CHRONIC DISEASE MANAGEMENT 2024
https://doi.org/10.33591/sfp.49.1.u1

Unit No. 1

PROTEINURIA AND HYPERTENSION WITH AND WITHOUT TYPE 2 DIABETES MELLITUS: 2024 UPDATE

A/Prof Goh Lee Gan

ABSTRACT

INTRODUCTION. Four related subtopics: (1) definition of hypertension and classification; (2) hypertension diagnosis; (3) hypertension and proteinuria; and (4) hypertension and proteinuria in Type 2 diabetes mellitus were reviewed. Two other related topics: (5) management of obesity; and (6) metabolic and bariatric surgery (MBS) were also reviewed.

METHODOLOGY. PubMed searches were done for relevant papers from 2019 to 2024 using the keywords of hypertension and definition, hypertension and diagnosis, hypertension and proteinuria, hypertension and proteinuria and Type 2 diabetes mellitus, obesity and treatment in Singapore, and metabolic and bariatric surgery in Singapore, Southeast Asia, and Australia. Four new references were added to the 2023 reference list.

RESULTS. In the 2017 MOH CPG, hypertension was defined as blood pressure of 140/90 mmHg. Since 2018, there has been a worldwide initiative to reduce this level to ≥135 mmHg systolic and ≥85 mmHg as the threshold for antihypertensive treatment, because this improves cardiovascular and renal outcomes as well as all-cause mortality. A higher cutoff (140/90 mmHg) is used in the elderly and frail. Hypertension in older patients should be treated to prevent worse outcomes but treatment should be individualised. Office BP readings need to be supplemented by ambulatory BP monitoring (AMBP) or home BP monitoring (HBPM).

CONCLUSION. The hypertension cutoff of 140/90 mmHg can be reduced to 130/80 mmHg to improve cardiovascular and renal outcomes as well as to reduce all-cause mortality. Hypertension in older patients should be treated to prevent worse outcomes but treatment should be individualised.

Keywords: Hypertension, proteinuria, non-diabetic patients, diabetic patients, obesity management, bariatric surgery.

SFP2024; 50(2): 5-12

A/PROF GOH LEE GAN
Senior Consultant.
Department of Family Medicine, National University Health System, Singapore

INTRODUCTION

This paper is a 2024 update of the 2023 version. As in previous updates, four related topics were reviewed, namely: (1) BP definition and classification; (2) hypertension diagnosis; (3) hypertension and proteinuria in non-diabetic patients; and (4) hypertension and proteinuria in the patient with Type 2 diabetes. Two related subtopics were also reviewed: (5) obesity management; and (6) medical therapy versus metabolic bariatric surgery (MBS) for treatment of severe obesity.

METHODOLOGY

PubMed searches were done for relevant papers using the following key words: definition of hypertension and classification; hypertension diagnosis; hypertension, proteinuria, and non-diabetic; and hypertension, proteinuria, and Type 2 diabetes mellitus; obesity and management; and metabolic bypass surgery. Searches were limited to Singapore, Southeast Asia, East Asia, and Australia.

RESULTS

1. DEFINITION OF HYPERTENSION AND CLASSIFICATION

BP Definition

Hypertension has been defined as a systolic blood pressure of ≥140 mmHg or a diastolic blood pressure ≥90 mmHg based on three or more occasions (Abdulhafiz et al, 2018,[1] Weber et al, 2014[2]). The severity of hypertension is classified into *grade* according to the joint statement of the European Society of Cardiology and the European Society of Hypertension (ESC/ESH) or *stages* according to the joint statement of the American Society of Hypertension and the International Society of Hypertension (ASH/ISH) (Whelton et al, 2017).[3]

Since 2017, the American Heart Association and the American College of Cardiology (AHA/ACC) have re-defined hypertension as a BP of 130/80 mmHg for diagnosis.[3] Their severity of hypertension classification has also been adjusted downwards (refer to **Table 1A**). Individualisation for treatment remains important as the lower cutoffs might not be tolerated by some patients, e.g., those who are elderly or frail.

Table 1A. Definition and Classification of Hypertension

	"Older classification" 2014[2]	"Recent classification" 2017[3]
BP category	BP (mmHg)	BP (mmHg)
Normal BP	<120/80	<120/80
Elevated BP	*Pre-hypertension*	*Elevated BP*
	120-139/80-89	<120-129/80
Hypertension	≥140/90	≥130/80
Stage 1	140-159/90-99	130-139/80-89
Stage 2	≥160/100	>140/90

Source: Abdelhafiz et al, 2018[1]

In 2017, the MOH Singapore Clinical Practice Guideline on Hypertension (Tay et al, 2017)[4] recommended a cutoff of 140/90 mmHg for diagnosis of hypertension (refer to **Table 1B**). There is evidence-based justification however to consider a lower cutoff of 130/80 mmHg for intervention, notwithstanding the fact that some patients, e.g., the elderly or frail may be able to tolerate this level of blood pressure reduction.

Table 1B. Definitions and Classification of BP Levels for Adults Aged 18 years and Older, MOH CPG 2017[4]

Category	Systolic BP	Diastolic BP
Normal BP	< 130 mmHg	< 85 mmHg
High-normal BP	130 to 139 mmHg	85 to 89 mmHg
Grade 1 hypertension	140 to 159 mmHg*	90 to 99 mmHg
Grade 2 hypertension	160 to 179 mmHg*	100 to 109 mmHg
Grade 3 hypertension	≥ 180 mmHg*	≥ 110 mmHg
Isolated systolic hypertension	≥ 140 mmHg*	< 90 mmHg

*Isolated systolic hypertension is graded according to the same level of systolic BP.

Source: MOH CPG: Hypertension 2017 (Tay JC et al, 2018)[4]

In the 2023 European Society of Hypertension (ESH) Management of Arterial Hypertension Guidelines, which are the most recent hypertension guidelines, the recommendation of drug therapy to the average of systolic BP 130 to 139 mmHg or diastolic BP 80 to 89 mmHg is the key takeaway. Implementing CPG recommendations for treatment and control of hypertension is a key priority (Whelton PK et al., 2023).[5]

2. HYPERTENSION DIAGNOSIS

Office BP Measurements

Office BP readings have been accepted for diagnosis and subsequent management for several decades (Campbell & White, 2017).[6] Errors in such readings can arise from two sources:

- Inaccurate assessment
- The effect of white-coat hypertension or masked hypertension

Inaccurate Assessment

Basing blood pressure measurement on a single office visit is inadequate. Two to three office visits are usually required to confirm the diagnosis of hypertension. The only time that a single visit reading is confirmatory is a blood pressure of ≥180/110 mmHg. A 10-point checklist for correct office blood pressure measurement is recommended by Unger et al[7] (refer to **Table 2**).

Table 2. Recommendations for Office Blood Pressure Measurement

Conditions	• Quiet room with comfortable temperature
	• Before measurements: Avoid smoking, caffeine, and exercise for 30 min; empty bladder; remain seated and relaxed for 3-5 min
	• Neither patient nor staff should talk before, during, and between measurements
Positions	• Sitting: Arm resting on table with mid-arm at heart level; back supported on chair; legs uncrossed and feet flat on floor
Device	• Validated electronic (oscillometric) upper-arm cuff device. Lists of accurate electronic devices for office, home, and ambulatory BP measurement in adults, children, and pregnant women are available at www.stridebp.org
	• Alternatively, use a calibrated auscultatory device (aneroid, or hybrid as mercury sphygmomanometers are banned in most countries) with 1st Korotkoff sound for systolic blood pressure and 5th for diastolic with a low deflation rate
Cuff	• Size according to the individual's arm circumference (smaller cuff overestimates and larger cuff underestimates blood pressure)
	• For manual auscultatory devices, the inflatable bladder of the cuff must cover 75-100% of the individual's arm circumference. For electronic devices, use cuffs according to device instructions
Protocol	• At each visit, take 3 measurements with 1 min between them. Calculate the average of the last 2 measurements. If BP of first reading is <130/85 mmHg, no further measurement is required
Interpretation	• Blood pressure of 2-3 office visits ≥140/90 mmHg indicates hypertension

Source: Unger et al, 2020.[8] 2020 ISH Global Hypertension Practice Guidelines. PMID:32371787

The Effect of White-Coat Hypertension or Masked Hypertension

It is now clear that office blood pressure readings are prone to inaccuracies due to:

- **White-coat hypertension**. This is characterised by a high office BP reading and a normal home BP reading, resulting in overdiagnosis and treatment.
- **Masked hypertension**. This is characterised by a normal office BP reading and a high home BP reading, resulting in underdiagnosis and treatment.

Supplementary measurements with ambulatory BP monitoring (ABPM) or home BP monitoring (HBPM) needs to be done. Both are capable of identifying patients with white-coat hypertension or masked hypertension.

Ambulatory BP Monitoring (ABPM) and Home BP Monitoring (HBPM)

The usefulness of ABPM for the management of hypertension is currently well established. It is no longer enough to diagnose hypertension based on office BP measurements alone. These readings should be supplemented by ABPM or its alternative HBPM.[6,8]

HBPM is an acceptable alternative when ABPM cannot be performed.[9] There is good correlation between HBPM and ABPM for accurately diagnosing sustained normotension, white-coat hypertension, and masked hypertension in both treated and untreated patients, with sensitivity ranging from 60 to 90 percent. The primary indications for HBPM are confirming elevated office BP in patients with undiagnosed hypertension and monitoring BP trends in patients with known hypertension.[10]

The 2020 Consensus statement of the Taiwan Hypertension Society and the Taiwan Society of Cardiology on HBPM has this to say: "HBP-based hypertension management strategies include bedtime dosing (for uncontrolled morning hypertension), shifting to drugs with longer-acting antihypertensive effect (for uncontrolled evening hypertension), and adding another antihypertensive drug (for uncontrolled morning and evening hypertension) should be considered".[11]

The adoption of HBPM has been encouraging. A report published in 2017 by Setia et al[12] described a survey of 60 physicians made up of 30 GPs, 20 cardiologists, and 10 nephrologists. Almost all physicians surveyed (98 percent) stated they recommended HBPM to their patients with hypertension. Overall, 81 percent of hypertensive patients were recommended to measure home BP (85 percent of those treated by cardiologists, 85 percent by nephrologists, and 76 percent by GPs).[12]

Table 3. Definitions of Hypertension in HPBM and APBM

	Systolic BP	Diastolic BP
HBPM	≥ 135 mmHg	≥ 85 mmHg
ABPM		
Daytime	≥ 135 mmHg	≥ 85 mmHg
24-hour	≥ 130 mmHg	≥ 80 mmHg
Night-time	≥ 120 mmHg	≥ 70 mmHg

Source: MOH CPG: Hypertension (Tay JC et al, 2018)[4]
HBPM = Home BP Monitoring
ABPM = Ambulatory BP Monitoring

Hypertension in Older Patients

In older patients, besides white-coat hypertension – which can be seen in up to 72 percent of clinic BP readings – and masked hypertension,[10] two other types of hypertension are encountered in older patients: namely, isolated systolic hypertension (BP >140/90 or 20/10 mmHg within three minutes of standing), which is common, affecting up to 20 percent of older people, and postural hypotension (BP drop >20/10 mmHg within three minutes of standing – seen in up to 20 percent of older people.[1]

BP Targets in Older Patients

Older people are heterogeneous in their health status. Hence, one BP target does not fit all. One strategy is to view older people to be made up of three functional categories with different targets ranging from tight BP control in the fit person to a relaxed approach in the frail elderly. Targets need to be individualised and dynamic to follow the changing functional state of the patients as they age (refer to **Figure 1**).[1]

Figure 2 shows the special considerations in managing hypertension in older patients, namely: patients with fall risks; with dementia; who are frail; have systolic hypertension; have postural hypotension; have polypharmacy associated with non-adherence; or are dependent and are staying in a long-term care setting.[1]

Figure 1. Suggested BP Targets Based on Patient's Functional Status

Independent
- Independent community living
- Mild comorbidities

– Target BP <130/80 mmHg

Partially dependent
- Assisted community living
- Moderate comorbidities

– Target BP <140/90 mmHg

Fully dependent
- Care home residency with limited life expectancy
- Severe comorbidities

– Target BP <150/90 mmHg

Source: Abdelhafiz et al, 2018[1] – Adapted

Figure 2. Special Considerations in the Management of Hypertension in Older Patients

Falls
Risk is proportionate to the intensity of therapy
Risk is highest on initiation of medication

Dementia
Does not improve with hypertension treatment
Target SBP should not be <130 mmHg

Frailty
U-shaped relation with cardiac outcome
Target BP should not be <140/90 mmHg

Systolic Hypertension
Less responsive to antihypertensives
DBP should not be <70 mmHg

Postural Hypotension
Frequent in uncontrolled hypertension
Nocturnal therapy may exacerbate symptoms

Polypharmacy
Associated with non-adherence
Regular medication review

Care Home Residents
Likely dependent
SBP <130 mmHg
Increases mortality

Source: Abdelhafiz et al, 2018[1] – slightly adapted

3. HYPERTENSION AND PROTEINURIA IN NON-DIABETIC PATIENTS

Low-Grade Albuminuria (LGA) in Non-Diabetic and Normotensive Individuals

A cohort study by Tanaka et al[14] highlighted the important consequences of LGA in a cohort of 3,599 individuals in Japan followed up over 5.9 years. At entry, the participants were 40 years and older, were non-diabetic and normotensive, with GFR reserve, and no cardiovascular history.

LGA was found to be a predictor of the incidence of cardiovascular disease and all-cause mortality in the participants. A total of 61 individuals had first CVD events, and 85 individuals died.

The hazard ratios (HRs) for CVD incidence and all-cause mortality in the top tercile was 2.79, with 95 percent CI of 1.4.1-5.52; and 1.69, with 95 percent CI of 1.00-2.84, respectively. Population-attributable fractions of the top tercile of LGA for CVA incidence and all-cause death were 37.9 and 20.1 percent respectively.

The conclusion is that in apparently healthy individuals with optimal blood pressure and no diabetes, LGA independently predicts CVD incidence and all-cause death. LGA therefore should be treated and not be ignored.

Microalbuminuria in Primary Hypertension

Microalbuminuria conventionally is defined as urinary albumin excretion between 30 and 300 mg/24 hours. This is associated with left ventricular hypertrophy and carotid atherosclerosis. An emerging issue highlighted by a review of the subject by Viazzi et al[15] is the observed linear relationship between the degree of albuminuria and left ventricular hypertrophy. Would the treatment of blood pressure be able to reduce microalbuminuria and result in better renal outcomes?

Urine albumin excretion (UAE) is a low-cost, easy-to-use test and a powerful predictor of cardiovascular diseases. This should be part of the routine evaluation of hypertensive patients.

Changes in Albuminuria and Cardiovascular Risk Under Antihypertensive Treatment

In another review paper, Viazzi et al, 2016[16] studied the trials' results and reported pairwise comparisons between antihypertensive treatment for cardiovascular outcome (in 16 randomised controlled trials and 48,580 patients, with a mean follow-up of 45 months, 5,867 cardiovascular events).

The authors found there was a relationship between improvement in urinary albumin excretion (UAE) and blood pressure reduction. Relative risks (RR) pooled was 0.45, with CI 95 percent 0.23-0.85. No improvement in UAE was found between randomised pairs where there was no BP reduction (RR pooled 1.04, with 95 percent CI, 0.86-1.26).

The conclusion was a reduction in UAE under antihypertensive treatment reduced the risk of clinical cardiovascular events.

Proteinuria in CKD Patients

A review by Dhaybi and Bakris[17] on the role of mineralocorticoid antagonists (MRAs) in chronic disease patients showed that when used in conjunction with ACEIs or ARBs, proteinuria was reduced. The concern in the past was over worsening kidney function and hyperkalaemia. Recent data from small studies highlight a way that MRAs may be used without fear of hyperkalaemia.

MRAs are highly efficacious for further reducing albuminuria when added to ACEIs or ARBs. The use of patiromer, a potassium-binding polymer, is well tolerated and enables the use of MRAs in people with advanced CKD. Using patiromer has been shown to further reduce aldosterone and BP when used with MRAs.

A novel nonsteroidal MRA, finerenone, which is associated with less hyperkalaemia, is currently being tested in both renal and cardiovascular outcomes trials to examine effects on outcomes.

4. HYPERTENSION AND PROTEINURIA IN THE PATIENT WITH DIABETES

Prevention of Microalbuminuria

A recent systematic review was published in 2016 by Persson et al[18] on prevention of microalbuminuria. Based on six trials (n=16,921), the authors found that ACE or ARB treatment was effective (RR=0.84) in the prevention of the development of microalbuminuria. Treatment also showed a trend towards a reduction in all cause-mortality (p=0.07).

Blood Pressure Targets in Patients with Type 2 Diabetes Mellitus

A review by Pavlou et al, 2018,[19] reported that two-thirds of patients with type 2 diabetes mellitus had arterial hypertension. This major risk factor increases the incidence of both microvascular and macrovascular complications in these patients. Furthermore, the co-existence of diabetes and hypertension leads to a fourfold increased risk for cardiovascular disease compared to normotensive non-diabetic controls. A BP target of less than 140/90 mmHg applies to most patients. Individualisation of the BP goal however is important, depending on the patient's age, medical history, and additional cardiovascular risk factors. For example, NICE (UK 2013) recommends a BP of <140/80 mmHg, but if there is retinopathy, cerebrovascular disease, or microalbuminuria, the target is <130/80 mmHg.

Review of Antihypertensives for Treating Hypertension in Diabetes

A recent review by Sarafidis et al in 2017[20] was done on the effectiveness of currently available antihypertensives used for treating hypertension in diabetes mellitus. The authors reported that several lines of evidence suggest that angiotensin-converting enzyme inhibitors (ACEIs), angiotensin-receptor blockers (ARBs), and calcium-channel-blockers (CCBs) have beneficial or neutral effects on carbohydrate metabolism, whereas old beta-blockers and thiazide diuretics have not. Thiazide diuretics and conventional beta-blockers were shown to reduce insulin sensitivity and to raise the risk of new-onset DM.

Renal outcome trials clearly suggest that in proteinuric diabetic CKD patients, ACEIs and ARBs reduce the rate of disease progression. Thus an ACEI or an ARB, if tolerated, should be the first choice in diabetic individuals, followed by CCBs, vasodilating beta-blockers, and diuretics, depending on the individual patient characteristics. These are the recommendations of the 2020 International Society of Hypertension Global Hypertension Practice Guidelines (Unger T et al).[7] Refer to **Table 4**. **Table 5** lists common examples of first-line antihypertensive medications and dosages in adults (Clarke SL).[21]

Table 4. 2020 International Society of Hypertension Global Hypertension Practice Guidelines on Core Antihypertensive Treatment Strategy

Use whatever drugs are available	Step 1 – Dual low-dose combination	A + C
	Step 2 – Dual full dose combination	A + C
	Step 3 – Triple combination	A + C + D
	Step 4 – (Resistant hypertension) Triple combination + spironolactone or other drug (e.g., clonidine, beta-blocker)	A + C + D Add spironolactone (12.5-50 mg od)
Footnote A = ACE inhibitor or ARB C = Calcium Channel Blocker (Dihydropyridin) D = thiazide-like diuretic Low dose = half of medium recommended dose.		

Source: Unger T et al, 2020[8] (Adapted). PMID-32370572

Table 5. First-Line Antihypertensive Medications, Common Examples

Class	Examples and Typical Dosages	Common Adverse Effects
Angiotensin-converting enzyme inhibitors (ACEI)[#]	Enalapril, 5-40 mg daily Lisinopril, 5-40 mg daily	Angioedema, Cough, Dizziness, Hyperkalemia, Hypotension
Angiotensin-receptor blockers (ARB)[#]	Losartan, 25-100 mg daily Olmesartan, 20-40 mg daily Valsartan, 80-320 mg daily	Dizziness, Hyperkalaemia, Hypotension
Calcium channel blockers (dihydropyridine) (CCB)	Amlodipine, 2.5-10 mg daily Nifedipine extended release, 30-90 mg daily	Dizziness, Hyperkalaemia, Hypotension
Thiazide diuretic	Hydrochlorthiazide, 12.5-25 mg daily	Hypokalaemia, Hyponatremia
Footnote: [#] = Angiotensin-converting enzyme inhibitors and angiotensin receptor blockers are preferred for patients with chronic kidney disease. They should not be used in combination and both are contraindicated in pregnancy. Source: Clarke SL. AmFP 2023[20]; 108(3):352-359 (Adapted)		

Recent studies also suggest that the new antidiabetic class of sodium-glucose co-transporter 2 inhibitors may offer a BP reduction in hypertensive patients, together with an important decrease in the incidence of cardiovascular and renal events in patients with type 2 diabetes mellitus. In the Empagliflozin Cardiovascular Outcomes and-Mortality in Type 2 diabetes (EMPA-REG OUTCOME) trial, the sodium-glucose co-transporter-2 (SGLT2) inhibitor empagliflozin reduced cardiovascular and renal events in type 2 DM, a result that was attributed in part to the small but sustained BP decrease throughout the trial. In this 2021 update, it was also noted that the accumulated evidence in the past few years clearly suggests that SGLT2-inhibitors have potent nephroprotective properties. In a recent paper published in 2021, Piperidou, Loutradis, and Sarafidis[22] noted that in clinical trials in patients with T2DM, SGLT-2 inhibitors were shown to reduce albuminuria and proteinuria by 30-50 percent and the incidence of composite heard renal outcomes by 40-50 percent.

Management of Hypertension in Diabetic Nephropathy: How Low?

A review by Sternlicht and Bakris, 2016[23] concluded that current data indicate that a blood pressure goal of less than 140/90 mmHg can optimally slow CKD progression in diabetic nephropathy. Blood pressure levels of less than 130/80 mmHg are indicated in those with an estimated GFR of less than 60 and more than 500 mg of urinary protein. However, the evidence is based exclusively on retrospective analysis and is weaker than the 140/90 mmHg goal.

5. CONTROL OF OBESITY

Obesity is one of the risk factors for the inception and progression of chronic kidney disease (CKD). Obesity directly leads to CKD as an independent risk factor as well as indirectly through increasing the risks for diabetes, hypertension, and premature atherosclerosis. A BMI or 30 or bigger increases the risk of renal disease and CKD (Chen et al, 2021).[24]

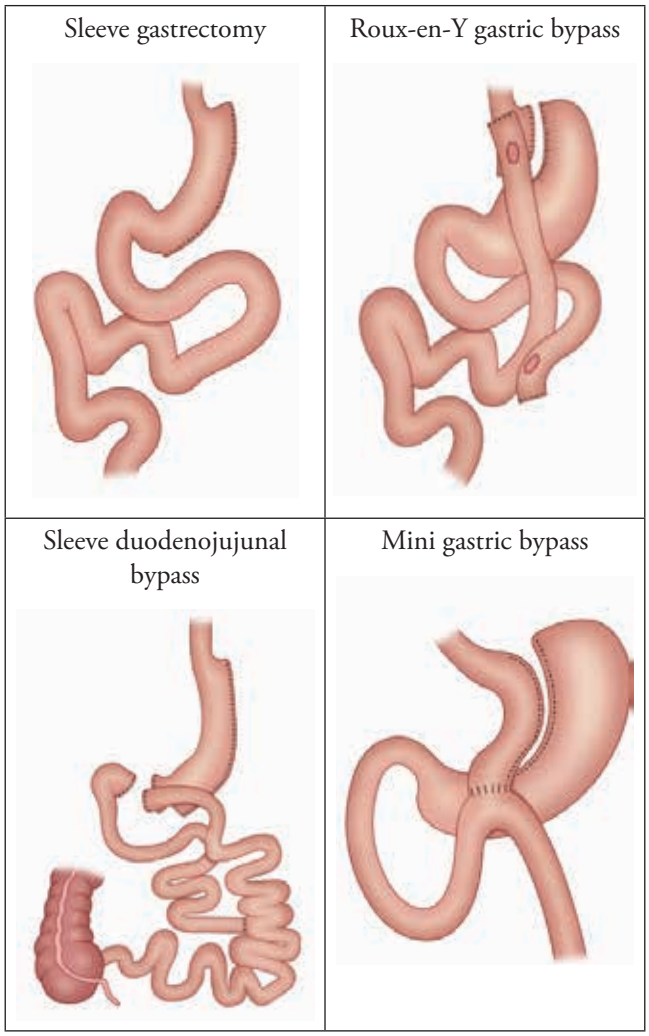
There is a rising prevalence of obesity in Singapore. Based on the National Population Health Survey 2020, people with a BMI of 30 and above have increased from 8 percent in 2013 to 10.5 percent in 2017. Obesity predisposes affected persons to cardiovascular disease and type 2 diabetes mellitus. The current treatment options are lifestyle modification, anti-obesity pharmacotherapy, and metabolic-bariatric surgery (Lee PC, Lim CH, Asokumar R, and Marvie Chua WJ, 2023).[25]

6. MEDICAL THERAPY AND METABOLIC BARIATRIC SURGERY (MBS)

MBS is found to be effective in treating diabetic kidney disease. Notwithstanding the effectiveness of state-of-the-art medical therapy (namely, renin-angiotensin-aldosterone system therapy, sodium-glucose co-transporter 2 inhibitor therapy, and the glucagon-like peptide-1 receptor agonist therapy), MBS is more effective in weight loss and reduction of metabolic complications of obesity on the kidney and the cardiovascular system (Friedman et al, 2022).[26]

A paper by Oh TJ, Lee HJ, and Cho MY on Asian perspectives in metabolic and bariatric surgery reported that the threshold of BMI values for metabolic and bariatric surgery (MBS) in East Asians is lower compared to European populations. MBS is considered when a BMI of 27.5 is reached and is recommended when a BMI of 32.5 or more is reached depending on the glucose homeostasis status. The most commonly done MBS in East Asia is sleeve gastrectomy (69 percent) and RYGB (10 percent). The main reason why RYGB is performed less frequently is likely due to the difficulty of endoscopic gastric cancer screening after the procedure. To overcome the limitation of gastric cancer screening and the relatively lower efficacy of sleeve gastrectomy, sleeve duddenojujunal bypass has been introduced and is frequently performed in Taiwan and Japan.[27] Refer to **Figure 3** for the types of MBS that may be done.

Figure 3. Types of Metabolic and Bariatric Surgery



Source: Oh TJ, Lee HJ, Cho YM. J Diabetes Investig 2022.[24]

DISCUSSION

With regards to BP definition, the current cutoff of 140/90 mmHg can be reduced to 130/80 to improve cardiovascular and renal outcomes as well as to reduce all-cause mortality.

The diagnosis of hypertension should no longer be based only on office BP readings alone but should be supplemented by ambulatory BP monitoring or home BP monitoring.

Hypertension in older patients should be treated to prevent worse outcomes, but individualisation is important. Older patients are heterogeneous in health status and deciding on the degree of control based on function categories is a necessary due process.

For non-diabetic patients, the presence of albuminuria from low-grade microalbuminuria needs to be treated. Adequate treatment of hypertension is needed to reduce proteinuria, prevent cardiovascular outcomes, and reduce all-cause mortality.

For diabetic patients, it is pertinent to note that hypertension is a major risk factor, and the co-existence of diabetes and hypertension increases the risk for cardiovascular disease fourfold compared to normotensive non-diabetic controls. A target of less than 140/90 mmHg should be applied to most patients.

Weight and obesity management through various strategies of healthy diet, exercise, weight control, smoking cessation, and reduced consumption of alcohol; use of SGLT2 inhibitors and GLP-1-receptor agonists; and metabolic and bariatric surgery singly and in combination has the potential to reduce the cardiovascular and renal consequences of obesity.

MBS by itself and together with the weight management strategies described above will be necessary for patients who are fit and able to benefit from such management.

CONCLUSION

The hypertension cutoff of 140/90 mmHg can be reduced to 130/80 mmHg to improve cardiovascular and renal outcomes as well as to reduce all-cause mortality. Hypertension in older patients should be treated to prevent worse outcomes but treatment should be individualised.

REFERENCE

1. Abdelhafiz AH, Marshall R, Kavanagh J, El-Nahas M. Management of hypertension in older people. Expert Rev Endocrinol Metab. 2018 Jul;13(4):181-191. PMID: 30063423.
2. Weber MA, Schiffrin EL, White WB, et al. Clinical practice guidelines for the management of hypertension in the community: a statement by the American Society of Hypertension and the International Society of Hypertension. J Clin Hypertens (Greenwich). 2014 Jan;16(1):14- 26. PMID: 24341872.
3. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. J Am Coll Cardiol. 2018 May 15;71(19):e127-e248. Erratum in: J Am Coll Cardiol. 2018 May 15;71(19):2275- 2279. PMID: 29146535.
4. Tay JC, Sule AA, Chew EK, et al. Ministry of Health Clinical Practice Guidelines: Hypertension. Singapore Med J. 2018 Jan;59(1):17-27. PMID: 29376186
5. Whelton PK, Flack JM, Jennings G, Schutte A, Wang J, Touyz RM. Editors' Commentary on the 2023 ESH Management of Arterial Hypertension Guidelines. Hypertension. 2023 Sep;80(9):1795-1799. PMID: 37354199.
6. Campbell PT, White WB. Utility of ambulatory blood pressure monitoring for the management of hypertension. Curr Opin Cardiol. 2017 Jul;32(4):365-372. PMID: 28306674.
7. Unger T, Borghi C, Charchar F, et al, 2020 International Society of Hypertension Global Hypertension Practice Guidelines. Hypertension. 2020 Jun;75(6):1334-1357. PMID: 32370572.
8. Pickering TG, White WB, American Society of Hypertension Writing Group. When and how to use self (home) and ambulatory blood pressure monitoring. J Am Soc Hypertens. 2008 MayJun;2(3):119-24. PMID: 20409893.
9. Siu AL, U.S. Preventive Services Task Force. Screening for high blood pressure in adults: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med. 2015 Nov 17;163(10):778-86. PMID: 26458123.
10. Liyanage-Don N, Fung D, Phillips E, Kronish IM. Implementing Home Blood Pressure Monitoring into Clinical Practice. Curr Hypertens Rep. 2019 Feb 12;21(2):14. PMID: 30747350.
11. Lin HJ, Wang TD, Yu-Chih Chen M, et al. 2020 Consensus Statement of the Taiwan Hypertension Society and the Taiwan Society of Cardiology on Home Blood Pressure Monitoring for the Management of Arterial Hypertension. Acta Cardiol Sin. 2020 Nov;36(6):537-561. PMID: 33235411.
12. Setia S, Subramaniam K, Teo BW, Tay JC. Ambulatory and home blood pressure monitoring: gaps between clinical guidelines and clinical practice in Singapore. Int J Gen Med. 2017 Jul 3;10:189-197. PMID: 28721085.
13. Correa A, Rochlani Y, Khan MH, Aronow WS. Pharmacological management of hypertension in the elderly and frail populations. Expert Rev Clin Pharmacol. 2018 Aug;11(8):805-817. PMID: 30004797.
14. Tanaka F, Komi R, Makita S, et al. Low-grade albuminuria and incidence of cardiovascular disease and all-cause mortality in non-diabetic and normotensive individuals. J Hypertens. 2016 Mar;34(3):506-12; discussion 512. PMID: 26820477.
15. Viazzi F, Cappadona F, Pontremoli R. Microalbuminuria in primary hypertension: a guide to optimal patient management? J Nephrol. 2016 Dec;29(6):747-753. PMID: 27417557.
16. Viazzi F, Muiesan ML, Schillaci G, et al. Changes in albuminuria and cardiovascular risk under antihypertensive treatment: a systematic review and metaregression analysis. J Hypertens. 2016 Sep;34(9):1689-97. PMID: 27254313.
17. Dhaybi OA, Bakris G. Mineralocorticoid antagonists in chronic kidney disease. Curr Opin Nephrol Hypertens. 2017 Jan;26(1):50-55. PMID: 27753685.
18. Persson F, Lindhardt M, Rossing P, Parving HH. Prevention of microalbuminuria using early intervention with renin-angiotensin system inhibitors in patients with type 2 diabetes: A systematic review. J Renin Angiotensin Aldosterone Syst. 2016 Aug 3;17(3):1470320316652047. PMID: 27488274.
19. Pavlou DI, Paschou SA, Anagnostis P, et al. Hypertension in patients with type 2 diabetes mellitus: Targets and management. Maturitas. 2018 Jun;112:71-77. PMID: 29704920.
20. Sarafidis PA, Alexandrou ME, Ruilope LM. A review of chemical therapies for treating diabetic hypertension. Expert Opin Pharmacother. 2017 Jun;18(9):909-923. PMID: 28480805.
21. Clarke SL. Hypertension in Adults: Initial Evaluation and Management. Am Fam Physician. 2023 Oct;108(4):352-359. PMID: 37843942.
22. Piperidou A, Loutradis C, Sarafidis P. SGLT-2 inhibitors and nephroprotection: current evidence and future perspectives. J Hum Hypertens. 2021 Jan;35(1):12-25. PMID: 32778748.

23. Sternlicht H, Bakris GL. Management of Hypertension in Diabetic Nephropathy: How Low Should We Go? Blood Purif. 2016;41(1-3):139-43. PMID: 26766168.
24. Chen Y, Dabbas W, Gangemi A, et al. Obesity Management and Chronic Kidney Disease. Semin Nephrol. 2021 Jul;41(4):392-402. doi: 10.1016/j.semnephrol.2021.06.010. PMID: 34715968.
25. Lee PC, Lim CH, Asokkumar R, Chua MWJ. Current treatment landscape for obesity in Singapore. Singapore Med J. 2023 Mar;64(3):172-181. PMID: 36876623.
26. Friedman AN, Petry TBZ, Aboud CM, Mendonca Dos Santos T, Roux CWL, Cohen RV. State-of-the-art Medical Therapy Versus Roux-en-Y Gastric Bypass Alone for Treatment of Early Diabetic Kidney Disease. J Ren Nutr. 2022 Nov;32(6):768-771. doi: 10.1053/j.jrn.2022.03.003. Epub 2022 Mar 31. PMID: 35367357.
27. Oh TJ, Lee HJ, Cho YM. East Asian perspectives in metabolic and bariatric surgery. J Diabetes Investig. 2022 May;13(5):756-761. PMID: 35029061.

LEARNING POINTS

- **For diagnosis and treatment of hypertension, the cutoff of 140/90 recommended in the MOH 2017 CPG on Hypertension can be reduced to 130/80 mmHg to improve cardiovascular and renal outcomes and to reduce all-cause mortality.**
- **Diagnosis of hypertension is no longer based only on office BP readings but should be supplemented by ABPM or HBPM.**
- **Hypertension in older patients should be treated to prevent worse outcomes and should be individualised.**
- **In non-diabetic patients, low grade microalbuminuria needs to be treated, and adequate BP control is needed to prevent cardiovascular outcomes and all-cause mortality.**
- **In diabetic patients, hypertension is a major risk factor, and the co-existence of diabetes and hypertension increases the risk for cardiovascular disease fourfold compared to normotensive non-diabetic controls. A target of less than 140/90 mmHg should be applied to most patients.**
- **Weight and obesity management reduces cardiovascular and renal consequences of obesity; metabolic and bariatric surgery (MBS) by itself and together with weight management will be necessary for patients who are fit and able to benefit from such management.**