SUMMARY of 2018 ESC GUIDELINES on definition of myocardial infarction , myocardial revascularisation, cardiovascular disease during pregnancy and on arterial hypertension.

Marc J Claeys [1] , MD PhD, Patrick Coussement[2] ,MD, PhD, Agnes Pasquet[3], MD, PhD, Tine De Backer[4] MD, PhD; Michel De Pauw[4] MD, PhD

(1) Antwerp University Hospital. (2) AZ Sint-Jan Brugge (3) Cliniques Universitaires Saint-Luc , Brussels (4) UZ Gent

Introduction

During the ESC congress in September 2018 in Munich, the new ESC guidelines were presented and are now available on the ESC website

The new guidelines describes the definition of myocardial infarction and covers management recommendations on following cardiovascular items: myocardial revascularisaton, cardiovascular disease during pregnancy and arterial hypertension.

The present document gives a summary of these guidelines and highlights the most important recommendations and changes in the management of these diseases.

It will help to increase awareness about the new guidelines and may stimulate to consult the full document for specific items. Ultimately, the authors hope that this document will enhance implementation of new ESC guidelines in daily clinical practice.

4th Universal Definition of Myocardial Infarction

Marc Claeys

This document, endorsed by the European Society of Cardiology, the American College of Cardiology Foundation, the American Heart Association and the World Heart Federation replaces the 3th edition of 2012. Following five most imported new or updated concepts were addressed in this summary.

1. Differentiation of myocardial infarction from myocardial injury: Cardiac TnI and CTnT, particularly the high-sensitivity assays, are the preferred biomarkers for the evaluation of myocardial injury. Detection of an elevated cTn value above the 99th percentile of URL is defined as myocardial injury. The injury is considered acute if there is a rise and/or fall of cTn values. Clinical definition of MI denotes the presence of acute myocardial injury (with cTn values) in the setting of evidence of myocardial ischemia (symptoms or new ischaemic ECG changes or new pathological Q wave or new regional wall motion abnormalities or presence of coronary thrombus by angiography of autopsy).

2. Differentiation of myocardial infarction type 1 from type 2.

Type 1 MI are caused by athero-thrombotic coronary artery disease and usually precipitated by atherosclerotic plaque disruption. Typ 2 MI has been defined as ischaemic myocardial injury in the context of a mismatch between oxygen supply and demand. Ischemic threshold may vary substantially depending on the magnitude of the stressor, the presence of non-cardiac comorbidities, the presence of cardiac structural abnormalities (e.g. hypertrophy) and the extent of underlying CAD (or non-atherosclerotic disease such as coronary artery dissection). Type 2 MI and myocardial injury are both related to a poor outcome and may co-exist in the same patient. The conceptual model to facilitate the clinical distinction between acute ischaemic myocardial injury with or without an acute athero-thrombotic event (typ 1 or type 2 MI) vs conditions without acute ischaemic myocardial injury is displayed in figure 1.

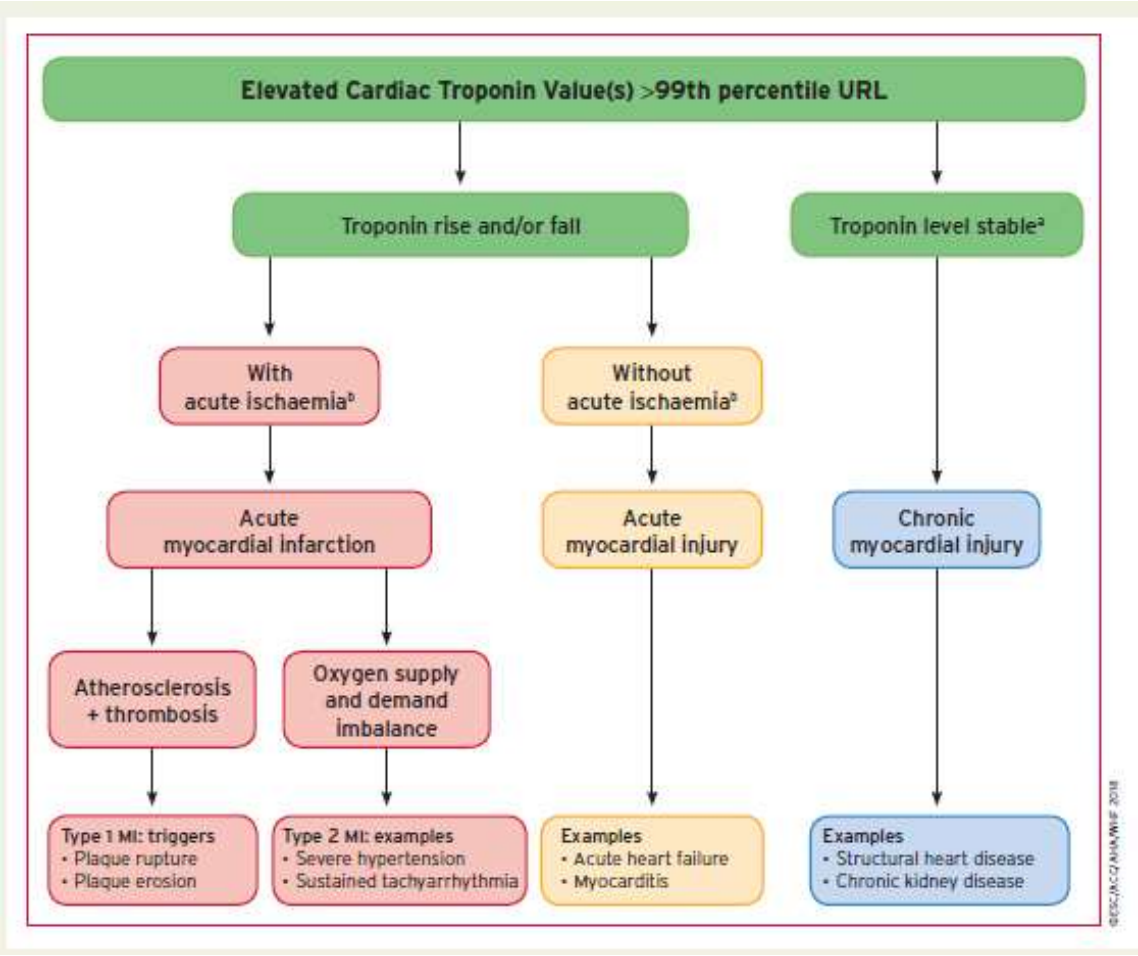
3. Type 4/5 MI: Coronary procedure-related myocardial infarction <48hours after index procedure is arbitrarily defined by an elevation of cTn values >5 times for PCI (type 4a) and > 10 times for CABG (type 5) of the 99th percentile URL in patients with normal baseline values. Patients with elevated stable pre-procedural cTn values, must meet the same criteria and manifest a change from the baseline value of >2O%. Other types of 4MI include type 4b MI stent thrombosis and type 4c MI restenosis.

4. Biomarker criteria for myocardial injury/infarction: blood samples for measurements of cTn should be drawn on first assessment (0h) and repeated 3-6h later, or earlier with hs-cTn assays. Strategies employing either very low levels of hs-cTn on presentation or the lack of any change and persistently normal h-cTn values over a 1-2 h period after presentation have been advocated to exclude acute myocardial injury and MI as well. The positive predictive value of such 1-2h sampling approaches for ruling in MI are limited by the substantial proportion of individuals who meet the proposed biomarker criteria for acute myocardial injury but other than MI. A single sample rule out strategy using very low values has high negative predictive value to exclude MI..

5. Electrocardiographic detection of acute transmural myocardial ischaemia includes new J-point elevation ≥ 1mm in two contiguous leads (other than V2-V3). For V2-V3 the cut-points are ≥ 2,5 mm in young (<40 year) men, ≥ 2 mm in men above 40 year and ≥ 1,5 mm in women regardless of age.

The document provides also short sections on Takotsubo syndrome, MINOCA (MI with non-obstructive coronary arteries) and the enhanced role of imaging including cardiac magnetic resonance imaging for the diagnosis of myocardial infarction.

Figure


Elevated Cardiac Troponin Value(s) >99th percentile URL
Troponin rise and/or fall
Troponin level stable[a]
With acute ischaemia[b]
Without acute ischaemia[a]
Acute myocardial infarction
Acute myocardial injury
Chronic myocardial injury
Atherosclerosis + thrombosis
Oxygen supply and demand imbalance
Type 1 MI: triggers
• Plaque rupture
• Plaque erosion
Type 2 MI: examples
• Severe hypertension
• Sustained tachyarrhythmia
Examples
• Acute heart failure
• Myocarditis
Examples
• Structural heart disease
• Chronic kidney disease

GUIDELINES ON MYOCARDIAL REVASCULARIZATION

Patrick Coussement

At the ESC congress in Munich the new 2018 guidelines on myocardial revascularization were presented (1). The document is an update of the previous recommendations from 2014.

A summary of the most important changes and new recommendations will be highlighted in this text.

Diagnostic tools to guide myocardial revascularization

The use of fractional flow reserve (FFR) in patients with intermediate-grade coronary lesions remains the gold standard to guide percutaneous coronary intervention (PCI), especially if multivessel disease is present.

But due to two large trials (DEFINE-FLAIR and iFR-SWEDEHEART) instantaneous wave-free ratio (iwFR) has an equal diagnostic accuracy compared to FFR.

Intravascular ultrasound (IVUS) is recommended to assess the severity of unprotected left main (LM) lesions.

Multidisciplinary decision-making

Revascularization strategies in patients with LM lesions or multivessel disease should be discussed within a multidisciplinary Heart Team and the SYNTAX score should be calculated to assess anatomical complexity of the disease and long-term risk of mortality and morbidity after PCI.

Based on data of the FAME and FAME2 studies functional complete revascularization is the preferred strategy for PCI.

Completeness of revascularization is also an important factor in the decision making between coronary artery bypass grafting (CABG) and PCI.

Revascularization for stable coronary artery disease (SCAD)

PCI is preferred to CABG in patients with one- and two vessel disease, without proximal LAD stenosis.

PCI and CABG are equally effective in patients with LM disease and low (0-22) or intermediate (23-32) SYNTAX score.

In patients with three vessel disease both techniques are equally effective as long as the SYNTAX score is low (0-22) and the patient has no diabetes mellitus.

CABG is preferred in patients with CAD and heart failure due to low ejection fraction (LVEF ≤ 35%).

Revascularization in NSTE-ACS

The revascularization strategies in stabilized NSTE-ACS do not differ from patients with SCAD. Only the timing of the invasive strategy is different. In high risk, biomarker positive patients an early invasive strategy (< 24 hrs) is advocated, while in all other ACS patients this is done < 72hrs.

Revascularization in STEMI and Cardiogenic Shock (CS)

Primary PCI is the preferred strategy in STEMI, even if the patient is presenting late (up to 48hrs) after symptom onset.

Complete revascularization has shown to be associated with lower risk of MACE, especially a lower incidence of urgent revascularization.

Routine but staged revascularization of non-culprit lesions before hospital discharge is the preferred strategy. Based on the Culprit-Shock trial data even in patients with STEMI and cardiogenic shock immediate complete revascularization is not recommended.

Routine use of intra-aortic balloon pump in patients with ACS and cardiogenic shock is not recommended but short-term mechanical circulatory support may be considered in selected cardiogenic shock patients.

Procedural aspects of CABG

Complete revascularization with minimal aortic manipulation is recommended.

Arterial grafting with IMA and radial artery is preferred over saphenous vein grafting.

In case vein grafts are used the no-touch vein harvesting technique is recommended.

Procedural aspects of PCI

Since the publication of two large randomized trials (RIVAL; MATRIX) in which radial access was superior to femoral access, radial access is the standard approach for coronary angiography and PCI.

Drug-eluting stents (DES) are recommended over bare metal stents (BMS) in all PCI's.

Bioresorbable scaffolds (BRS) are not recommended for clinical use outside clinical trials.

IVUS or optical coherence tomography (OCT) is considered to optimize stent implantation, especially in unprotected LM lesions.

PCI of chronic total occlusions (CTO) is recommended if patients remain symptomatic despite medical therapy or if there is a large (> 10%) ischemic area.

In bifurcation lesions single stent technique of the main branch, with provisional stenting of the side branch is recommended. Exception is made for true LM bifurcation lesions, in which a double-kissing (DK) crush stent technique may be the preferred technique.

Antithrombotic treatments

In elective patients dual antiplatelet therapy (DAPT) with Aspirin and Clopidogrel is initiated prior to the PCI procedure and maintained for 6 months (3 months if high bleeding risk).

Bleeding risk should be estimated by calculating the PRECISE-DAPT score. A score ≥ 25 is indicating a high bleeding risk.

In ACS patients DAPT duration is 1 year, irrespective of revascularization.

In patients with non-valvular AF requiring oral anticoagulation in combination with antiplatelet therapy, a NOAC is preferred over VKA, in the lowest approved dose.

Guideline	**Class**
Calculation of SYNTAX score in case of LM or multivessel disease	I
Radial access as standard approach for CAG and PCI	I
DES for any PCI	I
Systematic re-evaluation of patients after revascularization	I
Stabilized NSTE-ACS, revascularization strategy similar to SCAD	I
Radial artery graft is preferred over saphenous vein graft	I
CABG is preferred over PCI in patients with CAD and low ejection fraction (≤ 35%)	I
Completeness of revascularization prioritized in decision CABG vs. PCI	IIa
NOAC preferred over VKA in non-valvular AF requiring antiplatelet treatment	IIa
No-touch vein harvesting technique in CABG	IIa
Annual operator volume for LM PCI ≥ 25 cases/year	IIa
Pre- and post-hydration in patients with CKD if contrast volume > 100ml	IIa
Routine ad hoc revascularization of non-IRA lesions in STEMI with cardiogenic shock	III
Current generation BRS for clinical use outside clinical trial	III

Guidelines on cardiovascular disease and pregnancy

Agnes Pasquet

The previous version of these guidelines were published in 2012, from this time new evidence in diagnostic techniques, risk assessment, and the use of cardiovascular drugs, has emerged. This summary will be focused on the main change in this new edition. First this guidelines emphasize, the importance to perform a risk assessment in all the woman with cardiac disease in childbearing age and before the conception using the modified mWHO classification of maternal risk (Class IC). This classification is accompanied by recommendation regarding the follow up of the pregnancy and the time and location of delivery (figure 1) and by the introduction of a "pregnancy heart team" in charge of the pre-conception counselling, the follow up of the pregnancy and the decision regarding the timing and mode of delivery.

Aortic disease:
A table was provided for the different aortic disease (Marfan, Bicuspid aortic valve, Turner..) with clear contraindication for pregnancy (as example aorta >45 mm in a Marfan patient). B blocker therapy should be considered throughout the pregnancy in these patients (IIaC).

Anticoagulation in patient with valvular prosthesis.
The guidelines present 2 new flowcharts about anticoagulation during pregnancy according to the dose of VKA used:. For woman with mechanical valve and low doses of VKA (warfarin < 5 mg/day or phenprocoumon <3mg/day or acenocoumarol <2mg/day) continuation of VKA during the full pregnancy (until36w) is recommended. For women using higher dosage it is more recommended to switch during the 1 term to UFH or LMWH . It is also recommended to discuss with the pregnancy heart team the choice of the prosthesis if one will be proposed before a pregnancy. In pregnant woman under LMWH it is recommended to perform weekly antiXa activity monitoring.

Heart failure:
There is also a new algorithm for the management of heart failure during pregnancy. Antepartem ACE-Inhibition (or ARB) should not be given and should be replaced by hydralazine/nitrates. Diuretics should be restricted. For the peripartum cardiomyopathy, addition of bromocriptine to standard HF therapy may improve LV recovery and clinical outcome. It need always to be accompanied by anticoagulant therapy

Arrhythmia
A new table with a classification of the risk according to the arrhythmia has been added. This table also give recommendation for the follow up of patient with arrhythmia during pregnancy and level of surveillance according to the arrhythmia. As example, atrial fibrillation is considered as level one and does not require specific surveillance (beside the recommendation for anticoagulation) but frequent relapse of supraventricular tachycardia poorly tolerated may justify in some case catheter ablation (IIaC). Flecainide or propafenone are recommended for prevention of supraventricular tachycardia in patient with Wolf Parkinson White (IC).

Hypertension and pregnancy
The definition of hypertension in pregnancy was remembered : it is based only on "office" value: BP values [systolic BP (SBP) ≥ 140 mmHg and/or DBP ≥ 90 mmHg] and distinguishes mildly (140 159/90–109 mmHg) or severely (≥ 160/110 mmHg) elevated BP. Methyldopa, labetalol or nifidepine are the drugs of choice in patients with severe hypertension

Venous thrombo embolism risk.
For the diagnosis of venous thrombo embolism, D dimers is no longer recommended as first line diagnosis because D dimers are unreliable during pregnancy. If compression ultrasound is negative, magnetic resonance venography should be considered to diagnose venous thrombo embolism 8 (IIaC).
LMWH in therapeutic dose is recommended in pregnant patients with chronic thrombo-embolic pulmonary hypertension (IC). In patients with pulmonary embolism, thrombolytic therapy is recommended only in severe hypotension or shock (IC).
In women at high risk for thrombo-embolism, it is recommended to convert LMWH to UFH at least 36 h prior to delivery and stop the UFH infusion 4–6 h prior to anticipated delivery. aPTT should be normal before regional

anaesthesia (IC). In women at low risk for thrombo-embolism on therapeutic LMWH, induction or caesarean section is recommended to be performed 24 h after the last dose of LMWH. (IC).

Drugs during pregnancy.
The use of the old FDA classification of drugs (class from A to X according the risk for pregnancy is no longer recommended). A huge effort has been made to provide a new table (table 7 in the guidelines), this table contains information about the principal drugs used in cardiology, information on their potential passage through the placenta or to the milk and preclinical safety data. In cas of any question, it is recommended to visit the website "www.safefetus.com". Breastfeeding is not recommended in mothers who take antiplatelet agents other than low-dose aspirin (IIIC).

In conclusion, the guidelines insist on some "gap in evidence" some data were obtained from the ROPAC registry but there is no randomized studies in this field and we lack data on pregnant patients with aortic disease. For patients with mechanical valve treated by LMWH, the optimal anti- Xa levels, the importance of peak vs. pre-dose levels is still unknow. Concerning the drugs, the safety of antiplatelet agents used after PCI in pregnancy is not well known.

Figure: Modified World health Organization classification of cardiovascular risk.

	mWHO I	mWHO II	mWHOII-III	mWHOIII	mWHO IV
Diagnosis	- mild valvular heart disease -successfully repaired simple congenital disease -atrial/ventricular ectopia	-Unoperated ASD/VSD -Repaired Tetralogy of Fallot -most supraventricular arrhythmias -Turner syndrome without aortic dilatation	-Mild LV dysfunction (EF>45% -Hypertrophic CMP -mild MS -moderate AS -Marfan/bicuspid valve without aortic dilatation -repaired coarctation -AV septal defect	-LVEF 30-45% -Previous PPCMP with normal function -mechanical valve -moderate MS -severe asymptomatic AS -Systemic RV with good function -Fontan circulation (uncomplicated) -unrepaired cyanotic disease -Moderate Aortic dilatation -ventricular tachycardia	-LVEF<30% or NYHA class III-IV -PAH -Previous PPCMP with LV dysfunction -severe MS - severe symptomatic AS -Systemic RV with dysfunction -Severe aortic dilatation -Vascular Ehles-Danlos -severe (re)coarctation -Fontan with complication
Maternal Cardiac event rate	2.5-5%	5.7-10.5%	10-19%	19-27%	40-100%

ASD: atrial septum defect, AS: aortic valve stenosis, MS: mitral valve stenosis, LV: left ventricular PPCMP: peripartum cardiomyopathie, PAH: pulmonary arterial hypertension, RV: right ventricle, VSD: ventricular septum defect,

Guidelines for the Management of Arterial Hypertension

Michel De Pauw, Tine De Backer

One year after the groundbreaking new version of the ACC/AHA guidelines on the diagnosis and treatment of hypertension, the ESC/ESH issued a much waited revision of the 2013 guidelines. However apart from threshold numbers, both guidelines are quite consistent in their approach.

In the diagnostic workup a shift occurred from office BP towards repeated office BP measurements or out-of-office BP measurements with 24h ambulatory blood pressure monitoring (ABPM) and/or home blood pressure monitoring (HBPM), as office BP might provoke overdiagnosis (due to white coat effect) and might underdiagnose masked hypertension. Also, office blood pressures are often not measured according to state of the art techniques, which we all have learned and still remember but neglect to apply in a busy daily practice. Out-of-office BP measurements have a pivotal role in the confirmation of the diagnosis of hypertension, in the detection of white coat and masked hypertension, and in the follow up of blood pressure control. Unfortunately the use of ABPM and HBPM might be limited due to logistic or economic (reimbursement) issues.

As stated earlier the new ESC/ESH did not alter the thresholds, and a BP of 130-139/85-89 mmHg is still regarded as high normal, in contrast to the ACC/AHA 2017 guidelines where these values are considered as hypertensive. Overall the importance of a total CV risk assessment is underscored as already introduced in the ESC/ESH 2013 guidelines and in the ACC/AHA 2017 guidelines, in order not to rely on a magic number as such, but to introduce timely treatment in patients with high CV risk, especially in the presence of cardiovascular disease. In patients with grade 1 hypertension (140-159/90-99 mmHg) with low CV risk and in the absence of hypertension mediated organ damage (HMOD) life style interventions are introduced first, with an addition of medical treatment if the patient remains hypertensive. In grade 2 and 3 hypertension drug treatment is immediately introduced combined with life style changes. In older patients (>65y and <80y) BP-lowering drug treatment and life style interventions are upgraded from a IIb to a I class of recommendation, provided the presence of a SBP in the grade 1 range (140-159 mmHg) and if the treatment is well tolerated.

Compared to BP thresholds the BP targets using life style changes and BP-lowering drugs have been intensified from a treatment goal of <140 mmHg to the objective that BP should be lower than 140/90 mmHg in all patients, and provided the treatment is well tolerated BP values should be targeted to 130/80 mmHg or lower in most patients. At least in patients <65y it is recommended that SBP is lowered to a BP-range of 120-129 mmHg. In older patients (>65y and < 80y) a SBP-range 130-139 mmHg should be targeted , while in patients (>80y) a SBP range of 130-139 mmHg is recommended if tolerated, underscoring the importance of blood pressure treatment also in older patients .

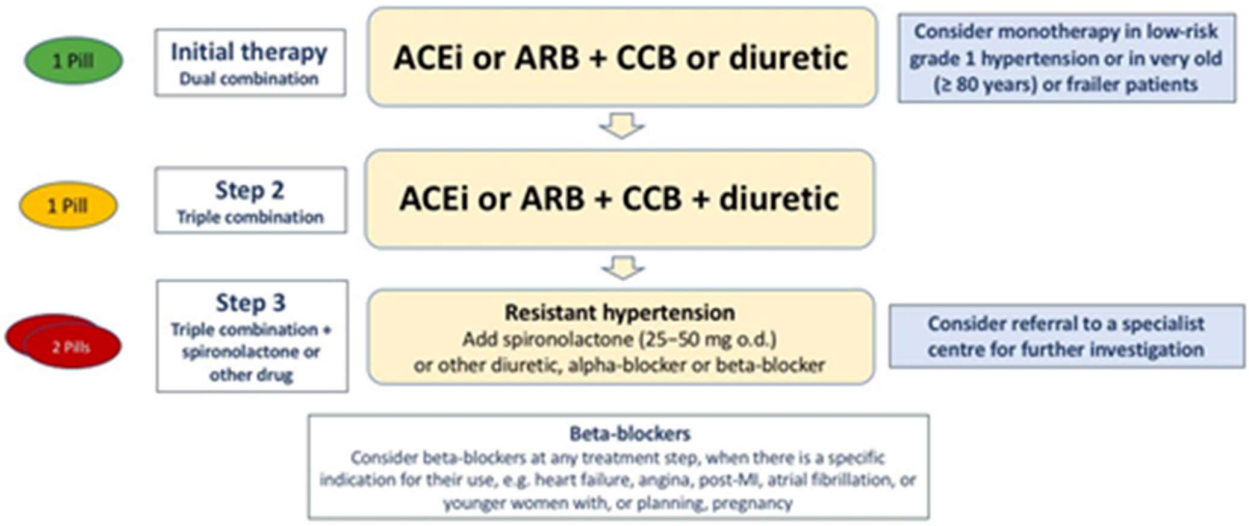
In addition a DBP target <80 to 70 mmHg should be considered in all hypertensive patients, regardless of the level of risk or the presence of comorbidities.

Finally regarding the initiation of BP-lowering drugs the use of a two drug combination is clearly upgraded preferably using a single pill combination (see figure), with the exception of low risk grade 1 hypertension or very old ($\geq$ 80 years) or frail patients, in whom the use of a single drug might be effective or more prudent, especially if SBP is below 150 mmHg. The use of single pill combinations is stressed to increase patient compliance. The proposed two drug strategy prefers the use of either an ACEI or ARB in combination with a calcium channel blocker or a thiazide/thiazide-like diuretic.

In patients with resistant hypertension the addition of a low dose spironolactone (25-50 mg once daily) is recommended, or the addition of other diuretic treatment in spironolactone intolerant patients, adding either eplerenone, amiloride, a higher dose thiazide/thiazide-like drug or a loop diuretic. An alternative to further diuretic treatment might be the use of bisoprolol or doxazosin (not commercialized in Belgium). Evaluating treatment adherence is underscored as it was proven to be the major cause of poor BP control.

The use of device-based treatment is further downgraded and is not recommended for the routine treatment of hypertension, unless in the context of clinical studies or RCT's, until further evidence regarding the safety and efficacy is available.

Figure Core drug-treatment strategy for hypertension



CONCLUSION

The 2018 guidelines have incorporated new evidence into the management of hypertension and of cardiovascular disease during pregnancy. , peripheral artery disease and ST elevation acute myocardial infarction. In addition an update on the definition of myocardial infarction and on myocardial revascularisation. The authors hope that this document will enhance implementation of these new ESC guidelines in daily clinical practice.

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