

Heart Failure and Cardiac Device Therapy: A Review of Current NICE and ESC Guidelines

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Supplementary Material

Supplementary Table 1: Indications for Cardiac Device Therapy Included in ESC Guidance vs NICE Guidance

	ESC	NICE
Bradypacing		
Sinus Node Dysfunction		
Symptomatic	✓	✓
Tachy-Brady syndrome + Pharmacological management	✓	
Patients with syncope + documented asymptomatic 6 sec pause	✓	
Symptomatic patients likely secondary to bradyarrhythmia without conclusive evidence	✓	
Transient sinus node dysfunction due to correctable causes	✓	
AV block		
Permanent or paroxysmal type II 2 nd or 3 rd degree AV block irrespective of symptoms	✓	✓
AF + 3 rd degree or high degree AV block	✓	✓
Symptomatic type I 2 nd degree AV block or located at intra or infra His levels on EPS	✓	
Symptoms similar to that of pacemaker syndrome attributable to 1 st degree AV block with a PR interval of >0.3sec	✓	
Transient AV block due to correctable causes	✓	
Bundle branch block		
Alternating bundle branch block irrespective of symptoms	✓	
Bifascicular block + unexplained syncope + HV time of >70ms, 2 nd or 3 rd degree intra- or infra-Hisian block during incremental atrial pacing, or an abnormal response to pharmacological challenge	✓	
Unexplained syncope and bifascicular block without EP study in elderly, frail patients, high-risk and/ or recurrent syncope	✓	
Asymptomatic bifascicular or bundle branch block	✓	
Reflex Syncope		
Reduction of recurrent syncope in patients aged >40 years, with severe, unpredictable, recurrent syncope who have: spontaneous documented symptomatic asystolic pause(s) >3 s or asymptomatic pause(s) >6 s due to sinus arrest or AVB; or cardioinhibitory carotid sinus syndrome; or asystolic syncope during tilt testing	✓	
Reduction of syncope recurrences in patients with the clinical features of adenosine-sensitive syncope	✓	
Undocumented (suspected) syncope and recurrent falls		
Unexplained falls without documented indications	✓	
Unexplained syncope without evidence of documented indications	✓	
CRT		
Patients in Sinus rhythm		
LBBB		

Symptomatic with EF \leq 35% QRS \geq 150ms despite OMT	✓	✓†
Symptomatic with EF \leq 35% QRS = 130-149ms despite OMT	✓	✓†
Non-LBBB		
Symptomatic with EF \leq 35% QRS \geq 150ms despite OMT	✓	✓†
Symptomatic with EF \leq 35% QRS = 130-149ms despite OMT	✓	✓†
Patients in AF		
Permanent AF with \leq LVEF 35% + NYHA III/IV + \geq QRS 130ms	✓	✓†
AF + AV Node ablation		
Heart failure with Reduced Ejection Fraction (HFrEF)	✓	
Heart failure with mildly Reduced Ejection Fraction	✓	
Guidance on right ventricular pacing over CRT in Heart Failure with preserved Ejection Fraction	✓	
Pre-existing pacemaker or ICD		
Upgrade to CRT if subsequent development of symptomatic HF (LVEF $<$ 35%) despite best medical management whilst having a significant RV pacing	✓	
Heart Failure and AV block		
Ejection Fraction $<$ 40% + high degree AV block (including AF)	✓	
Implantable Cardioverter Defibrillator + CRT		
Stand-alone indication for ICD who require a CRT = CRT-d	✓	
ICD		
ICD implantation (General principles)		
In patients with an expected good quality survival $>$ 1 year	✓	
Primary Prevention ICD		
Symptomatic VT	✓	✓
High risk channelopathies	✓	✓
High risk cardiomyopathies	✓	✓
High risk congenital heart disease	✓	✓
Post-myocardial infarction and persistent EF \leq 40% 6-12 weeks after MI	✓	
Asymptomatic + OMT + coronary artery disease + LVEF \leq 30% + narrow QRS	✓	✓
Symptomatic + OMT + coronary artery disease + LVEF \leq 35%		
Secondary prevention of sudden cardiac death (SCD)		
Documented VF	✓	✓
SCD secondary to ventricular arrhythmias without ongoing ischaemia with documented VF or haemodynamically not-tolerated VT occurring later than 48 h after MI	✓	
Secondary prevention in VF/ haemodynamic unstable VT in those with channelopathies, cardiomyopathies, congenital heart disease	✓	
Survived cardiac arrest due to VT or VF	✓	✓
Adding CRT to ICD		
When an ICD is indicated, evaluate whether the patient could benefit from CRT-d	✓	

Subcutaneous implantable cardioverter-defibrillator		
An alternative to transvenous defibrillator with an indication for ICD when pacing therapy for bradycardia, CRT or anti-tachycardia pacing is not needed	✓	✓▪
Wearable cardioverter defibrillator		
Indication for secondary prevention ICD but are temporarily not candidates for ICD implantation	✓	
Consider in early phase of MI in selected patients	✓	
Optimisation of device programming	✓	
ICD implantation in left ventricular assist device (LVAD) recipients		
Consider ICD implantation in LVAD recipients with symptomatic sustained ventricular arrhythmias	✓	
End-of-life issues in ICD carriers		
Informed discussion with patient and family about deactivation options and shared decision making is indicated prior to implantation and in case of significant health status deterioration	✓	
Temporary pacing		
Indications for transcutaneous pacing	✓	
Indications for transvenous pacing	✓	
Other pacing modalities		
His bundle pacing (HBP)		
In unsuccessful coronary sinus lead implantation, consider HBP along with other options like surgical epicardial lead	✓	
Implantation of right ventricular lead used as back up for pacing or sensing	✓	
HBP with ventricular backup lead in pace and ablate strategy for rapidly conducted supraventricular arrhythmia particularly when intrinsic QRS is narrow	✓	
Research context only		✓
Left bundle branch area pacing		
Potential role: blocks that are too distal to be treated with HBP + facilitates AV node ablation,	✓	
Leadless pacing		
Absence of upper extremity venous access or high risk of device pocket infection	✓	✓††
As an alternative to standard single lead ventricular pacing	✓	

Supplementary Table 2: Heart Failure Management Included in ESC Guidance vs NICE Guidance

	ESC	NICE
Acute heart failure		
Initial management		
Oxygen to maintain saturations or to correct hypoxaemia	✓	
NIV to reduce the rate of mechanical intubation	✓	✓
Intubation for progressive respiratory failure persisting despite oxygen administration or NIV	✓	✓
Intravenous loop diuretics	✓	✓
Combination of loop + thiazide for resistant oedema	✓	
Consider vasodilators to improve symptoms and reduce congestion	✓	✓
Consider inotropes or vasopressors if reversible cardiogenic shock		✓
Other drugs		
VTE prophylaxis unless anti-coagulated	✓	
Routine use of opiates is not recommended unless severe pain or anxiety	✓	
Short-term mechanical support		
Considered as a bridge to bridge/recovery/decision	✓	
IABP can be considered in cardiogenic shock or long term mechanical circulatory support or transplantation	✓	
Arrhythmias		
Revascularisation in HFrEF		
Valvular heart disease and Heart Failure		
Cancer + Heart Failure		
Chronic Heart Failure		
Heart Failure with Reduced Ejection Fraction		
Initial management		
ACE inhibitors (ACEi)	✓	✓
ARB is ACE inhibitor not tolerated	✓	✓
Betablockers (BB)	✓	✓
Mineralocorticoid receptor antagonist (MRA)	✓	✓
SGLT2 – Dapagliflozin/Empagliflozin	✓	
Sacubitril/Valsartan is recommended as a replacement for an ACE-I inhibitors	✓	✓
Other drugs		
Loop diuretics	✓	✓
Ivabradine if resting heart rate \geq 70bpm despite betablockers or are unable to tolerate a betablocker	✓	✓*
Vericiguat if worsening heart failure despite, ACEi, BB, MRA	✓	
Hydralazine	✓	✓**

- self-identified black patients + dilated left ventricle + OMT with ACEi, BB and MRA - Cannot tolerate one of ACEi, BB, MRA		
Isosorbide dinitrate - self-identified black patients + dilated left ventricle + OMT with ACEi, BB and MRA - Cannot tolerate one of ACEi, BB, MRA	✓	✓**
Digoxin if symptomatic despite OMT with ACEi, BB, MRA	✓	✓
Multidisciplinary management of chronic HF	✓	✓
Exercise rehabilitation	✓	✓
Palliative care	✓	✓
Heart transplantation guidance	✓	
Heart Failure with Preserved Ejection Fraction		
Diuretics	✓	✓
Management of hypertension	✓	
Statins if risk of cardiovascular disease	✓	
SGLT2 inhibitors if diabetic + risk of cardiovascular disease	✓	

ACEi = ACE Inhibitors; BB = betablockers; HF = heart failure; HFrEF = heart failure with reduced ejection fraction; IABP = intra-aortic balloon pump; MDT = multidisciplinary team; MRA = mineralocorticoid receptor antagonist; NIV = non-invasive ventilation; OMT = optimised medical therapy; VTE = venous thrombo-embolism.

† = Not specified if in sinus rhythm

▪ = Supports use but does not include indications

†† = If MDT concludes conventional pacemaker is contraindicated with special arrangements for clinical governance, audit, consent and research

* = If heart rate >75bpm

** = Combination therapy only, no specific direction