

Stimulation Cardiaque

Recommandations ESC 2021

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2021 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy

Developed by the Task Force on cardiac pacing and cardiac resynchronization therapy of the European Society of Cardiology (ESC)

With the special contribution of the European Heart Rhythm Association (EHRA)

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ESC Classes of recommendations

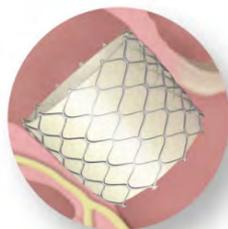
Classes of recommendations

	Definition	Wording to use
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.	Is recommended or is indicated
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.	
Class IIa	Weight of evidence/opinion is in favour of usefulness/efficacy.	Should be considered
Class IIb	Usefulness/efficacy is less well established by evidence/opinion.	May be considered
Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.	Is not recommended

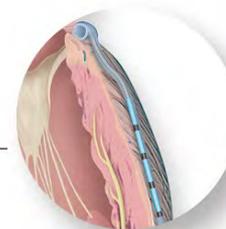
ESC Classes of recommendations

Level of evidence A	Data derived from multiple randomized clinical trials or meta-analyses.
Level of evidence B	Data derived from a single randomized clinical trial or large non-randomized studies.
Level of evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

New in these guidelines



Pacing in TAVI patients



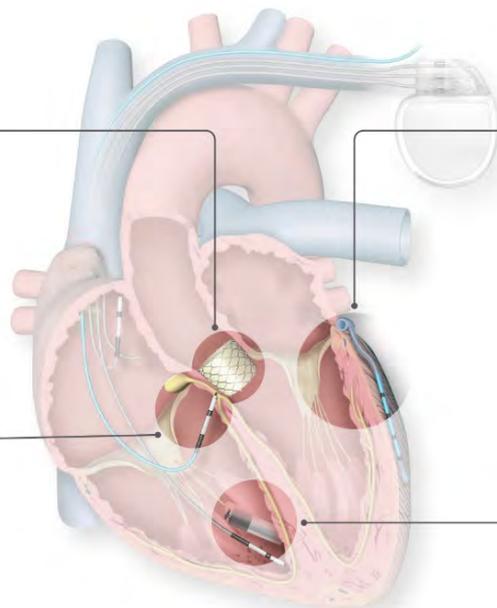
CRT indications



HBP in bradycardia or CRT



Leadless pacing



Preimplant evaluation

Minimizing complication risk

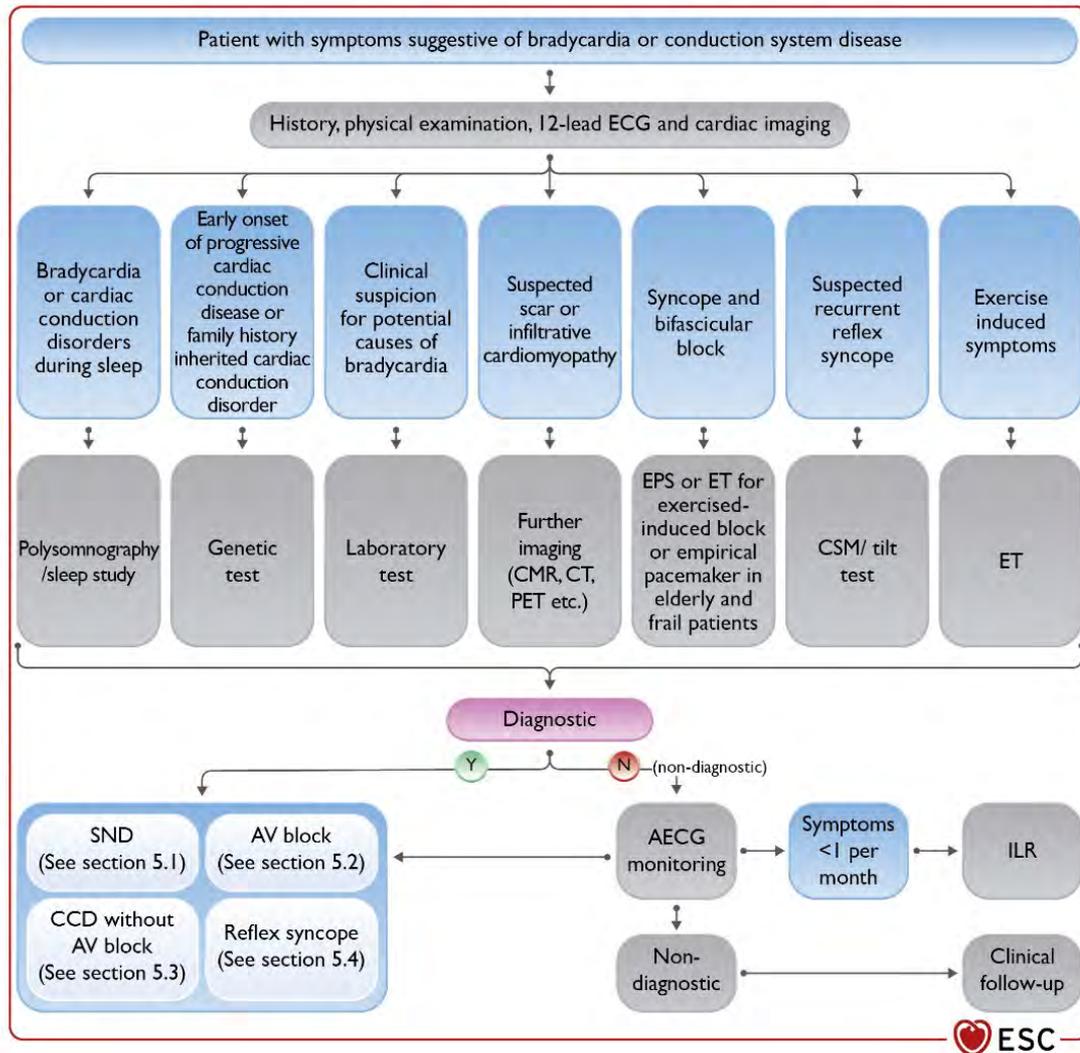
Pacing for bradycardia

Pacing in patients with rare diseases

Pacing in patients after cardiac surgery

High risk reflex syncope

Démarche diagnostique



Initial evaluation of patients with symptoms suggestive of bradycardia (SND or AV block)

History

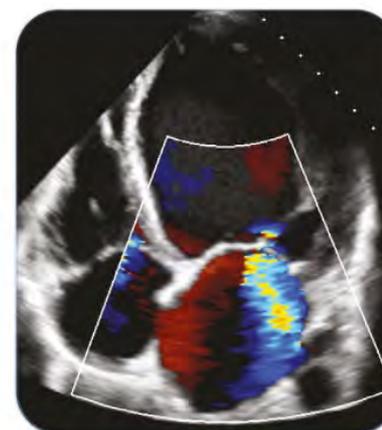
Physical examination

ECG

Cardiac imaging



- Cardiovascular risk
- Complete history focusing on symptoms
- Family history
- Medical treatment



Recommendations	Class	Level
Evaluation of the patient with suspected or documented bradycardia or conduction system disease		
Monitoring		
In patients with infrequent (less than once a month) unexplained syncope or other symptoms suspected to be caused by bradycardia, in whom a comprehensive evaluation did not demonstrate a cause, long-term ambulatory monitoring with an ILR is recommended.	I	A
Ambulatory electrocardiographic monitoring is recommended in the evaluation of patients with suspected bradycardia to correlate rhythm disturbances with symptoms.	I	C

ILR = implantable loop recorder.

Choice of ambulatory electrocardiographic monitoring depending on symptom frequency

Frequency of symptom	
Daily	24-h Holter ECG or in-hospital telemetric monitoring
Every 48–72 h	24–48–72 h Holter ECG
Every week	7-day Holter ECG/external loop recorder/external patch recorder
Every month	External loop recorder/external patch recorder/handheld ECG recorder
<1 per month	ILR

Recommendations	Class	Level
Carotid massage		
Once carotid stenosis is ruled out ^a , carotid sinus massage is recommended in patients with syncope of unknown origin compatible with a reflex mechanism or with symptoms related to pressure/manipulation of the carotid sinus area.	I	B
Tilt test		
Tilt testing should be considered in patients with suspected recurrent reflex syncope.	IIa	B

Recommendations	Class	Level
Exercise test		
Exercise testing is recommended in patients who experience symptoms suspicious of bradycardia during or immediately after exertion.	I	C
In patients with suspected chronotropic incompetence, exercise testing should be considered to confirm the diagnosis.	IIa	B
In patients with intra-ventricular conduction disease or AVB of unknown level, exercise testing may be considered to expose infranodal block.	IIb	C

Recommendations	Class	Level
Laboratory tests		
In addition to preimplant laboratory tests, ^b specific laboratory tests are recommended in patients with clinical suspicion for potential causes of bradycardia (e.g. thyroid function tests, Lyme titre, digitalis level, potassium, calcium, and pH) to diagnose and treat these conditions.	I	C

Recommendations	Class	Level
Sleep evaluation		
Screening for SAS is recommended in patients with symptoms of SAS and in the presence of severe bradycardia or advanced AVB during sleep.	I	C

Recommendations	Class	Level
Imaging		
Cardiac imaging is recommended in patients with suspected or documented symptomatic bradycardia to evaluate the presence of structural heart disease, to determine left ventricular systolic function, and to diagnose potential causes of conduction disturbances.	I	C
Multimodality imaging (CMR, CT, PET) should be considered for myocardial tissue characterization in the diagnosis of specific pathologies associated with conduction abnormalities needing pacemaker implantation, particularly in patients younger than 60 years.	IIa	C

Recommendations	Class	Level
Electrophysiological study		
<p>In patients with syncope and bifascicular block, EPS should be considered when syncope remains unexplained after non-invasive evaluation or when an immediate decision about pacing is needed due to severity, unless empirical pacemaker is preferred (especially in elderly and frail patients).</p>	<p>IIa</p>	<p>B</p>
<p>In patients with syncope and sinus bradycardia, EPS may be considered when non-invasive tests have failed to show a correlation between syncope and bradycardia.</p>	<p>IIb</p>	<p>B</p>

Recommendations	Class	Level
Genetics		
Genetic testing should be considered in patients with early onset (age <50 years) of progressive cardiac conduction disease.	IIa	C
Genetic testing should be considered in family members following the identification of a pathogenic genetic variant that explains the clinical phenotype of cardiac conduction disease in an index case.	IIa	C

Implantation et suivi

Recommendations	Class	Level
Special considerations on device implantations and perioperative management		
Administration of preoperative antibiotic prophylaxis within 1 h of skin incision is recommended to reduce risk of CIED infection.	I	A
Chlorhexidine alcohol instead of povidone-iodine alcohol should be considered for skin antisepsis.	IIa	B
Rinsing the device pocket with normal saline solution before wound closure should be considered.	IIa	C
Heparin-bridging of anticoagulated patients is not recommended.	III	A

Recommendations	Class	Level
Remote device management is recommended to reduce number of in-office follow-up in patients with pacemakers who have difficulties to attend in-office visits (e.g. due to reduced mobility or other commitments or according to patient preference).	I	A
Remote monitoring is recommended in case of a device component that has been recalled or is on advisory, to enable early detection of actionable events in patients, particularly those who are at increased risk (e.g. in case of pacemaker-dependency).	I	C
In-office routine follow-up of single- and dual-chamber pacemakers may be spaced by up to 24 months in patients on remote device management.	Ila	A

Frequency of follow-up for routine pacemaker and cardiac resynchronization therapy, either in person alone or combined with remote device management

	In-office only	In-office + remote
All devices	Within 72 h and 2–12 weeks after implantation	In-office within 72 h and 2–12 weeks after implantation
CRT-P or HBP	Every 6 months	Remote every 6 months and in-office every 12 months ^a
Single/dual-chamber	Every 12 months then every 3–6 months at signs of battery depletion	Remote every 6 months and in-office every 18–24 months ^a

Indications stimulation conventionnelle

New recommendations in 2021

Recommendations	Class	Level
Cardiac pacing for bradycardia and conduction system disease		
Pacing is indicated in symptomatic patients with the bradycardia-tachycardia form of SND to correct bradyarrhythmias and enable pharmacological treatment, unless ablation of the tachyarrhythmia is preferred.	I	B
Pacing is indicated in patients with atrial arrhythmia (mainly AF) and permanent or paroxysmal third- or high-degree AVB irrespective of symptoms.	I	C
In patients with SND and DDD PM, minimization of unnecessary ventricular pacing through programming is recommended.	I	A

AF = atrial fibrillation; AVB = atrioventricular block; DDD = dual-chamber, atrioventricular pacing; PM = pacemaker; SND = sinus node dysfunction.

Changes in guideline recommendations since 2013 Pause sinusale



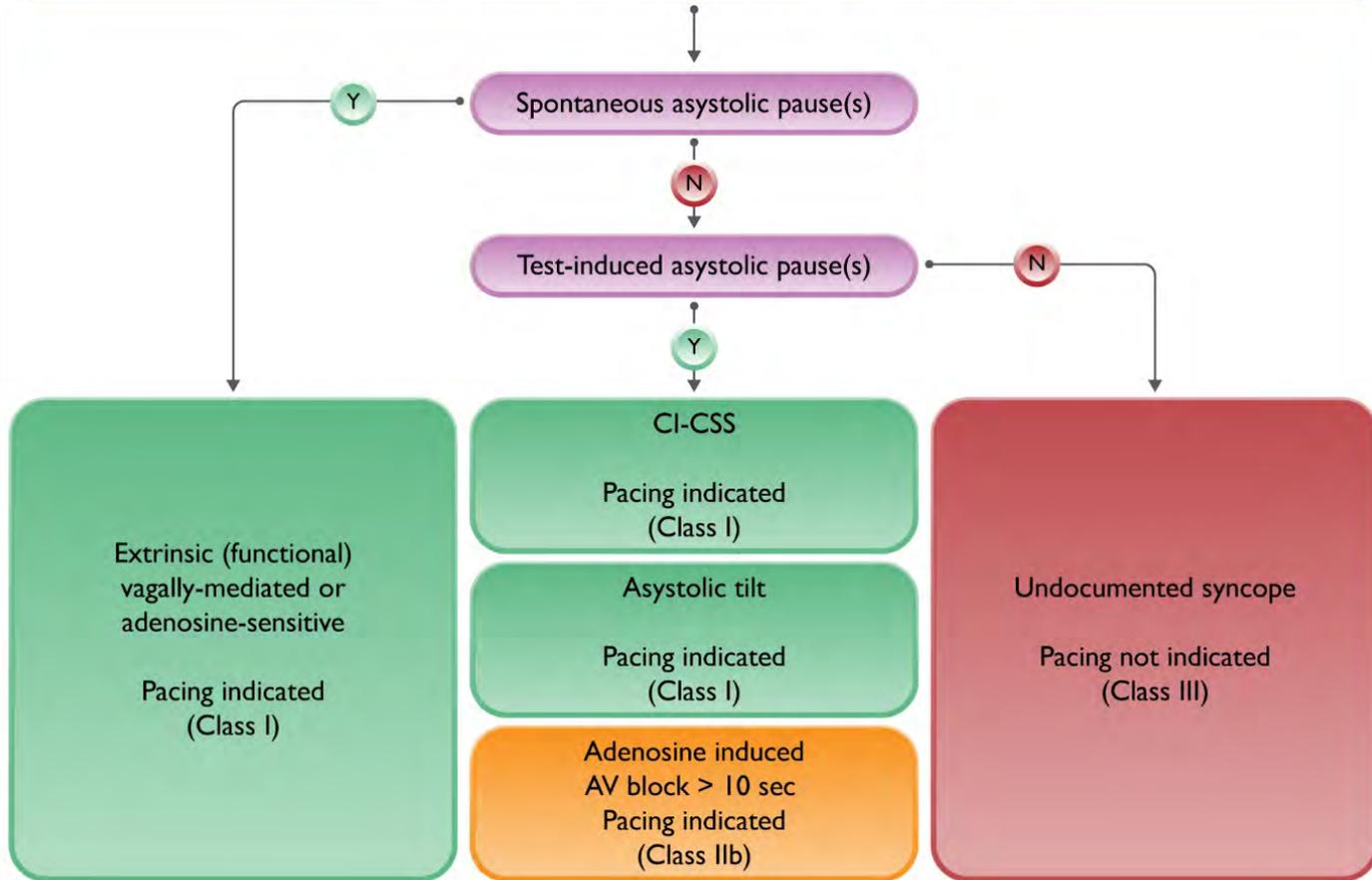
	2013	2021
	Class	
Cardiac pacing for bradycardia and conduction system disease		
In patients with syncope, cardiac pacing may be considered to reduce recurrent syncope when asymptomatic pause(s) >6 s due to sinus arrest are documented.	IIa	IIb

New recommendations in 2021 (10)

Recommendations	Class	Level
Cardiac pacing for bradycardia and conduction system disease (continued)		
AF ablation should be considered as a strategy to avoid pacemaker implantation in patients with AF-related bradycardia or symptomatic pre-automaticity pauses, after AF conversion, taking into account the clinical situation.	IIa	C
In patients with the bradycardia-tachycardia variant of SND, programming of atrial ATP may be considered.	IIb	B

AF = atrial fibrillation; ATP = antitachycardia pacing; SND = sinus node dysfunction.

Indications for pacing in patients above age 40 with reflex syncope



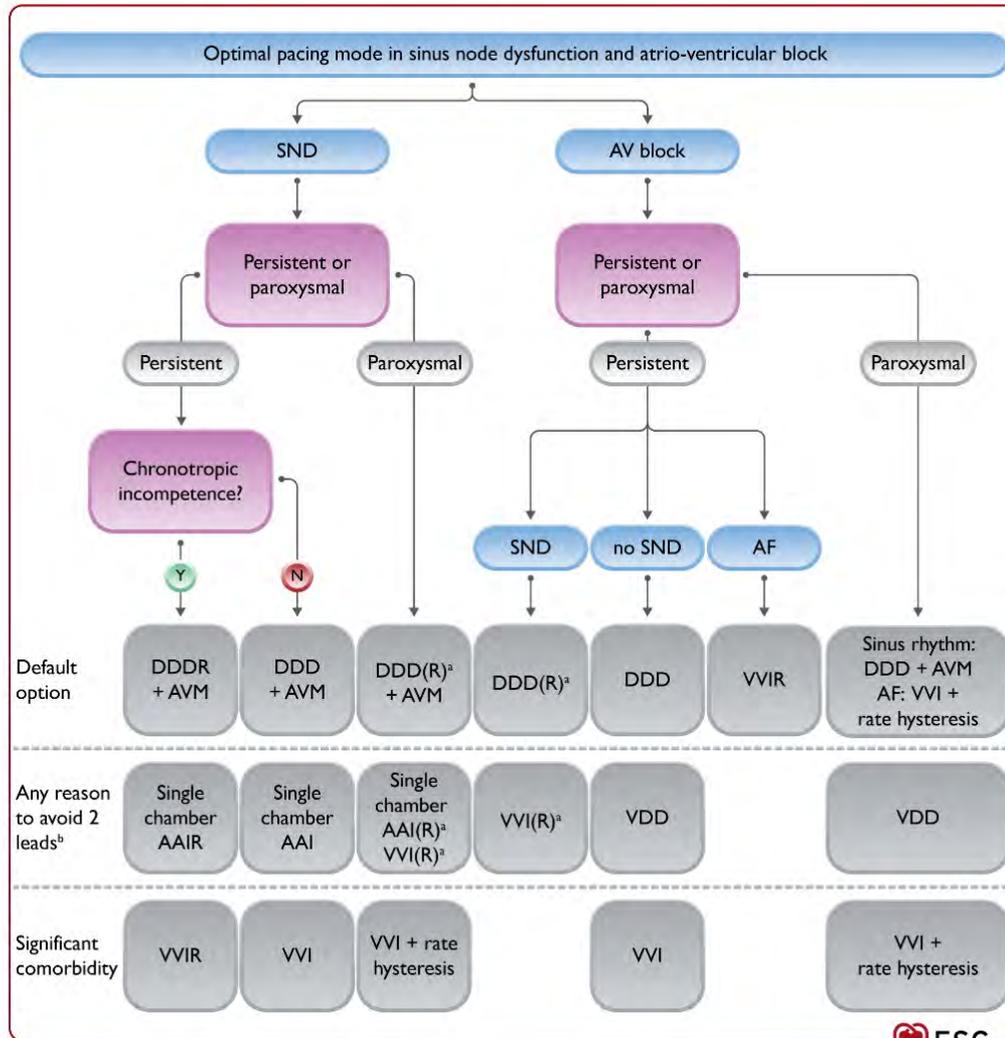
Recommendations	Class	Level
Cardiac pacing for bradycardia and conduction system disease (continued)		
<p>Dual chamber cardiac pacing is indicated to reduce recurrent syncope in patients aged >40 years with severe, unpredictable, recurrent syncope who have:</p> <ul style="list-style-type: none"> • spontaneous 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. 	I	A

Recommendations for pacing for reflex syncope

Recommendations	Class	Level
Dual-chamber cardiac pacing is indicated to reduce recurrent syncope in patients aged >40 years, with severe, unpredictable, recurrent syncope who have: <ul style="list-style-type: none">• 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.	I	A
Dual-chamber cardiac pacing may be considered to reduce syncope recurrences in patients with the clinical features of adenosine-sensitive syncope.	IIb	B
Cardiac pacing is not indicated in the absence of a documented cardioinhibitory reflex.	III	B

Recommendations	Class	Level
Cardiac pacing for bradycardia and conduction system disease (continued)		
Dual-chamber cardiac pacing may be considered to reduce syncope recurrences in patients with the clinical features of adenosine-sensitive syncope.	IIb	B

Recommendations	Class	Level
In patients with neuromuscular diseases such as myotonic dystrophy type 1 and any second- or third-degree AVB or HV ≥ 70 ms, with or without symptoms, permanent pacing is indicated. ^g	I	C
In patients with LMNA gene mutations, including Emery-Dreifuss and limb girdle muscular dystrophies who fulfil conventional criteria for pacemaker implantation or who have prolonged PR with LBBB, ICD implantation with pacing capabilities should be considered if at least 1-year survival is expected.	IIa	C
In patients with neuromuscular disease such as myotonic dystrophy type 1 with PR ≥ 240 ms or QRS duration ≥ 120 ms, permanent pacemaker implantation may be considered. ^g	IIb	C



Resynchronisation cardiaque

Recommendations	Class	Level
Cardiac resynchronization therapy		
In patients who are candidates for an ICD and who have CRT indication, implantation of a CRT-D is recommended.	I	A
In patients who are candidates for CRT, implantation of a CRT-D should be considered after individual risk assessment and using shared decision-making.	IIa	B
In patients with symptomatic AF and an uncontrolled heart rate who are candidates for AVJ ablation (irrespective of QRS duration), CRT rather than standard RV pacing should be considered in patients with HFmrEF.	IIa	C

Recommendations	Class	Level
Cardiac resynchronization therapy (continued)		
In patients with symptomatic AF and an uncontrolled heart rate who are candidates for AVJ ablation (irrespective of QRS duration), RV pacing should be considered in patients with HFpEF.	IIa	B
In patients with symptomatic AF and an uncontrolled heart rate who are candidates for AVJ ablation (irrespective of QRS duration), CRT may be considered in patients with HFpEF.	IIb	B

Changes in guideline recommendations since 2013 CRT

	2013	2021
	Class	
Patients who have received a conventional pacemaker or an ICD and who subsequently develop symptomatic HF with LVEF $\leq 35\%$ despite OMT and who have a significant ^a proportion of RV pacing should be considered for upgrade to CRT.	I	IIa
CRT rather than RV pacing is recommended for patients with HFrEF (<40%) regardless of NYHA class who have an indication for ventricular pacing and high-degree AVB in order to reduce morbidity. This includes patients with AF.	IIa	I
CRT should be considered for symptomatic patients with HF in SR with LVEF $\leq 35\%$, a QRS duration of 130–149 ms, and LBBB QRS morphology despite OMT, to improve symptoms and reduce morbidity and mortality.	I	IIa

Changes in guideline recommendations since 2013 CRT

	2013	2021
	Class	
Cardiac resynchronization therapy (continued)		
In patients with symptomatic AF and uncontrolled heart rate who are candidates for AVJ ablation (irrespective of QRS duration), CRT is recommended in patients with HFrEF.	IIa	I

Recommendation for upgrade from right ventricular pacing to cardiac resynchronization therapy



Recommendations	Class	Level
Patients who have received a conventional pacemaker or an ICD and who subsequently develop symptomatic HF with LVEF $\leq 35\%$ despite OMT, and who have a significant ^a proportion of RV pacing, should be considered for upgrade to CRT.	IIa	B

Recommendation for patients with heart failure and atrioventricular block

Recommendations	Class	Level
CRT rather than RV pacing is recommended for patients with HFrEF (<40%) regardless of NYHA class who have an indication for ventricular pacing and high degree- AVB in order to reduce morbidity. This includes patients with AF.	I	A

Recommendations for adding a defibrillator with cardiac resynchronization therapy

Recommendations	Class	Level
In patients who are candidates for an ICD and who have CRT indication, implantation of a CRT-D is recommended.	I	A
In patients who are candidates for CRT, implantation of a CRT-D should be considered after individual risk assessment and using shared decision-making.	IIa	B

Stimulation du Faisceau de His

Recommendations	Class	Level
Alternate site pacing – His bundle pacing		
In patients treated with HBP, device programming tailored to specific requirements of His bundle pacing is recommended.	I	C
In CRT candidates in whom coronary sinus lead implantation is unsuccessful, HBP should be considered as a treatment option along with other techniques such as surgical epicardial lead.	IIa	B
In patients treated with HBP, implantation of a right ventricular lead used as “backup” for pacing should be considered in specific situations (e.g. pacemaker-dependency, high-grade AVB, infranodal block, high pacing threshold, planned AVJ ablation), or for sensing in case of issues with detection (e.g. risk of ventricular undersensing or oversensing of atrial/His potentials).	IIa	C

Recommendations	Class	Level
Alternate site pacing – His bundle pacing (continued)		
HBP with a ventricular backup lead may be considered in patients in whom a “pace-and-ablate” strategy for rapidly conducted supraventricular arrhythmia is indicated, particularly when intrinsic QRS is narrow.	IIb	C
HBP may be considered as an alternative to right ventricular pacing in patients with AVB and LVEF >40%, who are anticipated to have >20% ventricular pacing.	IIb	C

Recommendations for using His bundle pacing (1)

Recommendations	Class	Level
In patients treated with HBP, device programming tailored to specific requirements of HBP is recommended.	I	C
In CRT candidates in whom coronary sinus lead implantation is unsuccessful, HBP should be considered as a treatment option along with other techniques such as surgical epicardial lead.	IIa	B
In patients treated with HBP, implantation of a RV lead used as “backup” for pacing should be considered in specific situations (e.g. pacemaker-dependency, high-grade AVB, infra-nodal block, high pacing threshold, planned AVJ ablation) or for sensing in case of issues with detection (e.g. risk of ventricular undersensing or oversensing of atrial/His potentials).	IIa	C

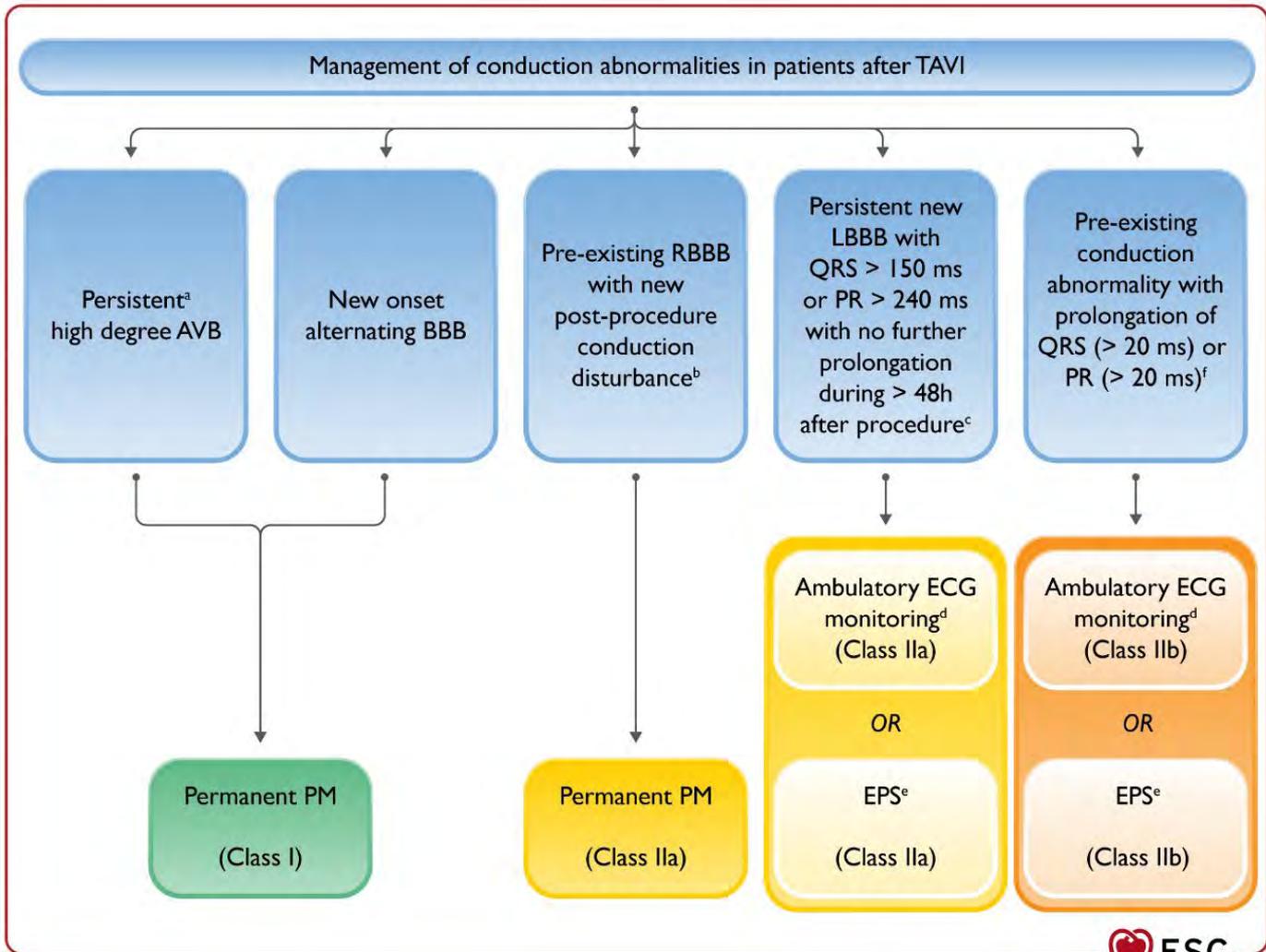
Recommendations for using His bundle pacing (2)

Recommendations	Class	Level
HBP with a ventricular backup lead may be considered in patients in whom a “pace-and-ablate” strategy for rapidly conducted supraventricular arrhythmia is indicated, particularly when intrinsic QRS is narrow.	IIb	C
HBP may be considered as an alternative to RV pacing in patients with AVB and LVEF >40%, who are anticipated to have >20% ventricular pacing.	IIb	C

Stimulateur sans sonde

Recommendations	Class	Level
Alternate site pacing – <i>Leadless pacing</i>		
Leadless pacemakers should be considered as an alternative to transvenous pacemakers when no upper extremity venous access exists or when risk of device pocket infection is particularly high, such as previous infection and patients on haemodialysis.	IIa	B
Leadless pacemakers may be considered as an alternative to standard single lead ventricular pacing, taking into consideration life expectancy and using shared decision-making.	IIb	C

Stimulation post TAVI



Recommendations	Class	Level
Indications for pacing in specific conditions – <i>Pacing in TAVI</i>		
Permanent pacing is recommended in patients with complete or high-degree AVB that persists for 24–48 h after TAVI.	I	B
Permanent pacing is recommended in patients with new onset alternating BBB after TAVI.	I	C
Early ^c permanent pacing should be considered in patients with pre-existing RBBB who develop any further conduction disturbance during or after TAVI. ^d	IIa	B
Ambulatory ECG monitoring ^e or an electrophysiology study ^f should be considered for patients with new LBBB with QRS >150 ms or PR >240 ms with no further prolongation during >48 h after TAVI.	IIa	C

Recommendations	Class	Level
Indications for pacing in specific conditions – <i>Pacing in TAVI (continued)</i>		
Ambulatory ECG monitoring ^e or electrophysiology study ^f may be considered for TAVI patients with pre-existing conduction abnormality who develop further prolongation of QRS or PR >20 ms.	IIb	C
Prophylactic permanent pacemaker implantation is not indicated before TAVI in patients with RBBB and no indication for permanent pacing.	III	C

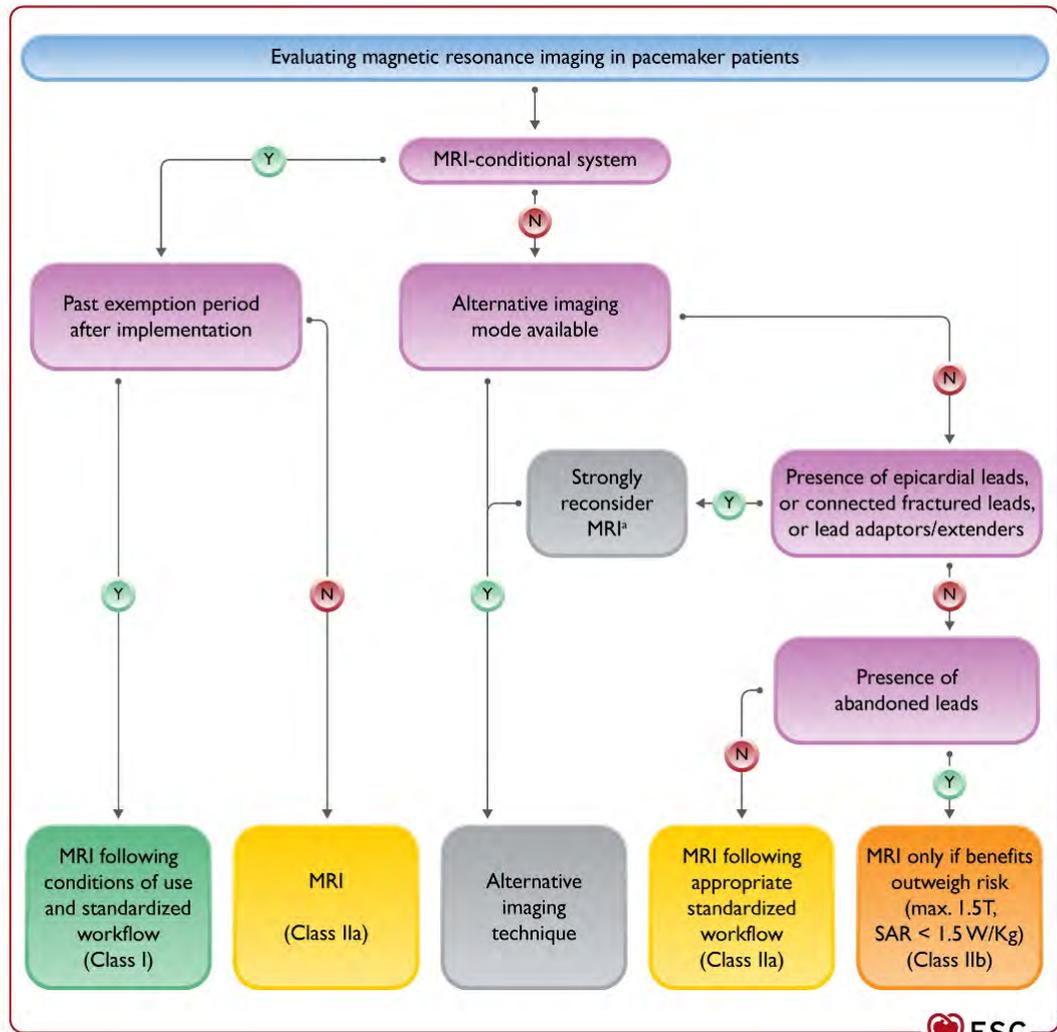
Stimulation cardiaque et IRM

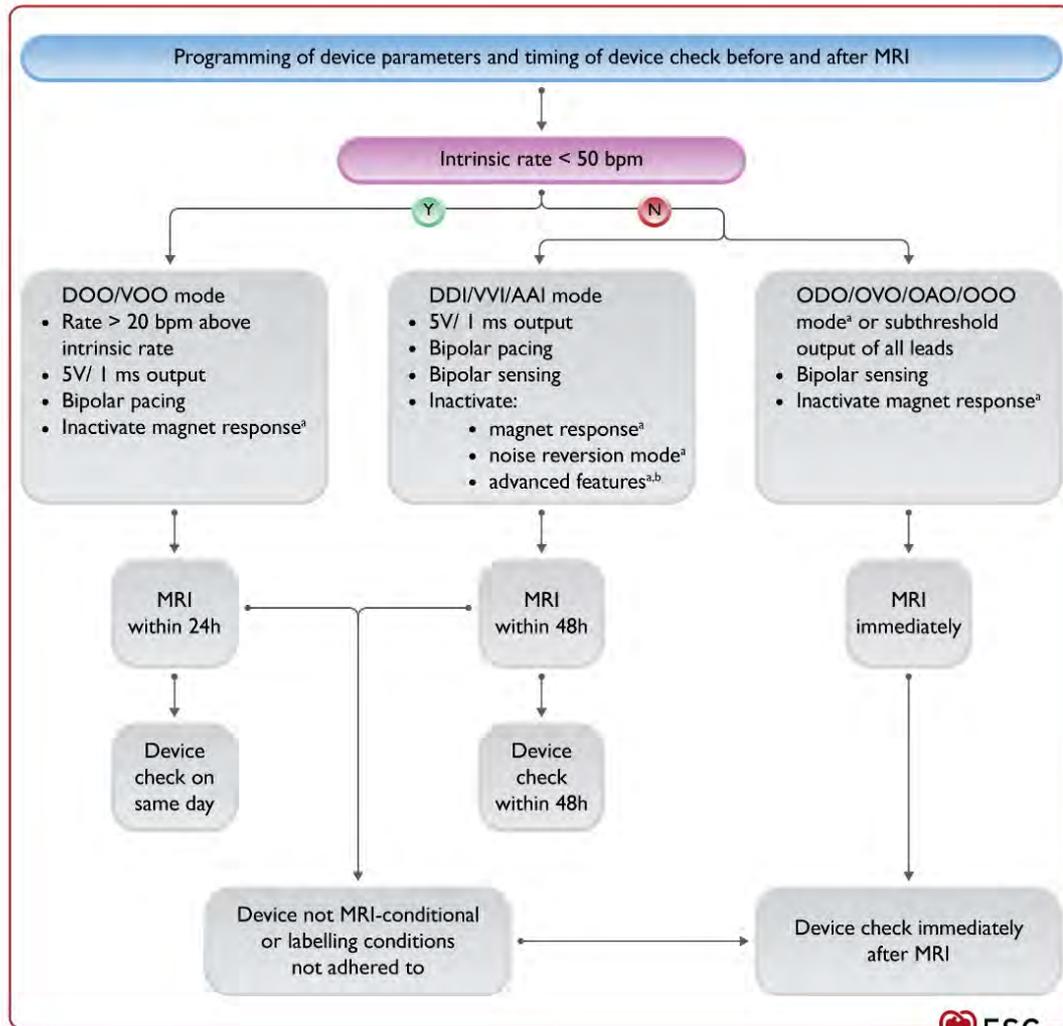
Changes in guideline recommendations since 2013 IRM

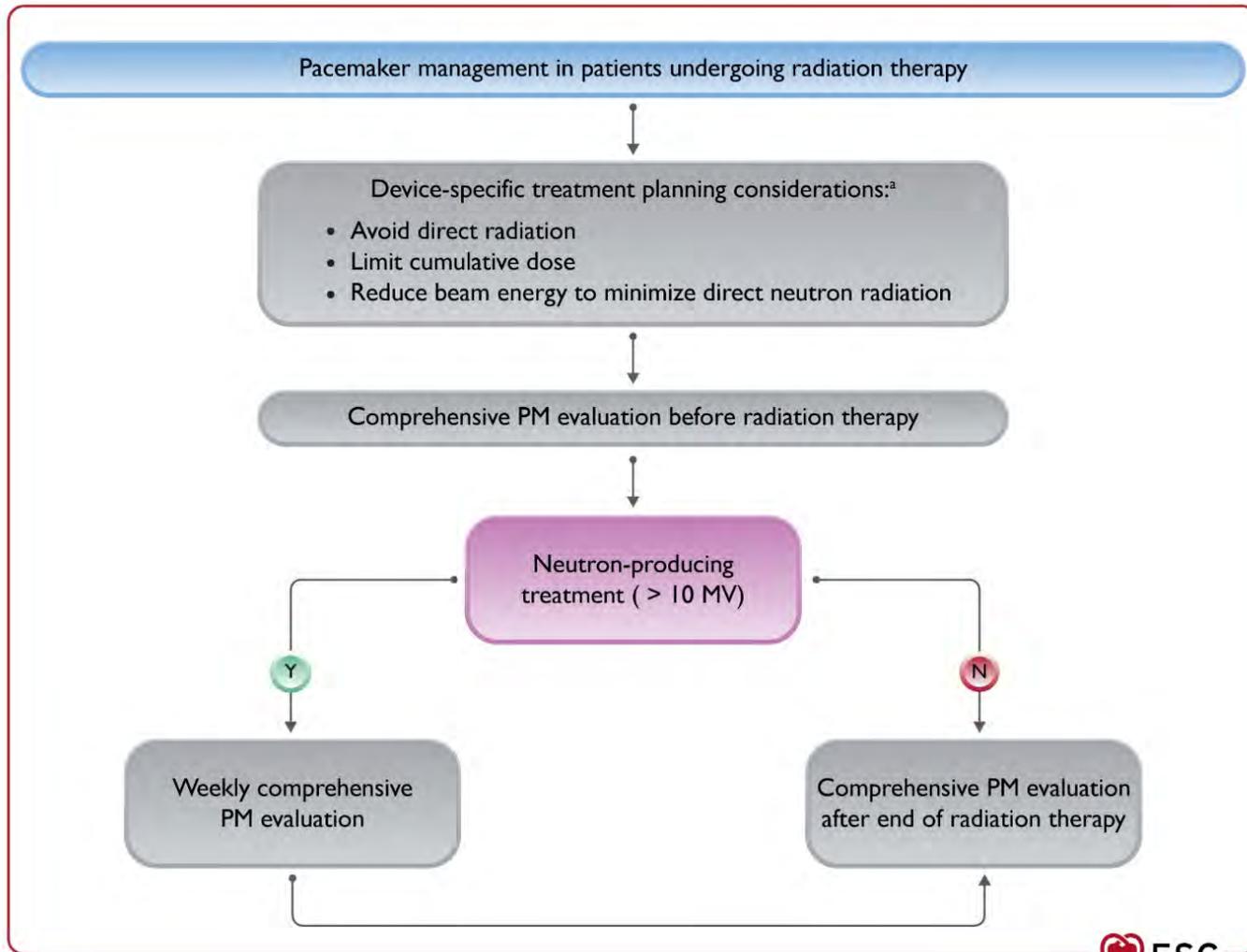
	2013	2021
	Class	
Management considerations		
In patients with MRI-conditional pacemaker systems ^b , MRI can be performed safely following manufacturer instructions.	IIa	I
In patients with non-MRI-conditional pacemaker systems, MRI should be considered if no alternative imaging mode is available and if no epicardial leads, abandoned or damaged leads, or lead adaptors/extendors are present.	IIb	IIa

Recommendations for performing magnetic resonance imaging in pacemaker patients

Recommendations	Class	Level
In patients with MRI-conditional pacemaker systems, ^a MRIs can be performed safely following manufacturer instructions.	I	A
In patients with non-MRI-conditional pacemaker systems, MRI should be considered if no alternative imaging mode is available and if no epicardial leads, abandoned or damaged leads, or lead adaptors/extendors are present.	IIa	B
MRI may be considered in pacemaker patients with abandoned transvenous leads if no alternative imaging modality is available.	IIb	C







Recommendation when pacing is no longer indicated

Recommendations	Class	Level
When pacing is no longer indicated, the decision on management strategy should be based on an individual risk-benefit-analysis in a shared decision-making process together with the patient.	I	C

Conclusions

- **Recommandations conservatrices**
- **Recommandations très prudentes sur la stimulation hissienne et la stimulation sans sonde**
- **Plus de liberté pour l'IRM**