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Practice Guidelines

2024 European Society of Hypertension clinical practice guidelines for the management of arterial hypertension

Endorsed by the European Federation of Internal Medicine (EFIM), European Renal Association (ERA), and International Society of Hypertension (ISH)

1. Introduction

The European Society of Hypertension (ESH) reported in 2023 its current Guidelines for the management of arterial hypertension [1]. Following their aim to summarize the best available evidence for all aspects of hypertension management, the Task Force of the 2023 Guidelines generated a comprehensive document covering almost 200 pages including 1736 references [1]. This document thus provides a valuable and comprehensive source of information for hypertension management. However, due to the length of the text and its complexity, not only primary care providers (e.g. family physicians, general physicians/internists), who represent the group of physicians that manages the vast majority of patients, but also specialists may find it challenging to navigate through the extensive guidelines with its numerous recommendations. Therefore, the ESH decided to provide with its 2024 Clinical Practice Guidelines a novel concise format that supports the dissemination of the most important information of the Guidelines for the management of the general hypertensive population and its implementation into clinical practice. To this end, the ESH developed a **MASTER**plan for the management of hypertension (Fig. 1). For aspects that are (intentionally) not covered in this document and for the supporting literature readers are referred to the full text of the 2023 ESH Guidelines [1].

2. Measure blood pressure–diagnose

The accurate measurement of blood pressure (BP) is the cornerstone for the diagnosis and management of hypertension. The measurement of BP to diagnose hypertension therefore represents the first pivotal step of the ESH **MASTER**plan for the management of hypertension.

- **Conventional attended office BP measurement (OBPM)** is the most well-studied method for assessing BP and the one by which the diagnosis of hypertension, BP classification, the role of BP as a cardiovascular (CV) risk factor, the protective effect of antihypertensive treatment and the BP thresholds and targets of therapeutic interventions have been established.
- **Ambulatory BP monitoring (ABPM) and home BP monitoring (HBPM)** are important methods for out-of-office BP monitoring, that provide important additional information for the management of

Abbreviations: ACEi, angiotensin-converting-enzyme inhibitor; ABPM, ambulatory blood pressure monitoring; ADL, activity of daily living; AF, atrial fibrillation; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor neprylisin inhibitor; BB, beta blocker; BP, blood pressure; BMI, body mass index; bpm, beats per minute; BSA, body surface area; CCB, calcium channel blocker; CV, cardiovascular; CVD, cardiovascular disease; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; COVID-19, Coronavirus Disease 2019 (COVID-19); COX-2, cyclooxygenase 2; DASH, dietary approaches to stop hypertension; DBP, diastolic blood pressure; ECG, electrocardiogram; eGFR, estimated glomerular filtration rate; ESH, European Society of Hypertension; FU, follow-up; HbA1c, hemoglobin A_{1c}; HBPM, home blood pressure monitoring; HDL, high density lipoprotein; HDP, hypertensive disorders in pregnancy; HF, heart failure; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; HMOD, hypertension-mediated organ damage; ISH, isolated systolic hypertension; LDL, low density lipoprotein; Lp(a), lipoprotien (a); LV, left ventricle; LVH, left ventricular hypertrophy; MMSE, mini mental state examination; MRA, mineralocorticoid receptor antagonist; MRI, magnetic resonance imaging; NSAIDS, non-steroidal anti-inflammatory drugs; NsMRA, non-steroidal mineralocorticoid receptor antagonist; OSA, obstructive sleep apnea; OBPM, office blood pressure monitoring; OTC, over the counter medications; PWV, pulse wave velocity; SCORE2, Systematic COronary Risk Evaluation model 2; SCORE2-OP, Systematic COronary Risk Evaluation model 2 for Older People; SBP, systolic blood pressure; SPC, single pill combination; SGLT2i, sodium-glucose cotransporter type 2 inhibitors; TIA, transient ischemic attack; T/TL-diuretic, thiazide/thiazide-like diuretic; UACR, urinary albumin-creatinine ratio.

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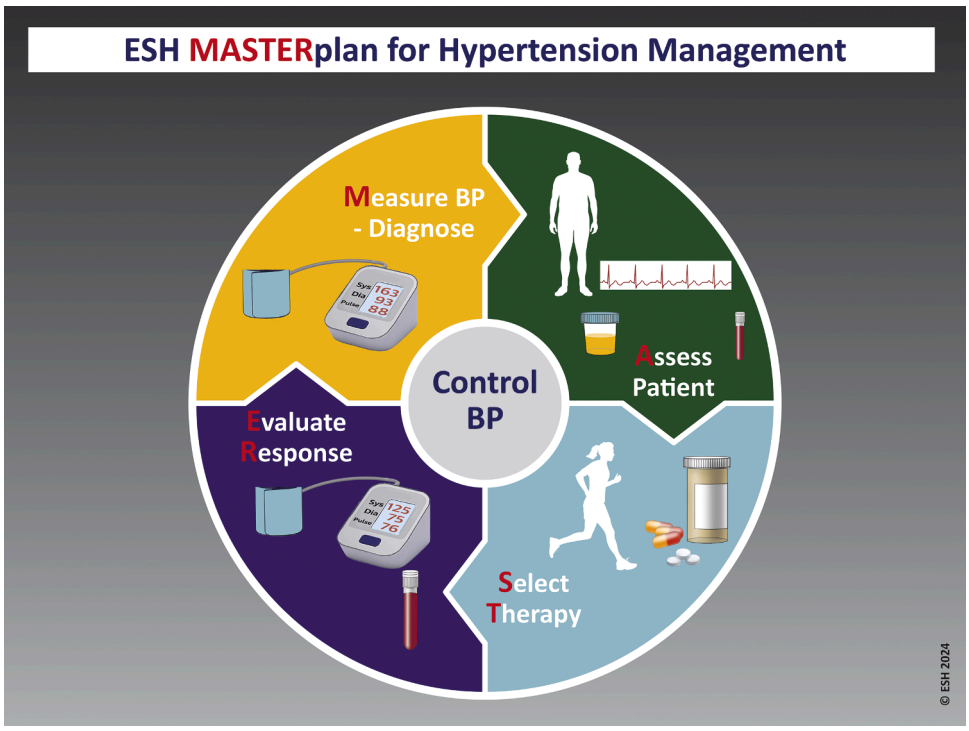

Fig. 1. The ESH **MASTER**plan for the management of hypertension.

Measure Blood Pressure - Diagnose

In Office

Office BP measurement (OBPM)

*SBP ≥140 and/or DBP ≥90

Conditions

1. Use validated automated electronic upper-arm cuff device[a] (www.stridebp.org).
2. Select appropriate cuff to fit arm size according to instructions by device manufacturer[b].
3. Quiet room with comfortable temperature.
4. No smoking, caffeine, food, or exercise 30 min before measurement.
5. Start measurement after patient remained seated and relaxed for 3-5 min[c].
6. No talking during and between measurements.

Posture

7. Sitting with back supported on chair.
8. Legs uncrossed, feet flat on floor.
9. Bare arm resting on table with mid-arm at heart level.

Measurement

10. Take 3 readings with 1 min intervals between them. Use the average of the last 2 readings for BP and also for pulse rate[d].

Relevance

- Was used in outcome trials and provides the basis for diagnosis and BP targets.

Out-of-office

Home BP monitoring (HBPM)

*SBP ≥135 and/or DBP ≥85

Conditions and Posture

1.-9. From OBPM apply also to HBPM.

Measurement

10. Propose a standardized protocol to the patient:
    - Educate the patient on how to use a validated device and report the data.
    - Take 2 readings with 1 min intervals between them.
    - Measure in the morning and the evening (before drug intake if treated).
    - Measure for 3–7 days before office visits.
    - Use the average of all readings excluding the first day for both BP and pulse rate.
11. For long-term follow-up of treated hypertension, make duplicate measurements once or twice per week or month.

Relevance

- Recommended for long-term follow-up of treated hypertension, because it improves BP control, especially when combined with education and counseling.
- Confirmation of hypertension diagnosis and of true resistant hypertension, particularly if ABPM is not available.

Ambulatory BP monitoring (ABPM)

*24-h mean BP: SBP ≥130 and/or DBP ≥80

*Daytime (awake): SBP ≥135 mmHg and/or DBP t≥85

*Nighttime (asleep): SBP ≥120 mmHg and/or DBP ≥70

Conditions

1.-2. From OBPM applies also to ABPM.

3. Use fully automated devices programmed to record BP automatically at preselected intervals for 24 h.

Measurement

4. The recommended optimal time interval between measurements should be 20 minutes during day (awake) and night (sleep).
5. Measure during a routine workday for 24 h.
6. Instruct patients to keep a diary of their activities, symptoms, meals, drug intake times, sleep times or any unusual problems.

Relevance

- Obtaining 24-h BP profile and especially BP during night (sleep) not captured by OBPM or HBPM
- Confirmation of hypertension diagnosis and of true resistant hypertension.

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*Definition of hypertension [a]A device that takes triplicate readings automatically is preferred. [b]The selection of an appropriate cuff size is crucial. A smaller than required cuff overestimates BP and a larger underestimates BP. [c]Use of electronic devices allowing automated storage and data transfer is encouraged. [d]At initial visit measure on both arms. An interarm SBP difference >10 mmHg must be confirmed with repeated measurements. If confirmed, the arm with the higher BP should be used for all subsequent measurements. If any two sequential BP readings in one arm differ by >10 mmHg, additional measurements are recommended. See also Table 1.

Fig. 2. Recommendations and use of the different methods for BP measurement.

Table 1
Clinical indications for home and ambulatory BP monitoring*.

Conditions in which white-coat hypertension is more common, e.g.
• Grade I hypertension on office BP measurement
• Marked office BP elevation without HMOD
Conditions in which masked hypertension is more common, e.g.
• High-normal office BP
• Normal office BP in individuals with HMOD or at high total CV risk
In treated individuals
• Confirmation of uncontrolled and true resistant hypertension
• Evaluation of 24 h BP control (especially in high-risk patients)
• Evaluating symptoms suggestive of hypotension (especially in older patients)
Suspected postural or postprandial hypotension in treated patients
Exaggerated BP response to exercise
Considerable variability in office BP measurements
Specific indications for ABPM rather than HBPM
• Assessment of nocturnal BP and dipping status (e.g. sleep apnea, CKD, diabetes, endocrine hypertension, or autonomic dysfunction)
• Patients incapable or unwilling to perform reliable HBPM, or anxious with self-measurement
• Evaluation of patients considered for renal denervation
• Children
• Pregnancy
Specific indications for HBPM rather than ABPM
• Long-term follow-up of treated individuals to improve adherence with treatment and hypertension control
• Patients unwilling to perform ABPM, or with considerable discomfort during the recording
Indications for repeat out-of-office BP evaluation (same or alternative method – HBPM/ABPM)
• Confirmation of white-coat hypertension or masked hypertension in untreated or treated individuals

* Using validated devices (see https://www.stridebp.org/).

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hypertensive patients. Important recommendations and details for the use of the different methods for BP measurement are summarized in Fig. 2.

Clinical indications that support the use of HBPM or ABPM are summarized in Table 1.

3. Assess patient

A thorough patient work-up aims to gather essential information about the patient's personal and medical history, any other relevant factors and co-morbidities that may impact their BP, CV risk and management. This information is critical in determining the initiation of the most appropriate treatment approach and the follow-up strategy.

3.1. Basic assessment

Due to the high prevalence of hypertension and thus the large number of individuals that will be managed by primary care providers, it is essential to prioritize the basic assessment to investigations that are effective and feasible in this setting, allowing widespread implementation. The recommended pathway shown in Fig. 3 should be adapted according to the severity of hypertension, clinical circumstances and individual needs of patients.

The basic assessment includes personal and medical history, physical examination, lab tests and the recording of a 12-lead resting electrocardiogram (ECG) (Fig. 3). The recommended evaluation allows the diagnosis and staging of chronic kidney disease (CKD), by assessing estimated glomerular filtration rate (eGFR) and urinary albumin-creatinine ratio (UACR), and of left ventricular hypertrophy (LVH) by ECG (although with limited sensitivity).

An extended list of factors to be considered in the evaluation of patient's history is shown in Table 2.

An extended list of factors that influence CV risk in patients with hypertension is shown in Table 3.

Further details for a comprehensive physical examination for patients with hypertension are summarized in Table 4.

The specific assessment of patients older than 80 years should include the analysis of their functional capacities/autonomy status as shown in Table 5.

Table 6 shows selected basic and extended laboratory tests for assessment of hypertensive patients

3.2. Extended assessment

The extended assessment of hypertension mediated organ damage (HMOD) can be executed as deemed necessary and available to physicians (Fig. 3).

3.3. When to refer a patient

Basic and extended assessment of patients should support decision making about when a patient should be referred to a hypertension specialist or a hospital (including the need for inpatient treatment). Criteria that influence these decisions are summarized in Fig. 3. Additional information on the incidence of selected forms of secondary hypertension according to age that can guide clinical decision making when to refer a patient with suspected secondary hypertension for further work-up is shown in Fig. 4.

4. Select therapy

4.1. General aspects

Lifestyle interventions have been shown to be effective in reducing BP in hypertensive patients and can also have additional benefits, such

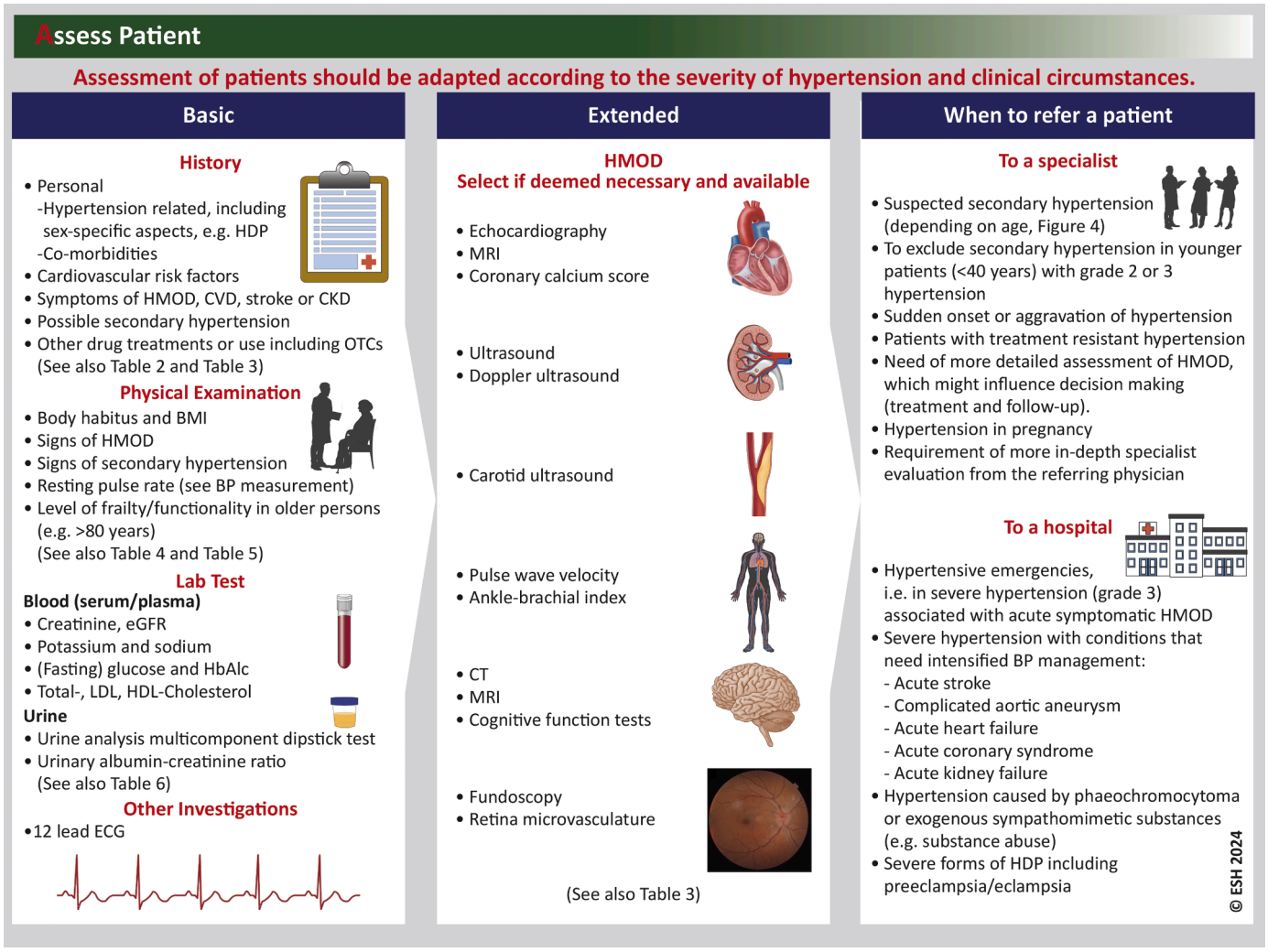

Fig. 3. Recommended assessment as adapted according to the severity of hypertension, clinical circumstances and individual needs of patients.

Table 2
Medical and family history[a].

Personal history
• Time of the first diagnosis of hypertension, including records of any previous medical screening, hospitalization
• Stable or rapidly increasing BP
• Recordings of current and past HBPM values
• Current/past antihypertensive medications including their effectiveness and intolerance
• Adherence to therapy
• Previous hypertension in pregnancy/preeclampsia
Risk factors[a]
• Family history of hypertension, CVD, stroke or kidney disease
• Smoking history
• Dietary history, alcohol consumption
• High volume of sedentary behavior and lack of physical activity
• Weight gain or loss in the past
• History of erectile dysfunction
• Sleep history, snoring, sleep apnea (information also from partner)
• Stress
• Long-term cancer survivor
History, signs and symptoms of HMOD, CVD, stroke and kidney disease
• Brain and eyes: headache, vertigo, syncope, impaired vision, TIA, sensory or motor deficit, stroke, carotid revascularization, cognitive impairment, memory loss, dementia (in older people)
• Heart: chest pain, shortness of breath, edema, myocardial infarction, coronary revascularization, syncope, history of palpitations, arrhythmias (especially AF), heart failure
• Kidney: thirst, polyuria, nocturia, hematuria, urinary tract infections
• Peripheral arteries: cold extremities, intermittent claudication, pain-free walking distance, pain at rest, ulcer or necrosis, peripheral revascularization
• Patient or family history of CKD (e.g. polycystic kidney disease)
History of possible secondary hypertension
• Young onset of grade 2 or 3 hypertension (<40 years), or sudden development of hypertension or rapidly worsening BP in older patients
• History of repetitive renal/urinary tract disease
• Repetitive episodes of sweating, headache, anxiety or palpitations, suggestive of pheochromocytoma
• History of spontaneous or diuretic-provoked hypokalemia, episodes of muscle weakness and tetany (hyperaldosteronism)
• Symptoms suggestive of thyroid disease or hyperparathyroidism
• History of or current pregnancy, postmenopausal status and oral contraceptive use or hormonal substitution
Drug treatments or use (other than antihypertensive drugs)
• Recreational drug/substance abuse, concurrent therapies including nonprescription drugs, e.g. glucocorticoids, NSAIDs/COX-2 inhibitors, paracetamol (acetaminophen), immunosuppressive drugs, anticancer drugs, nasal decongestants

[a] Additional factors to be considered are listed in Table 3

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Table 3
Factors that influence CV risk in patients with hypertension.

Parameter for risk stratification, which are included in SCORE2 and SCORE2-OP
Sex (men >women)
Age
Level of SBP[a]
Smoking – current or past history
Non-HDL cholesterol
Established and suggested novel factors
Family or parental history of early onset hypertension
Personal history of malignant hypertension
Family history of premature CVD (men aged <55 years; women aged <65 years)
Heart rate (resting values >80 bpm)
Low birth weight
Sedentary lifestyle
Overweight or Obesity
Diabetes
Dyslipidemia
Lp(a)
Uric acid
Adverse outcomes of pregnancy (recurrent pregnancy loss, preterm delivery, hypertensive disorders, gestational diabetes)
Early-onset menopause
Frailty, functional capacities and autonomy status
Psychosocial and socioeconomic factors
Migration
Environmental exposure to air pollution or noise
Additional clinical conditions or comorbidities
True resistant hypertension
Sleep disorders (including OSA)
COPD
Gout
Chronic inflammatory diseases
Metabolic dysfunction-associated fatty liver disease
Chronic infections (including long COVID-19)
Migraine
Depressive syndromes
Erectile dysfunction
Hypertension-mediated organ damage (HMOD)
Increased large artery stiffness
Pulse pressure (in older people) ≥60 mmHg
Carotid–femoral PWV >10 m/s in middle-aged people
Presence of non-hemodynamically significant atheromatous plaque (stenosis) on imaging
ECG LVH (Sokolow–Lyon index >35 mm, or R in aVL ≥11 mm; Cornell voltage-duration product (+6 mm in women) >2440 mm*ms, or Cornell voltage >28 mm in men or >20 mm in women)
Echocardiographic LVH (LV mass index: men >50 g/$m^{2.7}$; women >47 g/$m^{2.7}$ (m = height in meters); indexation for BSA may be used in normal-weight patients: >115 g/m^2 in men and >95/m^2 in women
Moderate increase of albuminuria 30–300 mg/24 h or elevated UACR (preferably in morning spot urine) 30 –300 mg/g
CKD stage 3 with eGFR 30–59 ml/min/1.73 m^2
Ankle–brachial index <0.9
Advanced retinopathy: hemorrhages or exudates, papilledema
Established cardiovascular and kidney disease
Cerebrovascular disease: ischemic stroke, cerebral hemorrhage, TIA
Coronary artery disease: myocardial infarction, angina, myocardial revascularization
Presence of hemodynamically significant atheromatous plaque (stenosis) on imaging
Heart failure
Peripheral artery disease
Atrial fibrillation
Severe albuminuria > 300 mg/24 h or UACR (preferably in morning spot urine) >300 mg/g
CKD stage 4 and 5, eGFR < 30 mL/min/1.73m^2

[a] DBP is not included in the SCORE2/SCORE2-OP tool to estimate CV risk.

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Table 4
Comprehensive physical examination for hypertension[a].

Body habitus
• Weight and height measured on a calibrated scale, with calculation of BMI
• Waist circumference
Signs of hypertension-mediated organ damage
• Neurological examination and cognitive status
• Fundoscopic examination for hypertensive retinopathy in emergencies
• Auscultation of heart and carotid arteries
• Palpation of carotid and peripheral arteries
• Ankle–brachial index
Signs of secondary hypertension
• Skin inspection: cafe-au-lait patches of neurofibromatosis (pheochromocytoma)
• Kidney palpation for signs of renal enlargement in polycystic kidney disease
• Auscultation of heart and renal arteries for murmurs or bruits indicative of aortic coarctation, or renovascular hypertension
• Signs of Cushing's disease or acromegaly
• Signs of thyroid disease

[a] Can be adapted according to the clinical circumstance.

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Table 5
Assessment of functional capacities/autonomy status in hypertensive patients older than 80 years.

Characteristics	**Group 1** Fit	**Group 2** Slowed but autonomous for most activities	**Group 3** Severely dependent
Diagnosis	-ADL (Katz) ≥5 and -absence of clinically significant dementia (MMSE>20) and -routine walking activities	-Profile between Groups 1 and 3	-ADL (Katz): ≤2 or -severe dementia (MMSE ≤10) or chronic bedridden or -end of life

ADL: Activities of Daily Living (Katz Index) scaled rated from 0 (completely dependent) to 6 (completely autonomous).
This scale comprises 6 ADL: Bathing, Dressing, Toileting, Transferring, Feeding and Continence.
For each ADL '0' means that the person is unable to do it without assistance, 0.5 need of some assistance, 1 no need of any assistance.
MMSE: Mini mental state examination. Score 0–30, 30 best, 0–10 severe dementia, 11–20 moderate dementia, 21–30 absence of clinically significant dementia. The assessment is used to guide treatment as shown in Fig. 9.
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as increasing the efficacy of BP-lowering therapy, improving overall CV health and reducing the risk of other chronic diseases. They are important in the prevention of hypertension and may control BP when used alone already in a fraction of patients, i.e. in patient with mildly elevated grade 1 hypertension with systolic BP (SBP) and diastolic BP (DBP) <150/95 mmHg and low CV risk. However, most patients with hypertension should be treated with a combination of both lifestyle interventions and pharmacological treatment. The strategy for the initial management of hypertension with the aim to control BP within 3 months according to the risk of patients is shown in Fig. 5.

The initial management as well as follow-up strategies should be executed according to the risk of patients as summarized in Fig. 6.

4.2. Lifestyle interventions

The recommended lifestyle interventions together with their relevance and prescribing patterns are shown in Fig. 7.

4.3. Pharmacological treatment

The general treatment strategy for patients with hypertension is shown in Fig. 8. The recommended major BP-lowering drug classes include angiotensin-converting enzyme inhibitors (ACEi), angiotensin receptor blockers (ARB), beta-blockers (BB), calcium channel blockers (CCB) and thiazide/thiazide-like diuretics (T/TL-diuretics). Additional therapies can be considered in patients with true resistant hypertension, heart failure and CKD as shown. Furthermore, renal denervation can be considered in true-resistant hypertension (Fig. 8) and in patients who have uncontrolled BP despite the use of antihypertensive drug combination therapy, or if drug treatment elicits serious side effects and poor quality of life (if eGFR $>$ 40 ml/min/1.73m^2).

The general strategy for pharmacological treatment shown in Fig. 8 applies to a large number of patients including patients with diabetes, after a stroke or with peripheral artery disease. Further specific treatment algorithms for true resistant hypertension and important comorbidities including coronary heart disease, heart failure with preserved ejection fraction, atrial fibrillation, and CKD are shown in suppl. Figs. 1–5.

The general BP treatment targets for office SBP and DBP are also shown in Fig. 8 along with additional comments that indicate the need to adjust these targets, e.g. in certain patient populations.

The recommended strategy in older persons according to their functional capacities/autonomy status is summarized in Fig. 9.

5. Evaluate response

It is important to evaluate the BP response after treatment initiation (3 months) as well as during short-term and long-term follow-up in patients with hypertension in order to monitor the effectiveness of the treatment and make any necessary adjustments. To aim first for BP control with SBP and DBP below 140 and 80 mmHg in most patients in the general hypertensive population and subsequently for optimal BP control achieving the individual BP targets is the important goal that should be evaluated (Fig. 8). However, the evaluation of possible side effects (tolerability) and safety parameters, e.g. eGFR and serum potassium levels, in response to treatment and changes in the risk factor

Table 6
Selected standard laboratory tests for work-up of hypertensive patients[a].

Blood (serum/plasma)
• Hemoglobin and/or hematocrit
• Fasting blood glucose and HbA1c
• Lipids: total cholesterol, LDL cholesterol, HDL cholesterol, triglycerides
• Potassium and sodium
• Uric acid
• Creatinine (and/or cystatin C) for estimating GFR with eGFR formulas
• Calcium
Urine
• Multicomponent dipstick test, UACR (preferably early morning spot urine), microscopic examination in selected patients

[a] Can be adapted according to the clinical circumstance.

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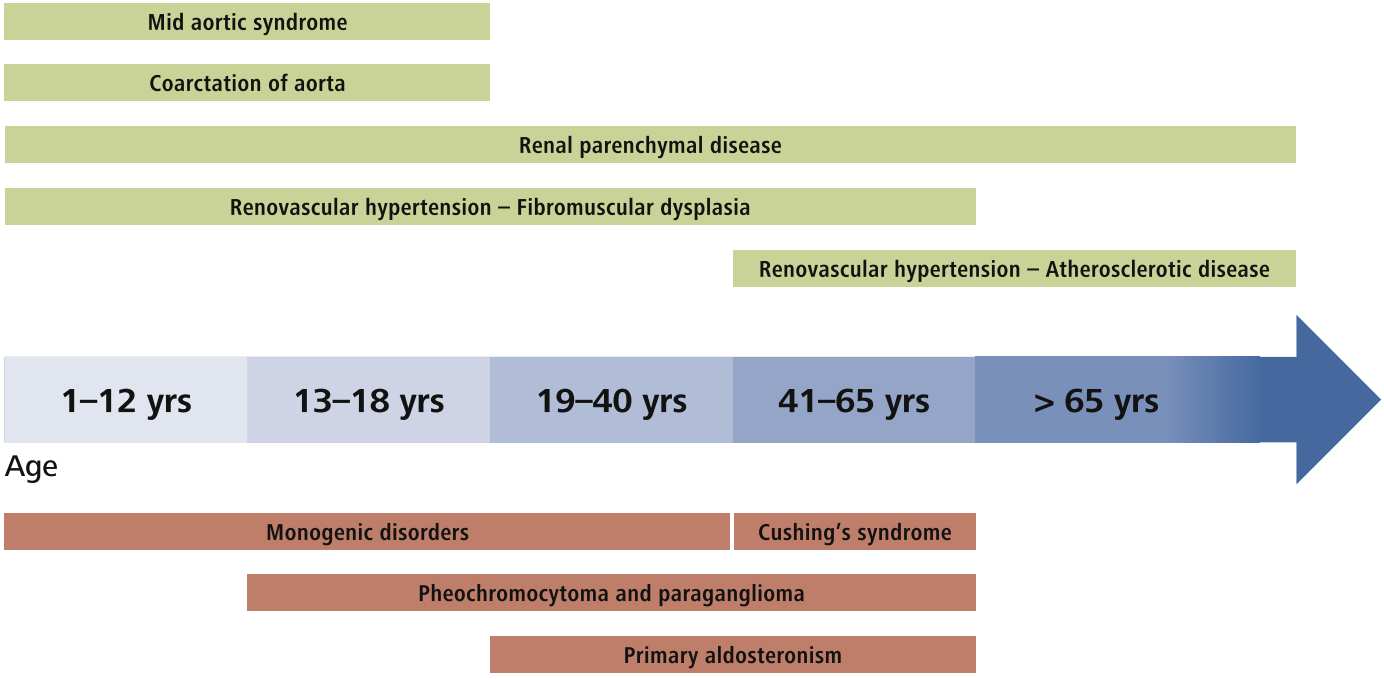

Fig. 4. Incidence of selected forms of secondary hypertension according to age.
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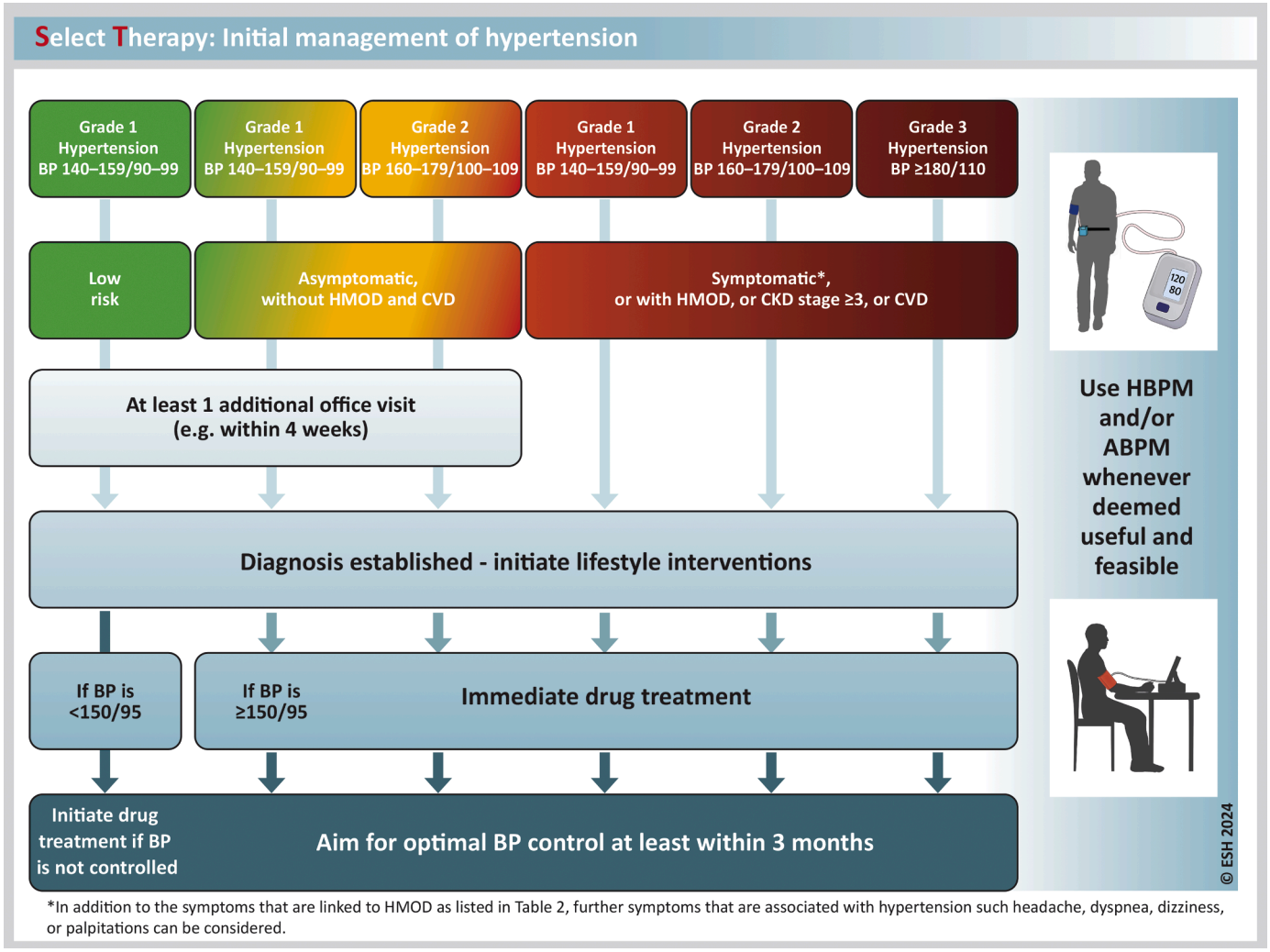

Fig. 5. Strategy of the initial management of hypertension with the aim to control BP within 3 months according to the risk of patients.
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Hypertension disease staging	Other risk factors, HMOD, CVD or CKD	BP (mmHg) grading			
		High-normal SBP 130–139 DBP 85–89	Grade 1 SBP 140–159 DBP 90–99	Grade 2 SBP 160–179 DBP 100–109	Grade 3 SBP ≥ 180 DBP ≥ 110
Stage 1	No other risk factors[a]	Low risk	Low risk	Moderate risk	High risk
	1 or 2 risk factors	Low risk	Moderate risk	Moderate to high risk	High risk
	≥3 risk factors	Low to moderate risk	Moderate to high risk	High risk	High risk
Stage 2	HMOD, CKD grade 3, or diabetes mellitus	Moderate to high risk	High risk	High risk	Very high risk
Stage 3	Established CVD or CKD grade ≥4	Very high risk	Very high risk	Very high risk	Very high risk

	<50 years	50-69 years	≥70 years
	<2.5%	<5%	<7.5%
	2.5 to <7.5%	5 to <10%	7.5 to <15%
	≥7.5%	≥10%	≥15%

Complementary risk estimation in Stage 1 with SCORE2/SCOR2-OP

Fig. 6. Risk stratification according to grade and stage of hypertension.
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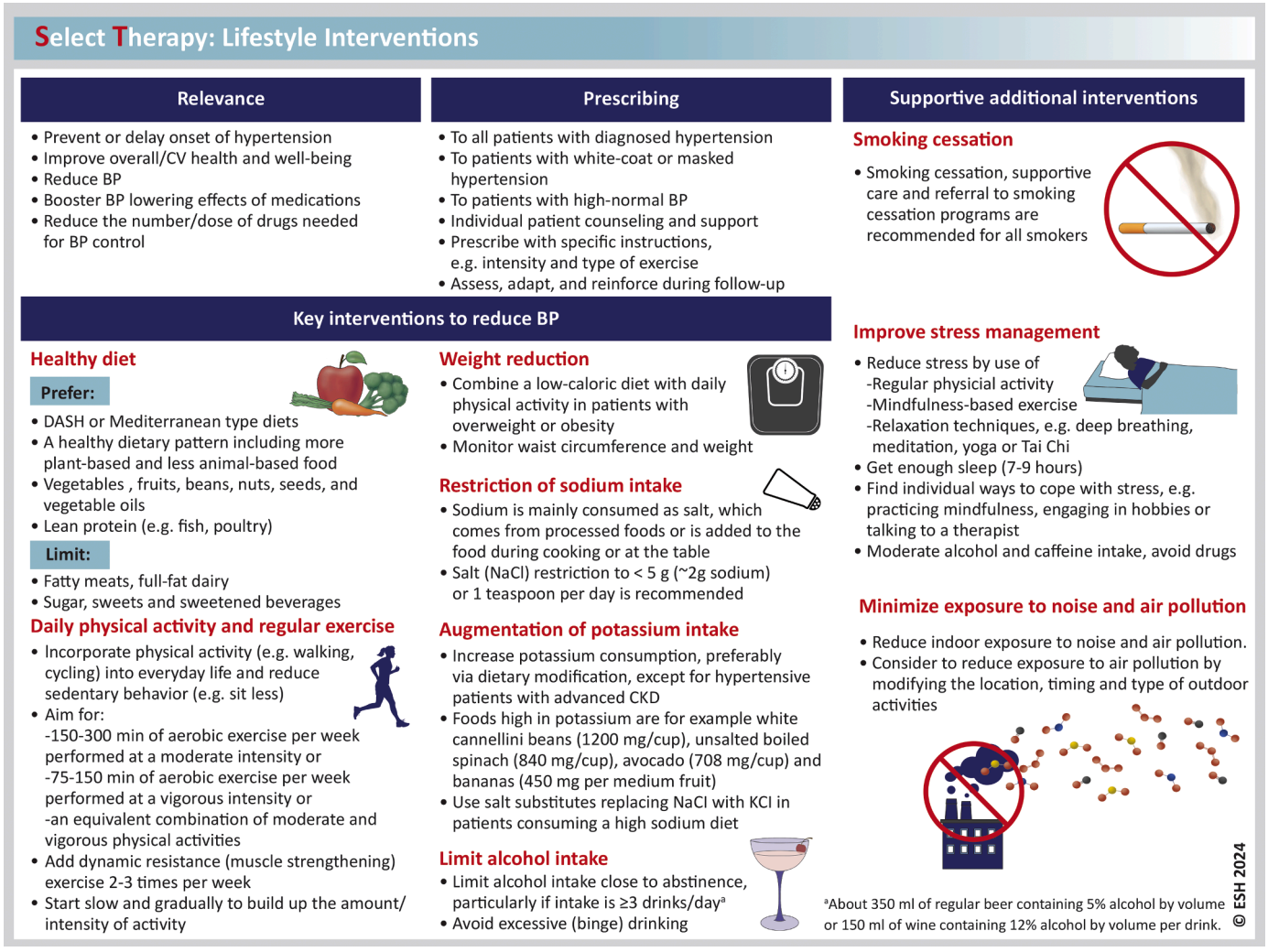

Fig. 7. Recommended lifestyle interventions together with their relevance and prescribing patterns.

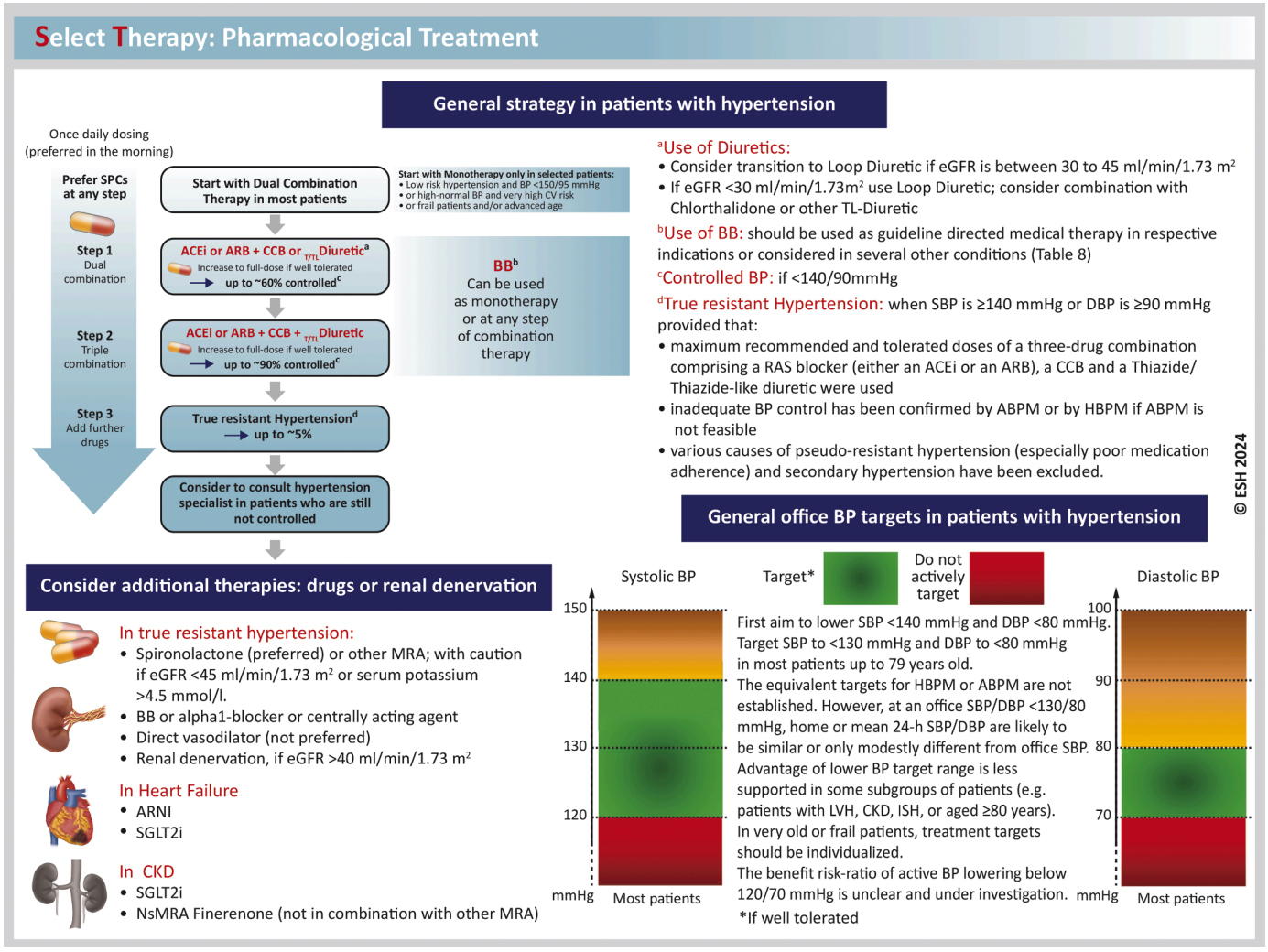

Fig. 8. The general treatment strategy for patients with hypertension.
Adapted with permission from Wolters Kluwer Health, Inc.: [Mancia G, Kreutz R, Brunstrom M, Burnier M, Grassi G, Januszewicz A, et al. 2023 ESH Guidelines for the management of arterial hypertension The Task Force for the management of arterial hypertension of the European Society of Hypertension: Endorsed by the International Society of Hypertension (ISH) and the European Renal Association (ERA). Journal of hypertension 2023; 41:1874–2071. https://doi.org/10.1097/hjh.0000000000003480].

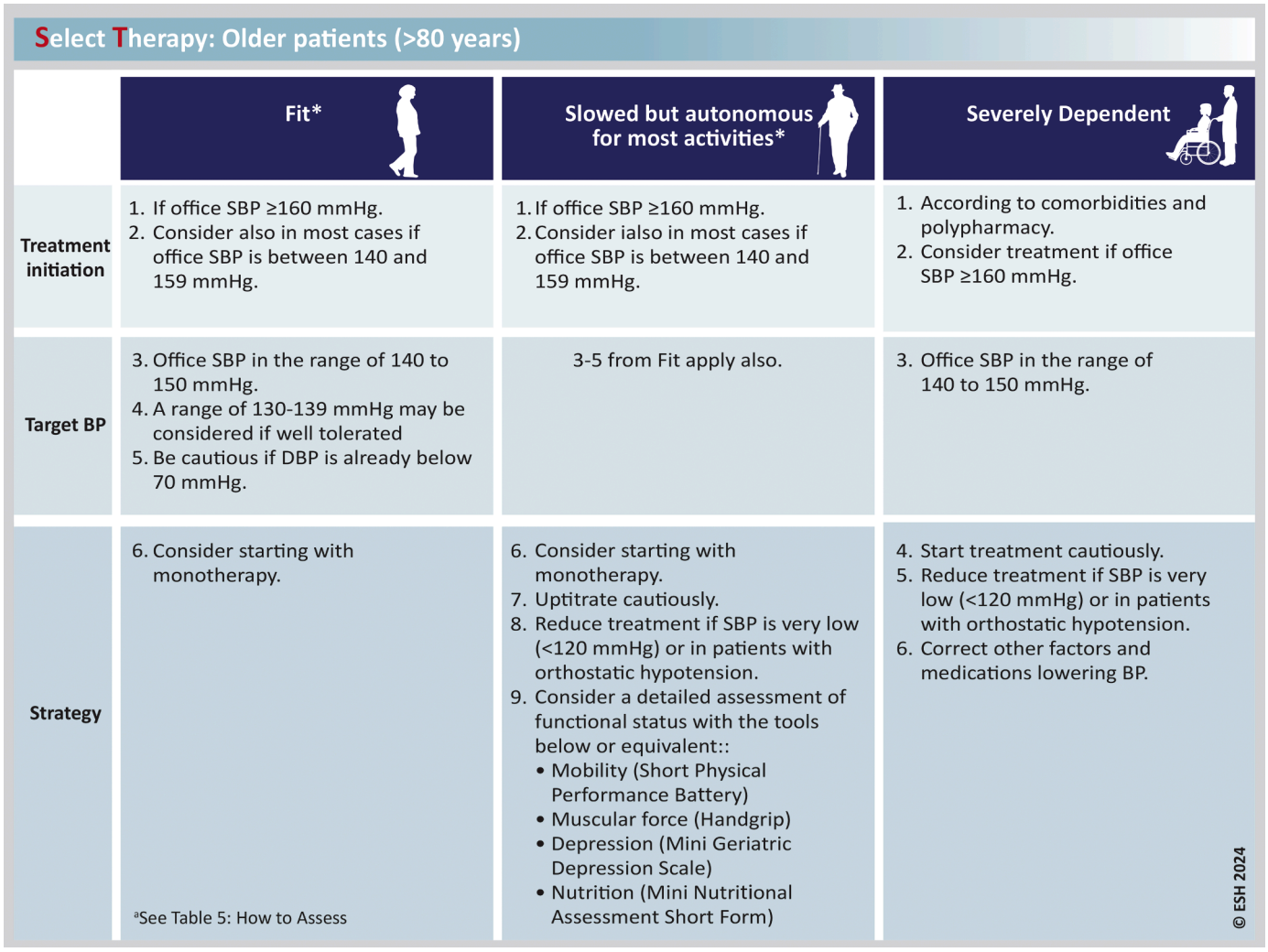

Fig. 9. Recommended strategy in older persons according to their functional capacities/autonomy status.

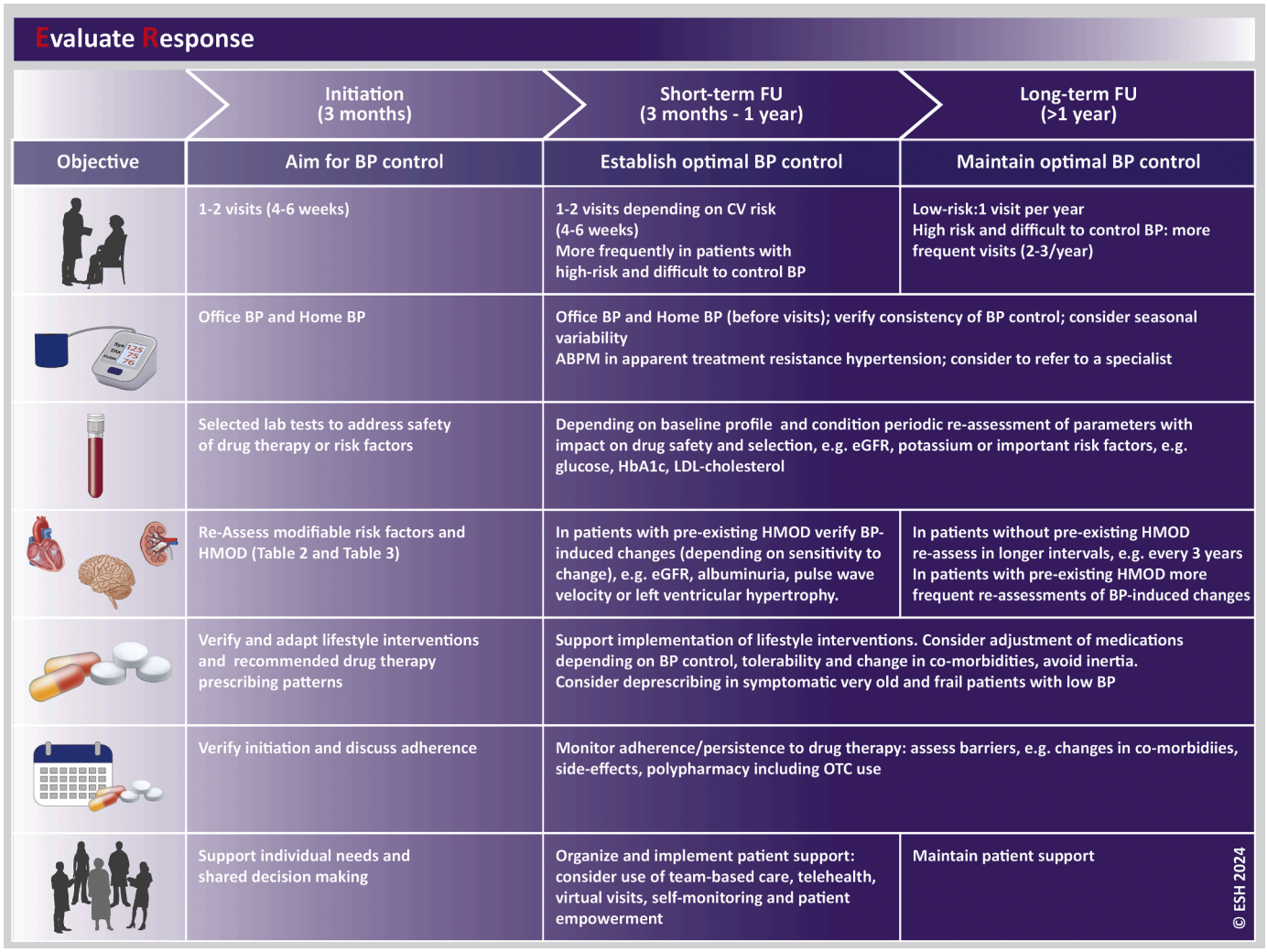

Fig. 10. Summary of important aspects that should be evaluated and considered during the initiation phase, short-term and long-term follow up.

profile, HMOD or co-morbidities is also important. Fig. 10 summarizes important aspects that should be evaluated and considered during the initiation phase, short-term and long-term follow up.

6. Conclusions

The successful implementation of the guideline recommendations for the treatment of hypertension depends on many factors, including national/regional opportunities and challenges in healthcare systems. The ESH hopes that this **MASTER**plan will make a meaningful contribution to the further development and improvement of hypertension care.

Declaration of competing interest

The conflict of interest declaration of authors are compiled into one file that can be found on the ESH website: https://www.eshonline.org/guidelines/2023-guidelines/. ESH received no financial support for the generation of this guidelines.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ejim.2024.05.033.

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[1] Mancia G, Kreutz R, Brunstrom M, Burnier M, Grassi G, Januszewicz A, et al. 2023 ESH Guidelines for the management of arterial hypertension The Task Force for the management of arterial hypertension of the European Society of Hypertension: endorsed by the International Society of Hypertension (ISH) and the European Renal Association (ERA). J Hypertens 2023;41:1874–2071.

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