Bijlage II Overzicht van alle aanbevelingen uit de ESC-richtlijn Cardiac pacing (level of evidence C)

Recommendation			
Ambulatory electrocardiographic monitoring (chapter 4.3)	**Class**	**Level**	**Status**
Ambulatory ECG monitoring is recommended in the evaluation of patients with suspected bradycardia to correlate rhythm disturbances with symptoms.	I	C	Overgenomen
Exercise testing (chapter 4.3)	**Class**	**Level**	**Status**
Exercise testing is recommended in patients who experience symptoms suspicious of bradycardia during or immediately after exertion.	I	C	Overgenomen
In patients with intraventricular conduction disease or AVB of unknown level, exercise testing may be considered to expose infranodal block	IIb	C	Overgenomen
Imaging before implantation (chapter 4.3)	**Class**	**Level**	**Status**
Cardiac imaging is recommended in patients with suspected or documented symptomatic bradycardia to evaluate the presence of structural heart disease, to determine LV systolic function, and to diagnose potential causes of conduction disturbances	I	C	Overgenomen
Multimodality imaging (CMR, CT, or 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	Overgenomen
Laboratory tests (chapter 4.3)	**Class**	**Level**	**Status**
In addition to pre-implantation laboratory tests, specific laboratory tests are recommended in patients with clinical suspicion for potential underlying causes of reversible bradycardia (e.g. thyroid function tests, Lyme titre, digitalis level, potassium, calcium, and pH) to diagnose and treat these conditions.	I	C	Overgenomen
Genetic testing (Chapter 4.3)	**Class**	**Level**	**Status**
Genetic testing should be considered in patients with early onset (age <50 years) of progressive cardiac conduction disease	IIa	C	Overgenomen
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	Overgenomen
Sleep evaluation (Chapter 4.3.6)	**Class**	**Level**	**Status**
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	Overgenomen
Pacing for atrioventricular block (chapter 5.2)	**Class**	**Level**	**Status**
Pacing is indicated in patients in SR with permanent or paroxysmal third- or second-degree type 2, infranodal 2:1, or high-degree AVB, irrespective of symptoms.	I	C	Overgenomen
Pacing is indicated in patients with atrial arrhythmia (mainly AF) and permanent or paroxysmal third- or high-degree AVB irrespective of symptoms.	I	C	Overgenomen
In patients with permanent AF in need of a pacemaker, ventricular pacing with rate response function is recommended.	I	C	Overgenomen
Pacing should be considered in patients with second-degree type 1 AVB that causes symptoms or is found to be located at intra- or infra-His levels at EPS.	IIa	C	Overgenomen
Permanent pacemaker implantation should be considered for patients with persistent symptoms similar to those of pacemaker syndrome and clearly attributable to first-degree AVB (PR >0.3 s).	IIa	C	Overgenomen
Pacing is not recommended in patients with AVB due to transient causes that can be corrected and prevented	III	C	Overgenomen
Pacing in patients with bundle branch block (chapter 5.3)	**Class**	**Level**	**Status**
Pacing is indicated in patients with alternating BBB with or without symptoms.	I	C	Overgenomen
Pacing for suspected (undocumented) bradycardia (chapter 5.5)	**Class**	**Level**	**Status**
In patients with recurrent unexplained falls, the same assessment as for unexplained syncope should be considered.	IIa	C	Overgenomen
Pacing is not recommended in patients with unexplained syncope without evidence of SND or conduction disturbance.	III	C	Overgenomen
Cardiac resynchronization therapy in patients with persistent or permanent atrial fibrillation (chapter 6.3)	**Class**	**Level**	**Status**
1) In patients with HF with permanent AF who are candidates for CRT:			

CRT should be considered for patients with HF and LVEF ≤35% in NYHA class III or IV despite OMT if they are in AF and have intrinsic QRS ≥130 ms, provided a strategy to ensure biventricular capture is in place, in order to improve symptoms and reduce morbidity and mortality.	IIa	C	Overgenomen
2) 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	Overgenomen
CRT may be considered in patients with HFpEF. Het plaatsen van een CRT-device kent complicaties (de kans op complicaties is hoger dan bij een 1-kamer of 2-kamerdevice). Het is belangrijk de beslissing rondom het plaatsen van een CRT-device te nemen in gezamenlijke besluitvorming (shared decision making).	IIb	C	Overgenomen (patiënten informeren over mogelijke complicaties, in rood toegevoegd)
His bundle pacing (chapter 7.2)	**Class**	**Level**	**Status**
In patients treated with HBP, device programming tailored to specific requirements of HBP is recommended.	I	C	Overgenomen
In patients treated with HBP, implantation of an RV 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 the case of issues with detection (e.g. risk of ventricular undersensing or oversensing of atrial/His potentials).	IIa	C	Overgenomen
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 the intrinsic QRS is narrow.	IIb	C	Overgenomen
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	Overgenomen
Een voorgenomen behandeling met CSP versus conventionele RV of CRT pacing, dient met de patiënt te worden besproken, waarbij voordelen en nadelen worden afgewogen inclusief potentiële andere korte- en langetermijncomplicaties (zie hiervoor "Table 5 Advantages and limitations of HBP and of LBBAP" uit het EHRA Consensus document (Burri, 2023)). Het uiteindelijke besluit dient te worden genomen in samenspraak met de patiënt.	-	-	Extra toegevoegd
De adviezen van de praktische toepassing van CSP zoals vermeld in het hoofdstuk Table of advice uit het EHRA Consensus document (Burri, 2023) worden overgenomen door de werkgroep.	-	-	Extra toegevoegd
Using leadless pacing (leadless pacemaker) (chapter 7.4)	**Class**	**Level**	**Status**
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	Overgenomen
Cardiac pacing after acute myocardial infarction (chapter 8.1)	**Class**	**Level**	**Status**
Implantation of a permanent pacemaker is indicated with the same recommendations as in a general population (section 5.2) when AVB does not resolve within a waiting period of at least 5 days after MI.	I	C	Overgenomen
In selected patients with AVB in the context of anterior wall MI and acute HF, early device implantation (CRT-D/CRT-P) may be considered.	IIb	C	Overgenomen
Cardiac pacing after cardiac surgery and heart transplantation (chapter 8.2)	**Class**	**Level**	**Status**
1) High-degree or complete AVB aftercardiac surgery A period of clinical observation of at least 5 days is indicated to assess whether the rhythm disturbance is transient and resolves. However, in the case of complete AVB with low or no escape rhythm when resolution is unlikely, this observation period can be shortened.	I	C	Overgenomen
2) Surgery for valvular endocarditis and intraoperative complete AVB Immediate epicardial pacemaker implantation should be considered in patients with surgery for valvular endocarditis and complete AVB if one of the following predictors of persistence is present: pre-operative conduction abnormality, Staphylococcus aureus infection, intracardiac abscess, tricuspid valve involvement, or previous valvular surgery	IIa	C	Overgenomen
3) SND after cardiac surgery and heart transplantation	IIa	C	Overgenomen

Before permanent pacemaker implantation, a period of observation of up to 6 weeks should be considered.			
4) Chronotropic incompetence after heart transplantation Cardiac pacing should be considered for chronotropic incompetence persisting for >6 weeks after heart transplantation to improve quality of life.	IIa	C	Overgenomen
5) Patients requiring pacing at the time of tricuspid valve surgery Transvalvular leads should be avoided and epicardial ventricular leads used. During tricuspid valve surgery, removal of pre-existing transvalvular leads should be considered and preferred over sewing in the lead between the annulus and a bioprosthesis or annuloplasty ring. In the case of an isolated tricuspid annuloplasty based on an individual riskÿbenefit analysis, a preexisting RV lead may be left in place without jailing it between ring and annulus.	IIa	C	Overgenomen
6) Patients requiring pacing after biological tricuspid valve replacement/tricuspid valve ring repair When ventricular pacing is indicated, transvenous implantation of a coronary sinus lead or minimally invasive placement of an epicardial ventricular lead should be considered and preferred over a transvenous transvalvular approach. RV pacing is not necessarily the preferred option for permanent epicardial lead.	IIa	C	Overgenomen, verduidelijking toegevoegd (in rood).
7) Patients requiring pacing after mechanical tricuspid valve replacement Implantation of a transvalvular RV lead should be avoided.	III	C	Overgenomen
Cardiac pacing after transcatheter aortic valve implantation (chapter 8.3)	**Class**	**Level**	**Status**
Permanent pacing is recommended in patients with new-onset alternating BBB after TAVI.	I	C	Overgenomen
Ambulatory ECG monitoring or EPS should be considered for patients with new LBBB with QRS >150 ms or PR >240 ms with no further prolongation during the >48 h after TAVI.	IIa	C	Overgenomen
Ambulatory ECG monitoring or EPS may be considered for patients with a pre-existing conduction abnormality who develop prolongation of QRS or PR >20 ms.	IIb	C	Overgenomen
Prophylactic permanent pacemaker implantation is not indicated before TAVI in patients with RBBB and no indication for permanent pacing.	III	C	Overgenomen
Cardiac pacing in patients with congenital heart disease (chapter 8.4)	**Class**	**Level**	**Status**
In patients with congenital complete or high degree AVB, pacing is recommended if one of the following risk factors is present: a. Symptoms b. Pauses >3 the cycle length of the ventricular escape rhythm c. Broad QRS escape rhythm d. Prolonged QT interval e. Complex ventricular ectopy f. Mean daytime heart rate <50 b.p.m.	I	C	Overgenomen
In patients with congenital complete or high degree AVB, permanent pacing may be considered even if no risk factors are present.	IIb	C	Overgenomen
In patients with persistent post-operative bifascicular block associated with transient complete AVB, permanent pacing may be considered.	IIb	C	Overgenomen
In patients with complex CHD and asymptomatic bradycardia (awake resting heart rate <40 b.p.m. or pauses >3 s), permanent pacing may be considered on an individual basis.	IIb	C	Overgenomen
Pacing in hypertrophic obstructive cardiomyopathy (chapter 8.5)	**Class**	**Level**	**Status**
AV sequential pacing with short AV delay may be considered in selected patients with drug refractory symptoms, ≥50 mmHg baseline or provocable LV outflow tract gradients, in SR, at high risk of developing AVB during septal ablation.	IIb	C	Overgenomen
Cardiac pacing in rare diseases (chapter 8.6)	**Class**	**Level**	**Status**
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.	I	C	Overgenomen
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.	IIb	C	Overgenomen

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 interval with LBBB, ICD implantation with pacing capabilities should be considered if at least 1-year survival is expected.	IIa	C	Overgenomen
In patients with Kearns-Sayre syndrome who have PR prolongation, any degree of AVB, BBB, or fascicular block, permanent pacing should be considered.	IIa	C	Overgenomen
In patients with Kearns-Sayre syndrome without cardiac conduction disorder, permanent pacing may be considered prophylactically.	IIb	C	Overgenomen
~~In patients with cardiac sarcoidosis who have permanent or transient AVB, implantation of a device capable of cardiac pacing should be considered.~~ In patients with cardiac sarcoidosis who have transient AVB, implantation of a device capable of cardiac pacing should be considered. In patients with cardiac sarcoidosis who have permanent AVB, implantation of a device capable of cardiac pacing is recommended.	IIa	C	Aangepast
In patients with sarcoidosis and an indication for permanent pacing who have LVEF <50%, implantation of a CRT-D should be considered.	IIa	C	Overgenomen
Device implantations and peri-operative management (chapter 9)	**Class**	**Level**	**Status**
To confirm target ventricular lead position, use of multiple fluoroscopic views should be considered	IIa	C	Overgenomen
For implantation of coronary sinus leads, quadripolar leads should be considered as first choice.	IIa	C	Overgenomen
Rinsing the device pocket with normal saline solution before wound closure should be considered.	IIa	C	Overgenomen
Pacing of the mid-ventricular septum may be considered in patients at high risk of perforation (e.g. elderly, previous perforation, low body mass index, women).	IIb	C	Overgenomen
In pacemaker implantations in patients with possible pocket issues such as increased risk of erosion due to low body mass index, Twiddler's syndrome, or for aesthetic reasons, a submuscular device pocket may be considered.	IIb	C	Overgenomen
Temporary cardiac pacing (chapter 11.3)	**Class**	**Level**	**Status**
Temporary transvenous pacing is recommended in cases of haemodynamic-compromising bradyarrhythmia refractory to intravenous chronotropic drugs	I	C	Overgenomen
Transcutaneous pacing should be considered in cases of haemodynamic-compromising bradyarrhythmia when temporary transvenous pacing is not possible or available.	IIa	C	Overgenomen
Temporary transvenous pacing should be considered when immediate pacing is indicated and pacing indications are expected to be reversible, such as in the context of myocardial ischaemia, myocarditis, electrolyte disturbances, toxic exposure, or after cardiac surgery.	IIa	C	Overgenomen
Temporary transvenous pacing should be considered as a bridge to permanent pacemaker implantation when this procedure is not immediately available or possible due to concomitant infection.	IIa	C	Overgenomen
For long-term temporary transvenous pacing, an active fixation lead inserted through the skin and connected to an external pacemaker should be considered.	IIa	C	Overgenomen
When pacing is no longer indicated (chapter 11.6)	**Class**	**Level**	**Status**
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	Overgenomen
Pacemaker and cardiac resynchronization therapy-pacemaker follow-up (chapter 11.7)	**Class**	**Level**	**Status**
Remote monitoring is recommended in the 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 the case of pacemaker dependency).	I	C	Overgenomen
Patient-centred care and shared decision-making in cardiac pacing and cardiac resynchronization therapy (chapter 12)	**Class**	**Level**	**Status**
In patients considered for pacemaker or CRT, the decision should be based on the best available evidence with consideration of individual risk-benefits of each option, the patient's preferences, and goals of care, and it is	I	C	Overgenomen

recommended to follow an integrated care approach and use the principles of patient-centred care and shared decision-making in the consultation.			