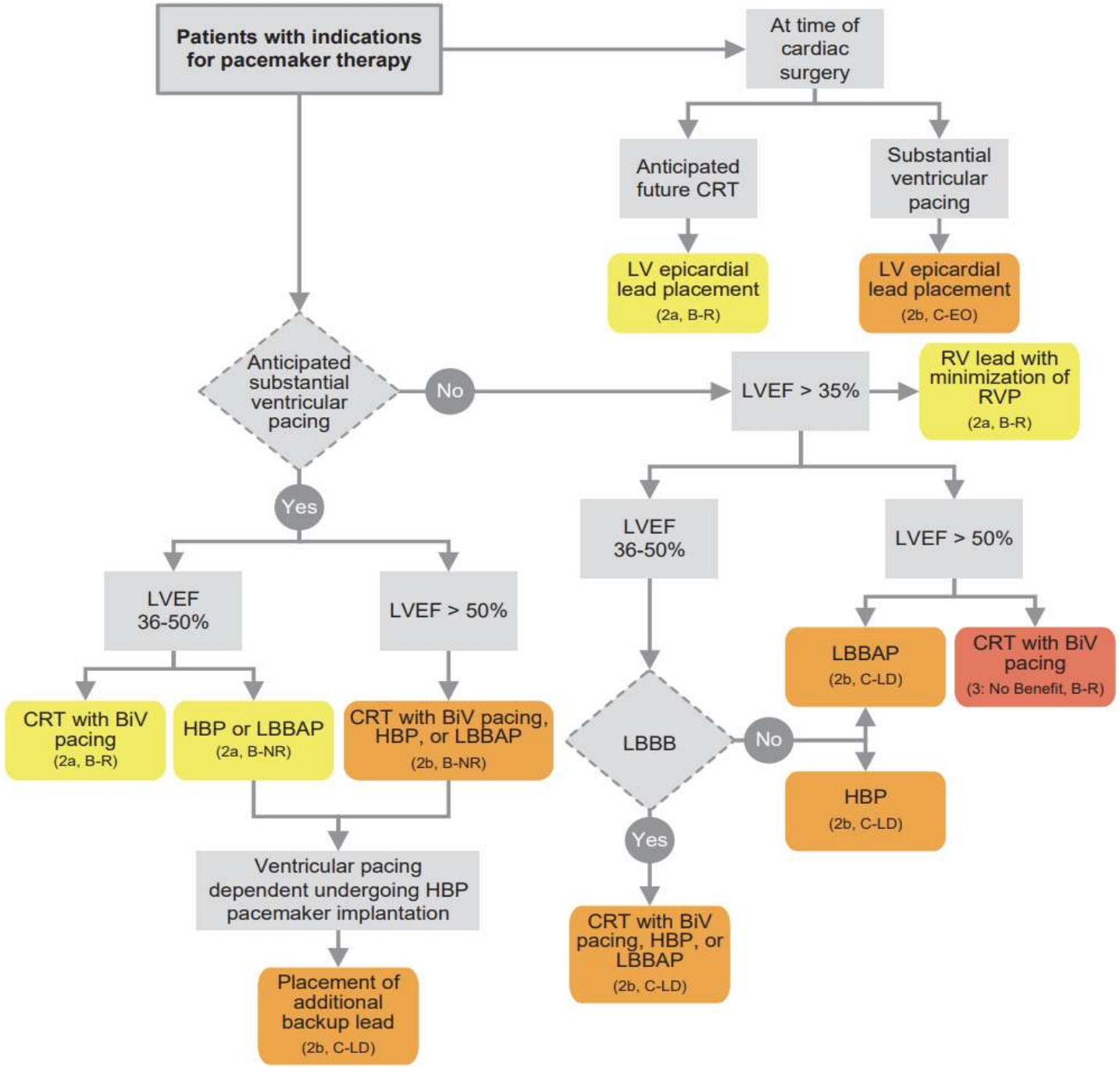
Cardiac Physiologic Pacing

Cardiac physiologic pacing (CPP) is defined here as any form of cardiac pacing intended to restore or preserve synchrony of ventricular contraction. CPP can be achieved by engaging the intrinsic conduction system via conduction system pacing (CSP; which includes His bundle pacing or left bundle branch area pacing) or cardiac resynchronization therapy (CRT), the latter most commonly achieved by biventricular (BiV) pacing using a coronary sinus branch or epicardial left ventricular pacing lead.

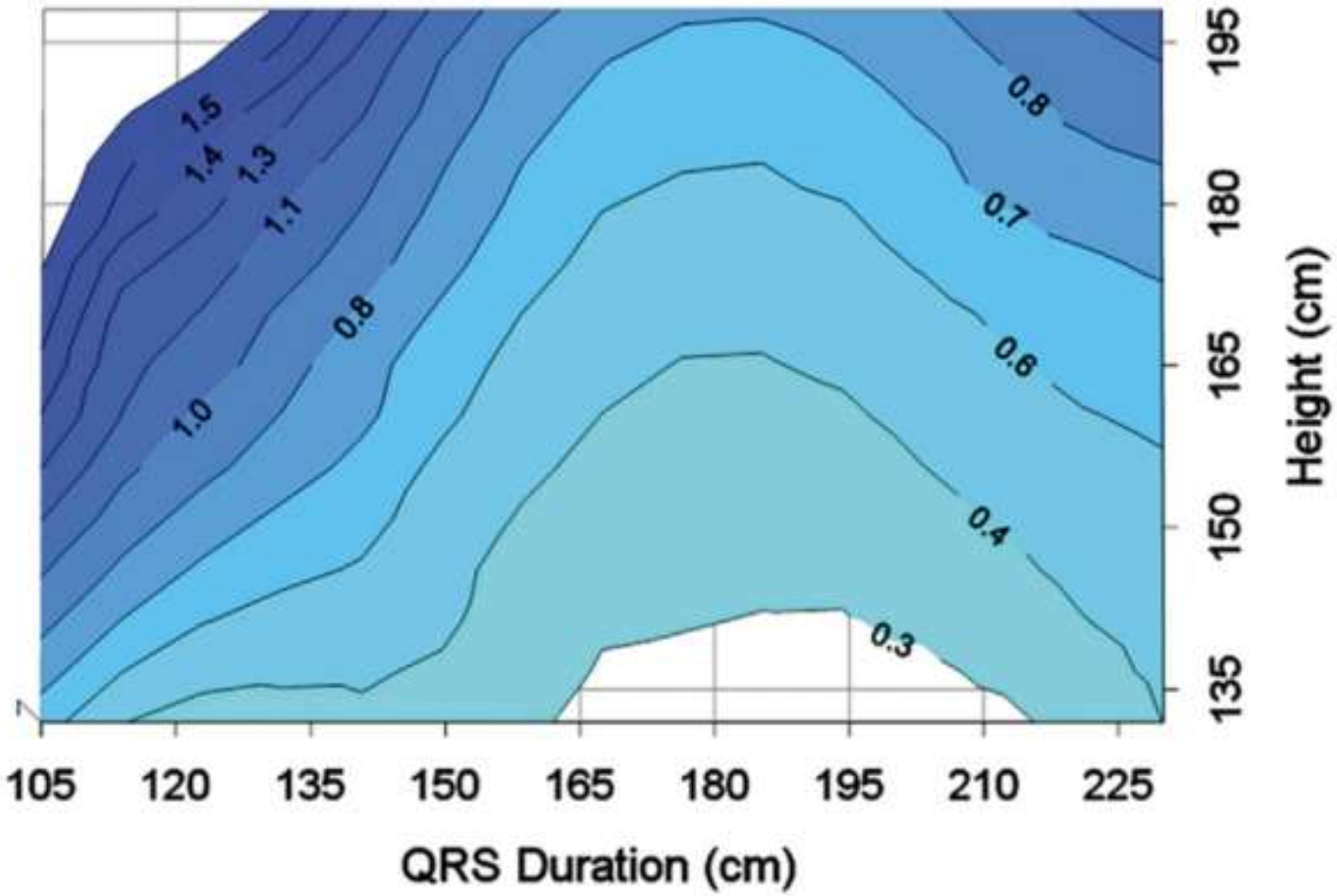
Possible candidates for CPP

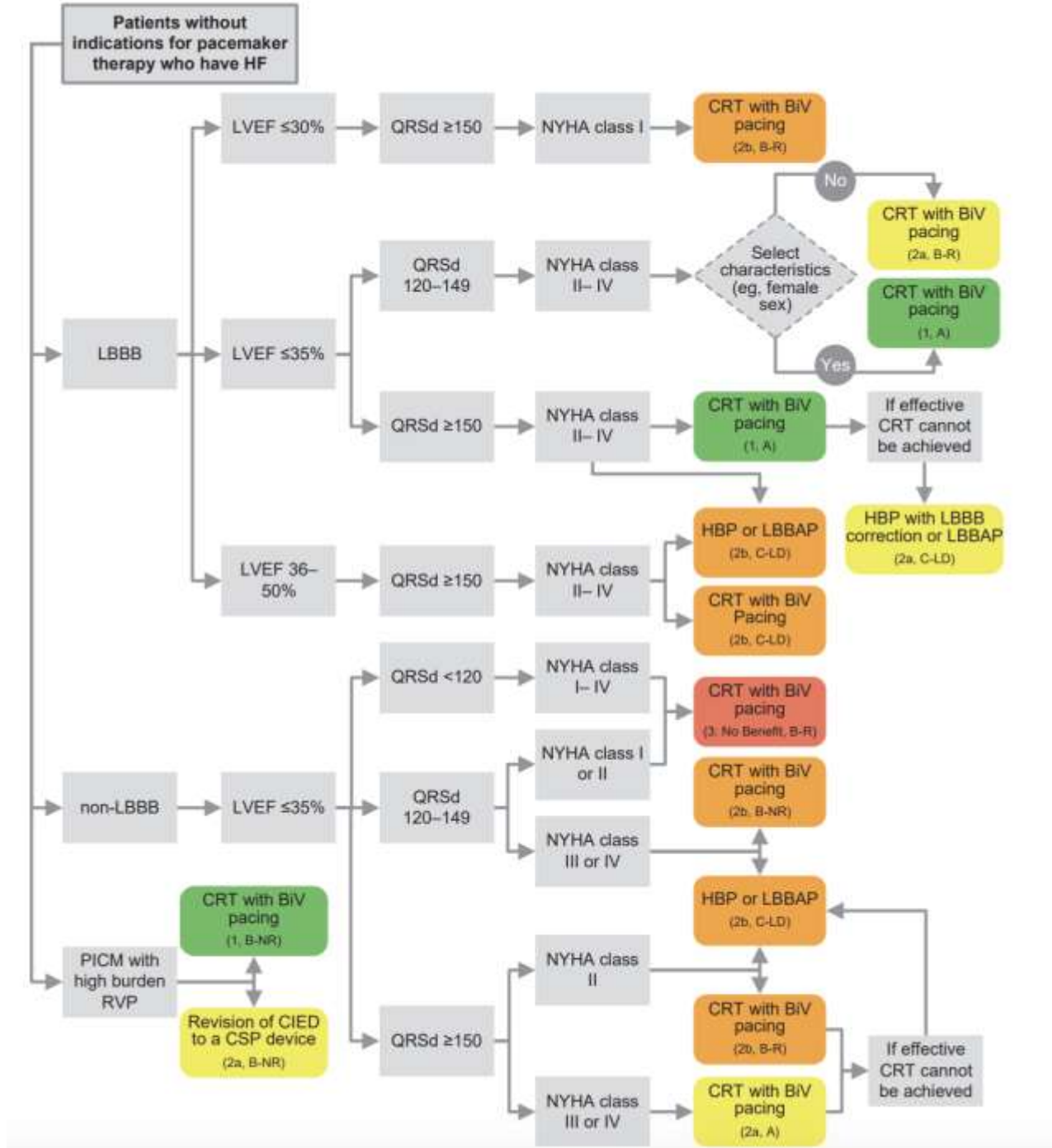
Recommendations for detection of electrical dyssynchrony–induced cardiomyopathy			
COR	LOE	Recommendations	References
1	B-NR	1. In patients who have substantial RVP that cannot be minimized with programming, periodic assessment of ventricular function is recommended to detect pacing-induced cardiomyopathy.	13–20
2a	B-NR	2. In patients with chronic LBBB, periodic assessment of ventricular function is reasonable to detect cardiomyopathy.	21–27

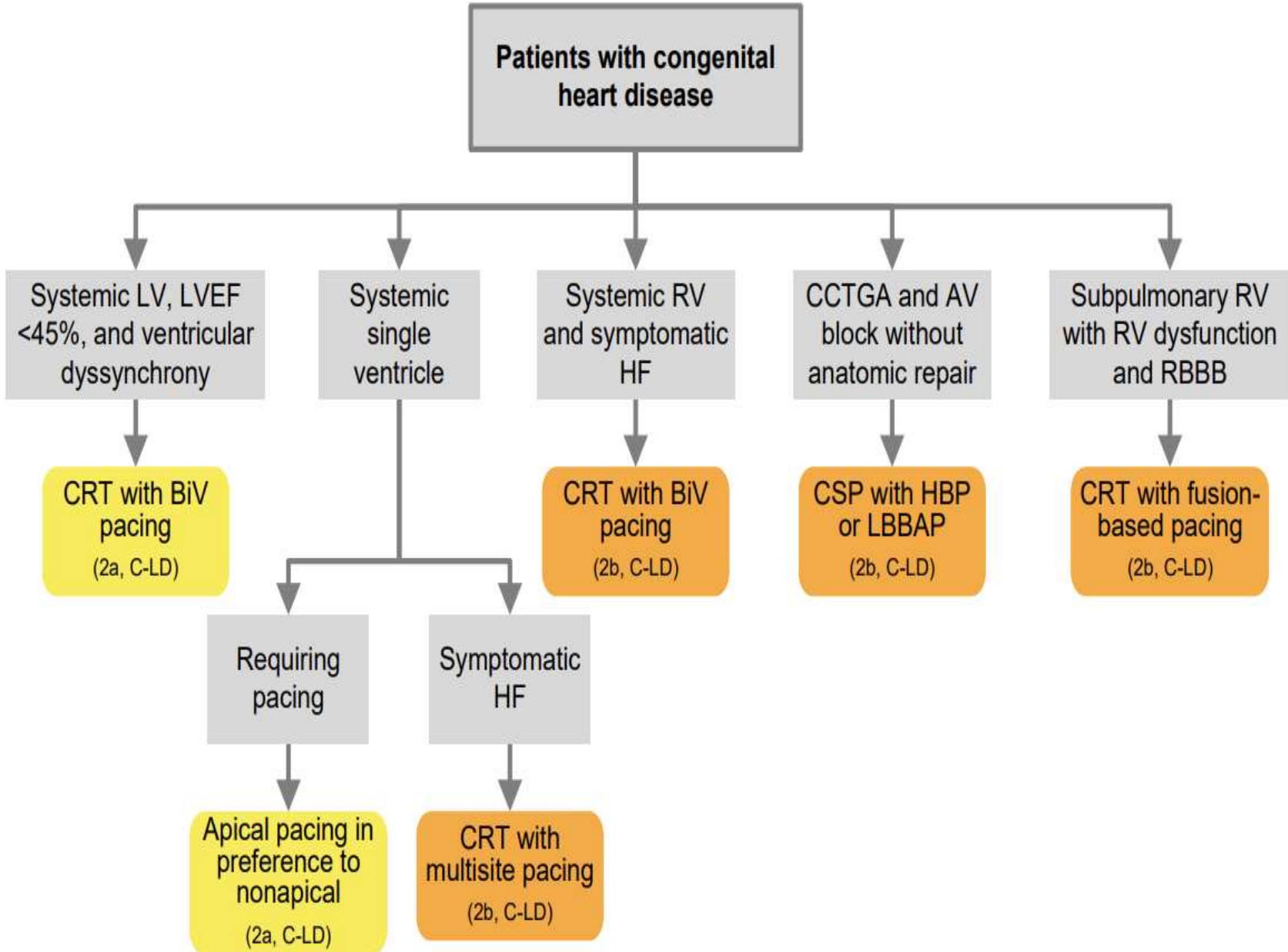
- High RVP burden (40%) has been associated with an increased risk of HFH as observed in the Mode Selection Trial (MOST).
- The incidence of PICM in observational cohorts has ranged from 5.9% to 39%.
- A systematic review20 of 26 studies (6 prospective) on nearly 58,000 patients showed a pooled prevalence of 12% of PICM using 15 unique definitions from 23 publications.

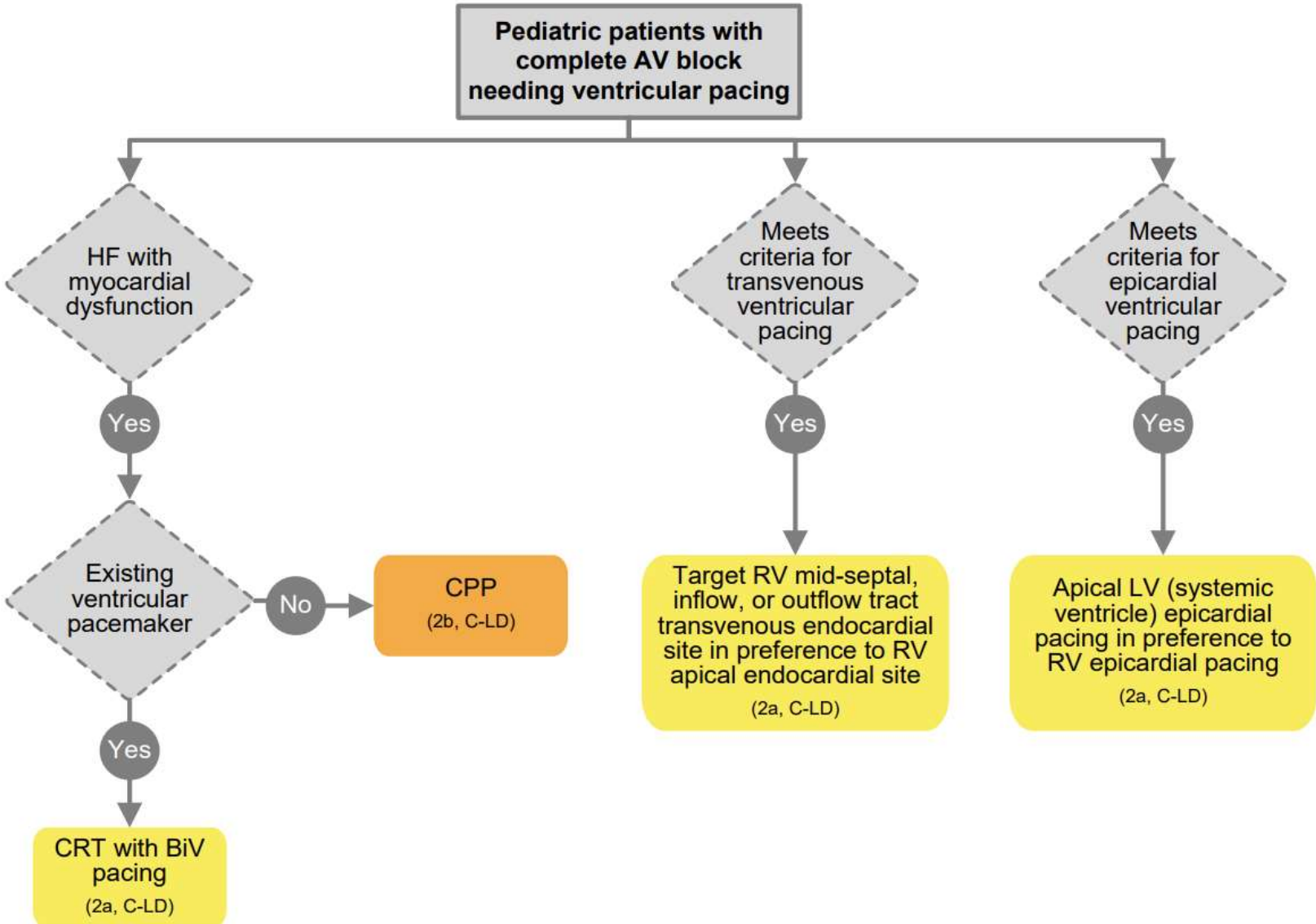

Patients with indications for pacemaker therapy
At time of cardiac surgery
Anticipated future CRT
Substantial ventricular pacing
LV epicardial lead placement
(2a, B-R)
LV epicardial lead placement
(2b, C-EO)
Anticipated substantial ventricular pacing
No
LVEF > 35%
RV lead with minimization of RVP
(2a, B-R)
Yes
LVEF 36-50%
LVEF > 50%
CRT with BiV pacing
(2a, B-R)
HBP or LBBAP
(2a, B-NR)
CRT with BiV pacing, HBP, or LBBAP
(2b, B-NR)
Ventricular pacing dependent undergoing HBP pacemaker implantation
Placement of additional backup lead
(2b, C-LD)
LVEF 36-50%
LVEF > 50%
LBBAP
(2b, C-LD)
CRT with BiV pacing
(3: No Benefit, B-R)
LBBB
No
HBP
(2b, C-LD)
Yes
CRT with BiV pacing, HBP, or LBBAP
(2b, C-LD)

Is Gender important?




Patients without indications for pacemaker therapy who have HF
LBBB
LVEF ≤30%
QRSd ≥150
NYHA class I
CRT with BiV pacing
(2b, B-R)
LVEF ≤35%
QRSd 120–149
NYHA class II– IV
Select characteristics (eg, female sex)
No
CRT with BiV pacing
(2a, B-R)
Yes
CRT with BiV pacing
(1, A)
QRSd ≥150
NYHA class II– IV
CRT with BiV pacing
(1, A)
If effective CRT cannot be achieved
HBP with LBBB correction or LBBAP
(2a, C-LD)
LVEF 36–50%
QRSd ≥150
NYHA class II– IV
HBP or LBBAP
(2b, C-LD)
CRT with BiV Pacing
(2b, C-LD)
non-LBBB
LVEF ≤35%
QRSd <120
NYHA class I– IV
CRT with BiV pacing
(3, No Benefit, B-R)
QRSd 120–149
NYHA class I or II
CRT with BiV pacing
(2b, B-NR)
NYHA class III or IV
HBP or LBBAP
(2b, C-LD)
PICM with high burden RVP
CRT with BiV pacing
(1, B-NR)
Revision of CIED to a CSP device
(2a, B-NR)
QRSd ≥150
NYHA class II
CRT with BiV pacing
(2b, B-R)
NYHA class III or IV
CRT with BiV pacing
(2a, A)
If effective CRT cannot be achieved


Patients with congenital heart disease
Systemic LV, LVEF <45%, and ventricular dyssynchrony
Systemic single ventricle
Systemic RV and symptomatic HF
CCTGA and AV block without anatomic repair
Subpulmonary RV with RV dysfunction and RBBB
CRT with BiV pacing (2a, C-LD)
Requiring pacing
Symptomatic HF
CRT with BiV pacing (2b, C-LD)
CSP with HBP or LBBAP (2b, C-LD)
CRT with fusion-based pacing (2b, C-LD)
Apical pacing in preference to nonapical (2a, C-LD)
CRT with multisite pacing (2b, C-LD)


Pediatric patients with complete AV block needing ventricular pacing
HF with myocardial dysfunction
Yes
Existing ventricular pacemaker
No
CPP
(2b, C-LD)
Yes
CRT with BiV pacing
(2a, C-LD)
Meets criteria for transvenous ventricular pacing
Yes
Target RV mid-septal, inflow, or outflow tract transvenous endocardial site in preference to RV apical endocardial site
(2a, C-LD)
Meets criteria for epicardial ventricular pacing
Yes
Apical LV (systemic ventricle) epicardial pacing in preference to RV epicardial pacing
(2a, C-LD)

Thank you for attention.