>Statement of Objectives

After reading this lesson you will be able to:

1. Discuss prevalence rates of hypertension in the Canadian population.
2. Describe the current rate of control of hypertension in Canada.
3. Describe the benefit of controlling high blood pressure.
4. Review standard treatment algorithms as suggested by the Canadian Hypertension Society (CHS) and the rationale for those recommendations as well as new data which may affect them.
5. Discuss adherence rates for hypertension regimens and options for improving adherence.

>Instructions

1. After carefully reading this lesson, study each question and select the one answer you believe to be correct. Circle the appropriate letter on the attached reply card.
2. Complete the card and mail, or fax to (416) 764-3937.
3. Your reply card will be marked and you will be advised of your results in a letter from Rogers Publishing.
4. To pass this lesson, a grade of 70% (14 out of 20) is required. If you pass, your CEU(s) will be recorded with the relevant provincial authority(ies). (Note: some provinces require individual pharmacists to notify them.)

EP 1 CEU

Approved for 1 CE unit by the Canadian Council on Continuing Education in Pharmacy.

File # 971-0403

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HYPERTENSION AND ADHERENCE

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INTRODUCTION

HYPERTENSION OR HIGH BLOOD PRESSURE IS a common condition affecting a large section of the Canadian population. It is estimated to be the third leading risk factor associated with death worldwide and is one of the leading causes of visits to family physician offices.[1] Complications of hypertension include damage to the end organs including the heart, eyes, kidneys, brain and large vessels. As well, hypertension is an important risk factor for cerebrovascular disease, coronary artery disease and congestive heart failure, as well as renal failure and peripheral vascular disease. The probability of premature death from any of these causes increases with increasing systolic or diastolic blood pressure. Through the effective utilization of both nonpharmacologic and pharmacologic treatment, many of the complications of hypertension can be prevented.

Prevalence of Hypertension in Canada

Data from the Canadian Heart Health Survey, which assessed cardiovascular risk factors in a sample of 23,129 randomly selected, noninstitutionalized Canadian adults aged 18 to 74 years between 1986 and 1992, demonstrated that an estimated 4.1 million Canadians were hypertensive. Of the 22% of Canadians who were hypertensive, 42% were unaware of having hypertension, 19% were aware of being hypertensive and were not treated and were not controlled, a further 23% were treated but were not controlled, and only 16% were treated and controlled.[2]

Although more up-to-date Canadian data is not available, data from the NHANES trials in the United States indicate that awareness, treatment and control of hypertension has declined in the period of 1991-94 compared to the prior period of 1988-91 in the American population.[3] This data is consistent with that seen around the world indicating that fewer than 30% of patients with hypertension have blood pressure reduced to below 140/90 mm Hg.[4] In contrast to these findings, unpublished data suggests that there has been a significant increase in prescriptions dispensed in the major classes of antihypertensive agents in Canada. This increase in prescription volume coincides with the introduction of the annual recommendations of the CHS. This may reflect an improvement in treatment rates, however, whether the increased prescription volume actually indicates improved treatment remains unknown.[5]

Defining and Diagnosing Elevated Blood Pressure

Hypertension is generally defined as a persistent office blood pressure reading of 140 mm Hg or more for systolic blood pressure, or 90 mm Hg or more for diastolic blood pressure. Current Canadian recommendations indicate that hypertension may be diagnosed immediately if the patient is suffering a hypertensive urgency or emergency, after 3 visits in the

presence of target organ damage (damage to the eyes, heart, kidneys or vasculature) in clinically stable patients, and after 5 visits if no target organ damage is apparent and the initial blood pressure is less than 180/105 mm Hg.[6]

Impact of Hypertension and Benefits of Treatment

The risk of cardiovascular events increases across the continuum of both systolic and diastolic blood pressures without a clear threshold separating patients who will benefit from treatment and those who will not.[7] Although the absolute benefits of treatment vary widely depending on an individual's risk profile, the relative benefit of treatment (approximately 25-30% depending on the specific outcome considered) are similar regardless of baseline risk or pretreatment blood pressure at least for diastolic blood pressure in excess of 90 mm Hg.[8] A number of clinical trials and meta-analysis have demonstrated that compared with control groups, active treatment of hypertension generally produces a long-term difference of 5-6 mm Hg in diastolic blood pressure. With this reduction in diastolic blood pressure, the reduction in stroke incidence is approximately 35-40% and reduction in incidence of coronary heart disease 8-14%.[9] In a meta-analysis including recent trials including older adults (generally >70 years), up to a 50% reduction in stroke-related events and a 30-40% reduction in cardiovascular events was seen with a reduction in systolic blood pressure of 8-9 mm Hg.[10]

TREATMENT

THE CHS RECOMMENDATIONS PROVIDE GUIDance to practitioners in terms of when to initiate therapy and guidance in terms of types of therapy that should be offered. These recommendations are evidence-based and dependent on patient-specific variables. Regardless of pharmacologic therapy offered, all hypertensive patients should be offered advice on the nonpharmacologic management of hypertension. Pharmacotherapy may be considered following a trial of nonpharmacologic therapy or initiated concurrently with pharmacologic therapy, depending on the situations.[6]

Current indications for pharmacotherapy in adults under the age of 60 years are:

Consider prescription if:
- Sustained diastolic blood pressure of ≥90 mm Hg or
- Isolated systolic hypertension of ≥160 mm Hg and
- No other risk factors

Prescribe if:
- Target-organ damage or cardiovascular disease (CVD), or
- Concomitant diseases such as diabetes mellitus or
- Other cardiovascular risk factors

Prescribe if:
- Diastolic blood pressure readings average ≥100 mm Hg, regardless of other factors

In select populations, these recommendations differ slightly and are as follows :

In adults over 60 years of age prescribe if:
- systolic pressure ≥160 mm Hg
- diastolic pressure ≥105 mm Hg

In patients with diabetes without end organ damage, prescribe if:
- BP ≥140/90 mm Hg

In patients with diabetes with end organ damage, prescribe if:
- BP ≥130/80

GOALS OF TREATMENT

TREATMENT TARGETS AS RECOMMENDED BY THE CHS are dependant on characteristics of the patient. In those patients 18-80 years of age with elevated diastolic/systolic blood pressure, those patients 60-80 years old with isolated systolic blood pressure or

TABLE 1 Lifestyle Modifications to Prevent or Manage Hypertension[12]

Modification	Comments
Maintain ideal body weight	Blood pressure reduced by 1.6/1.1 mm Hg for each 1 kg of weight loss
Engage in aerobic physical activity (30-45 minutes each day, most days of the week)	May reduce blood pressure by as much as 13/8 mm Hg
Eat abundant fruits and vegetables and low-fat dairy products; reduce intake of saturated and total fats	May lower blood pressure by as much as 11.4/5.5 mm Hg after 8 weeks
Limit sodium intake to a maximum of 100 mmol per day (2.4 g of sodium or 6 g of sodium chloride)	May lower blood pressure by 3.7-4.8/0.9-2.5 mm Hg
Maintain adequate intake of dietary potassium (approximately 90 mmol per day)	
Maintain adequate intake of dietary calcium and magnesium	
Limit alcohol intake to a maximum of 30 mL per day (½ as much for women and those of low body weight)	
Stop smoking	

FACULTY HYPERTENSION AND ADHERENCE

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REVIEWERS
All lessons are reviewed by pharmacists for accuracy, currency and relevance to current pharmacy practice.

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TABLE 2 *Considerations in the individualization of antihypertensive therapy*[6]

Risk factor/disease	Initial therapy	Second-step therapy	Notes/cautions
Uncomplicated hypertension	Low-dose thiazide-like diuretics, beta blockers, ACE inhibitors or long-acting dihydropyridine calcium channel blockers	Combinations of first-line agents	Alpha blockers not recommended as initial therapy. Beta blockers are not recommended as initial therapy in those over age 60 years. Hypokalemia should be avoided by using K sparing agents in those prescribed diuretics
Isolated systolic hypertension	Low-dose thiazide-like diuretics, or long-acting dihydropyridine calcium channel blockers		Hypokalemia should be avoided by using K sparing agents in those prescribed diuretics
Diabetes mellitus with nephropathy	ACE inhibitors alternatively angiotensin II blockers	One or more of low-dose thiazide-like diuretics, cardioselective Beta blockers, long-acting calcium channel blockers	If the serum creatinine is >150 mmol/L a loop diuretic should be used as a replacement for a low-dose thiazide diuretic if volume control is required
Diabetes mellitus without nephropathy	ACE inhibitors	One or more of angiotensin receptor blockers, low-dose thiazide-like diuretics, cardioselective beta blocker, long-acting calcium channel blocker	
Diabetes mellitus without nephropathy with systolic hypertension	ACEI, alternatively, low-dose thiazide diuretic, long-acting dihydropyridine CCB		
Angina	Beta blocker (consider ACEI as add-on therapy)	Long-acting CCB	
Prior MI	Beta blocker and/or ACE inhibitor	Combinations of additional agents	
Past cerebrovascular accident or TIA	Strongly consider blood pressure reduction after the acute phase		Blood pressure reduction reduces recurrent cerebrovascular events
Renal disease	ACE inhibitors (diuretics as additive therapy)	Combinations of additional agents	Avoid ACE inhibitors if bilateral renal artery stenosis
Left Ventricular Hypertrophy (LVH)	Does not affect initial treatment recommendations	Does not affect initial treatment recommendations	Avoid hydralazine and minoxidil
Peripheral arterial disease	Does not affect initial treatment recommendations	Does not affect initial treatment recommendations	Avoid beta blocker with severe disease
Dyslipidemia	Does not affect initial treatment recommendations	Does not affect initial treatment recommendations	
Systolic dysfunction	ACEI (thiazide or loop diuretics, bb, spironolactone as additive therapy	ARB, hydralazine/isosorbide dinitrate, amlodipine	Avoid non-dihydropyridine CCB

those with chronic hypertension following a stroke, the goal of treatment is to achieve a blood pressure less than 140/90 mm Hg. In those patients with diabetes or nondiabetic nephropathy, the treatment goal is a blood pressure less than 130/80 mm Hg. In those patients with proteinuria greater than 1g/24 h, the treatment goal is less than 125/75 mm Hg.[6]

Nonpharmacologic Treatment Strategies

Nonpharmacologic strategies for blood pressure reduction and control include a healthy diet consistent with Canada's Guide to Healthy Eating, limitation of salt additives and foods high in salt, weight loss in those who are overweight, regular physical activity, low alcohol consumption and smoking cessation.[11] Table 1 indicates lifestyle modification therapies and benefit for select interventions.

Pharmacologic Management of Hypertension

Most antihypertensive drugs reduce blood pressure by 10-15%. Monotherapy is effective in about 30-50% of unselected

TABLE 3 Effective Combination Therapies

Column 1	Column 2
Low-dose thiazide	Beta blocker
Long-acting dihydropyridine CCB (nifedipine, felodipine, amlodipine)	ACE inhibitor

patients, however, as baseline blood pressure increases the need for more than one drug increases.[13] Despite the abundance of hypertension trials available, there have been few trials that compare the various pharmacologic classifications which have sufficient size and methodological rigor to indicate similarities or differences in morbidity and mortality. Thus, bodies providing recommendations to practitioners must weigh a multitude of trials in providing direction. Most often, the choice of therapy for a given individual is based on characteristics of that individual including age, disease state, race and other pathophysiologic characteristics. As well, another key consideration should include whether the agent has demonstrated an ability to reduce overall mortality. As compared with placebo, diuretics and beta-blockers have demonstrated reductions in stroke, coronary heart disease and total mortality in patients without pre-existing coronary heart disease (CHD), diabetes mellitus (DM) or proteinuruia.[14] ACE inhibitors, as compared to placebo, have demonstrated reductions in stroke, CHD, major cardiovascular events, death from cardiovascular cause and all-cause death.[15] Calcium-channel antagonists, as compared with placebo, reduce the risk of stroke, major cardiovascular events and death from cardiovascular causes.[15] Whether one drug is better than another in a clinical setting is somewhat unclear, however, a recent meta-analysis has suggested important differences.[16]

The CHS updates its treatment recommendations on an annual basis. These recommendations are based on a thorough review of all clinical trial evidence pertaining to the treatment of hypertension and provide evidence-based guidance to the clinician. The last complete set of recommendations reflects the 3rd year of publication of comprehensive recommendations.[6] It is anticipated that the 4th complete set of recommendations, which will include all clinical trial evidence available to the end of 2002 and labeled the 2002 Recommendations, should be released midsummer of 2003. As well as being well published in multiple professional health journals in Canada, these recommendations will be available in slide format on the CHS website at www.chs.md and are available to professionals and the public.

The current recommendations (2001 recommendations)[6] list as initial drugs for diastolic and combined systolic and diastolic hypertension: diuretics, long-acting dihydropyridine calcium channel blockers (nifedipine XL, felodipine SR, amlodipine) and angiotensin converting enzyme inhibitors. Beta-blockers are recommended as first-line therapy in those under but not over the age of 60 years, as these agents have demonstrated disappointing reductions in hypertensive morbidity and mortality in those patients over the age of 60. Alpha-blockers are not recommended as first-line therapy and short-acting calcium channel blockers are not recommended as antihypertensive agents. For isolated systolic hypertension, initial therapy recommendations include a low-dose thiazide-like diuretic or a long-acting dihydropyridine calcium channel blocker.

In people with DM, angiotensin-converting enzyme inhibitors are recommended as first-line therapy in all situations. Low-dose thiazide-like diuretics and long-acting dihydropyridine calcium channel blockers are recommended as alternative first-line agents in patients with isolated systolic hypertension. Angiotensin II receptor blockers are recommended as alternative first-line agents to angiotensin converting enzyme inhibitors in the presence of diabetic renal disease.

Table 2 provides considerations in initial therapy and second-step therapy as suggested by the Canadian Hypertension recommendations in patients with comorbid illnesses.

Until recently, the initial treatment of mild uncomplicated hypertension emphasized single-drug therapy with stepwise dose increases as the strategy of choice in initiating antihypertensive therapies. It was further recommended that patients switch to another drug class if the initially chosen drug was not effective or tolerated. The addition of a second,

TABLE 4 Contraindications and Side-Effects of Various Classes of Antihypertensive Agents[12]

Class	Contraindication	Side-Effects
Diuretics	Gout	Hypokalemia, hyperuriciemia, glucose intolerance, hypercalcemia (thiazides), hyperlipidemia, hyponatremia, impotence (thiazides)
Beta blockers	Asthma, chronic obstructive pulmonary disease, heart block	Bronchospasm, bradycardia, heart failure, impaired peripheral circulation, insomnia, fatigue, decreased exercise tolerance, hypertriglyceridemia
ACE inhibitors	Pregnancy, bilateral renal artery stenosis, hyperkalemia	Cough, angioedema, hyperkalemia, rash, loss of taste, leukopenia
Calcium channel blockers	Heart block (verapamil, diltiazem)	Headache, flushing, gingival hyperplasia, edema; short-acting CCBs may precipitate coronary ischemia
Alpha blockers	Orthostatic hypotension	Headache, drowsiness, fatigue, weakness, postural hypotension
ARBs	Pregnancy, bilateral renal artery stenosis, hyperkalemia	Angioedema (rare), hyperkalemia

TABLE 5 Actions to increase adherence with prevention and treatment recommendations[3]

Actions by Patients	Specific Strategies
Patients must engage in essential prevention and treatment behaviours. Decide to control risk factors. Negotiate goals with provider. Develop skills for adopting and maintaining recommended behaviors. Monitor progress towards goals. Resolve problems that block achievement of goals. Patients must communicate with providers about prevention and treatment services.	Understand rationale of treatment, importance of gaining control of blood pressure and gain patient commitment to therapy. Develop effective communication skills. Use reminder systems (dosettes, medication calendars, etc.). Use self-monitoring skills (home blood pressure monitoring). Develop problem-solving skills, use social support networks. Define own needs on basis of experience. Validate rationale for continuing to follow recommendations.
Actions by Providers	**Specific Strategies**
Providers must foster effective communication with patients. Provide clear, direct messages about importance of behaviour or therapy. Include patients in decisions about prevention and treatment goals and related strategies. Incorporate behavioural strategies into counselling. Document and respond to patients progress toward goals. Create an evidence-based practice. Assess patients compliance at each visit. Develop reminder systems to ensure identification and follow-up of patient status.	Provide oral and written instruction, including rationale for treatments. Develop skills in communication/counselling. Use tailoring and contracting strategies. Negotiate goals and a plan. Anticipate barriers to compliance and discuss solutions. Use active listening. Use telephone follow-up.

and if necessary a third agent, was recommended when higher or maximal doses of single-drug therapy failed to normalize blood pressure. More recently, combination drug therapy, including fixed, low-dose combination of two-drug components in the initial treatment of hypertension or the addition of a second drug instead of maximizing the dose of a single drug agent is being recommended by the International Society of Hypertension/World Health Organization (ISH/WHO),[17] the American Recommendations (JNC VI),[3] the CHS[6] and the British Hypertension Society (BHS).[18] The concept of multiple drug therapy has become increasingly important over time as a number of clinical trials have clearly demonstrated that single drug antihypertensive therapies result in blood pressure control in generally only 30-50% of patients and even less when more rigorous goals are sought such as in diabetic patients.[19] The utilization of combination therapy poses the benefit of higher rates of efficacy, lower adverse effect profiles and potentially greater rates of adherence.[20]

The CHS suggests initial therapy with a single agent. If only a partial response to monotherapy results, combination therapy should be used. Useful combinations include a thiazide diuretic or dihydropyridine calcium channel blocker with either an ACE inhibitor or a beta blocker. If blood pressure is still not controlled, or adverse effects arise, other classes of antihypertensive agents (such as alpha-blockers, angiotensin II receptor blockers, centrally-acting agents or nondihydropyridine calcium channel blockers) may be attempted.[6]

Table 3 provides guidance to clinicians in combining drug therapies. It is recommended that to gain additive hypotensive effect in dual therapy, an agent from column 1 should be combined with an agent in column 2.[6]

Multiple agents are recommended either as first-line or alternative agents for the management of hypertension. It is important that clinicians have a clear understanding of the agents available, their contraindications and their side-effects. When selecting an agent, these variables may play a significant role. Table 4 provides information pertaining to contraindications and side-effects for patients on the various classes of antihypertensive agents.

Hypertension guidelines change on a frequent basis depending on the clinical trial evidence available. Recently, a number of clinical trials have been published which may have an impact on the upcoming 2002 CHS recommendations. These trials have been designed to provide information pertaining to comparative effects between pharmacologic classes and have sufficient patient numbers to demonstrate differences in morbidity and mortality if differences exist.

The Losartan Intervention for Endpoint Reduction (LIFE) study was published in 2002 and demonstrated that losartan was more effective than atenolol in reducing the risk of stroke in the populations studied. This trial, in just under 10,000 patients between 55 and 80 years of age with evidence of left ventricular hypertrophy, is likely to result in changes to the Canadian Hypertension Guidelines. It is anticipated that angiotensin receptor blockers such as losartan will be recommended as initial therapy in patients with left ventricular hypertrophy. These agents will likely be added as first-line agents in patients with uncomplicated hypertension due to this trial.

The recently published Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT) is the largest randomized trial comparing several antihypertensive agents as initial therapy conducted to date. It demonstrated that in patients over the age of 55,

diuretic-based therapy was as effective as calcium channel blockers or ACE inhibitors in preventing major coronary events. Diuretic-based therapy was slightly more effective than CCBs in preventing heart failure and was more effective than treatment with ACE inhibitors in preventing stroke and heart failure. However, a consideration in this trial was the large proportion of African-Americans (35%) in whom ACE inhibitors are generally thought to be suboptimal.[21] This trial is likely to suggest that if possible, thiazide diuretics should be a component of the antihypertensive regimen of individuals able to take them.

The results of the Second Australian National Blood Pressure Study (ANBP2) were reported very recently. This study was designed to address the question of possible regimen-specific benefit with respect to the outcome of the treatment of hypertension in older subjects with hypertension who had had few previous cardiovascular events. This prospective, randomized, open-label study, with blinded assessment of endpoints conducted in 6,083 hypertensive individuals aged 65-84 years and followed for a median of 4.1 years, demonstrated that initiation of antihypertensive treatment involving ACE inhibitors in older subjects, particularly men, appeared to lead to better outcomes than treatment with diuretic agents, despite similar reductions in blood pressure.[22] This trial confirms data pertaining to the beneficial effects of ACE inhibitors on cardiovascular events seen in trials such as the Heart Outcomes Prevention Evaluation trial (HOPE)[23] and brought somewhat into question by the ALLHAT trial. Although the HOPE trial was not a hypertension trial, it demonstrated that in high-risk patients (those with a history of vascular disease or diabetes), randomization to an ACE inhibitor versus placebo decreased mortality over 5 years by 22%.

CURRENT RATES OF ADHERENCE

ADHERENCE MAY BE DEFINED AS THE EXTENT to which a patient's behaviour (in terms of taking medication) coincides with medical or health advice.[24,25] The term "adherence" is intended to be nonjudgmental – a statement of fact rather than of blame of the prescriber, patient or treatment. Adherence is a complex issue and is generally not well understood. Issues pertaining to adherence may be particularly critical in asymptomatic and chronic diseases such as hypertension and in older patients who are often prescribed many medications for a variety of medical reasons.[26] Numerous studies suggest that it has little relation to sociodemographic factors including age, sex, race, intelligence and education.[27,28] According to JNC VI, poor adherence to therapy remains a major therapeutic challenge contributing to the lack of adequate control in more than two-thirds of patients with hypertension.[3]

Nonadherence may begin with not having a prescription filled or refilled on schedule. Taking the incorrect dose, taking a dose at the wrong time, forgetting to take a dose or stopping a medication too early. Different patterns of underdosing, particularly as 2-3 day drug-free holiday or omissions are the most common form of medication nonadherence. The effects of missed doses on blood pressure depend on pharmacological parameters of the medication used. It is essential that pharmacists attempt to characterize patient behaviours regarding patient medication adherence and work with the patient to resolve suboptimal adherence issues.

Data suggests that adherence to antihypertensive therapies is generally less than 50% after one year and decreases with time.[29] Newer agents such as the ACE inhibitors, CCBs and ARBs have generally been reported to have higher rates of adherence than older agents.[30] In a recently reported, retrospective 5-year study utilizing the Saskatchewan Health Prescription Drug Database, it was demonstrated that the class of agents utilized to treat hypertension had a significant effect on persistence. Angiotensin II blockers had the highest persistence followed by ACE inhibitors, CCBs, beta blockers and diuretics. As has been seen in numerous other trials, persistence decreased as the time interval increased.[31]

Successful interventions that enhance adherence and lead to improved patient outcomes are primarily behavioural in nature. Patient knowledge is necessary but may not be adequate to improve adherence if action does not follow knowledge. In large clinical trials, extensive and continuous interventions as provided by multidisciplinary teams demonstrate improved adherence. JNC VI provided guidance to practitioners in terms of optimizing adherence. These recommendations are outlined in Table 5.

In improving adherence, simple changes such as simplifying dosage regimens may improve adherence.[32,33] Pharmacists who note lack of adherence may discuss issues with patients, and if regimen complexity is thought to be a cause of nonadherence, work with the prescriber to simplify the regimen. Studies of complex interventions involving provision of care at the worksite, special pill containers, counselling, reminders, self-monitoring, support groups and feedback and reinforcement, reported positive effects on both adherence and clinical outcomes in patients with hypertension.[34] When necessary and possible, pharmacists may work with patients to ensure appropriate reminder systems (medication calendars), packaging systems such as dosettes and support systems such as the patients' family and/or loved ones.

ROLE OF THE PHARMACIST

THE PHARMACIST IS WELL POSITIONED TO HELP aid in hypertension control. JNC VI in the United States suggested that "in particular, pharmacists should be encouraged to monitor patients' use of medications, to provide information about potential adverse effects, and to avoid drug interactions." JNC VI data demonstrates the role of pharmacists assisting with patient education, blood pressure monitoring, drug therapy management and compliance assessment.[35-38] Pharmacists should be playing a role in encouraging long-term adherence to antihypertensive therapy and notifying prescribers when patients discontinue therapy. By effectively talking to patients about the benefits of therapy in concrete terms, by sharing expectations of therapy and potential adverse effects of drugs along with anticipated actions with the patient, pharmacists can play a significant role in improving outcomes for hypertensive Canadians.

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QUESTIONS

1. Based on current Canadian data, it appears that hypertension affects:
a) less than 10% of Canadians
b) between 10 and 20% of Canadians
c) between 20 and 30% of Canadians
d) more than 30% of Canadians

2. Data appears to reflect that:
a) the rate of control of hypertension in Canada is better than it has ever been in the past.
b) the rate of control of hypertension may be improving.
c) utilization of antihypertensive drugs is increasing which may reflect improved control.
d) hypertension does not continue to be a significant public health issue.

3. Complications of hypertension include damage to all of the end organs EXCEPT:
a) heart
b) eyes
c) liver
d) large vessels

4. Hypertension is an important risk factor for all of the following EXCEPT:
a) cerebrovascular disease
b) diabetes
c) coronary artery disease
d) renal failure

5. Control of systolic blood pressure (or a 8-9 mm Hg reduction) results in:
a) Significant variability depending on an individual's risk profile
b) A similar benefit regardless of age, baseline blood pressure and risk factors
c) Approximately 15-50% reduction in events depending on the specific outcome considered
d) Benefit only in the elderly
e) a and c

6. Effective blood pressure treatment in patients at risk results in:
a. 5-6 mm Hg reduction in diastolic blood pressure decreases stroke-related mortality by 38%
b) 5-6 mm Hg reduction in systolic blood pressure decreases CHD-related mortality by 38%
c) 5-6 mm Hg reduction in diastolic blood pressure decreases CHD-related mortality by 38%
d) 5-6 mm Hg reduction in systolic blood pressure decreases stroke-related mortality by 38%

7. The Canadian Hypertension recommendations suggest initiating pharmacologic therapy in patients in all of the following situations EXCEPT:
a) blood pressure is repeatedly above 90 mm Hg diastolic and target organ damage exists
b) diastolic blood pressure readings average greater than 95 mm Hg regardless of other risk factors
c) diastolic blood pressure readings average ≥100 mm Hg regardless of other risk factors
d) in patients with diabetes without end organ damage if BP ≥140/90 mm Hg

8. Treatment targets, as recommended by the Canadian Hypertension Society, are:
a) Less than 140/90 mm Hg in those patients 18-80 years of age with elevated diastolic/systolic blood pressure, those patients 60-80 years old with isolated systolic blood pressure, or those with chronic hypertension following a stroke
b) Less than 130/80 mm Hg in those patients with diabetes or nondiabetic nephropathy
c) Less than 125/75 mm Hg in those patients with proteinuria greater than 1g/24 h
d. all of the above

9. Nonpharmacologic options for the treatment of blood pressure include:
a) smoking cessation
b) reduction in potassium intake
c) weight loss in those overweight individuals
d) complete abstinence from alcohol
e) a and c

10. Which of the following agents are NOT recommended as a first-line agent in the management of hypertension by the Canadian guidelines:
a) thiazide diuretics
b) beta blockers
c) ACE inhibitors
d) alpha blockers
e) calcium channel blockers

11. Appropriate initial therapy combinations include all of the following EXCEPT:
a) ACE inhibitors and thiazide diuretics
b) ACE inhibitors and calcium channel blockers
c) calcium channel blockers and thiazide diuretics
d) thiazide diuretics and beta blockers

12. Initial drug of choice for a patient with diabetes suffering from nephropathy is:
a) doxazosin
b) amlodipine
c) enalapril
d) atenolol

13. Mr. A.P. is a 63-year-old male construction worker who was recently diagnosed with hypertension following his admission to hospital for pneumonia. He tells you that his blood pressure is approximately 140/95 mm Hg. Which of the following agents would not be suitable alternatives for his blood pressure at this point?
a) beta blockers
b) calcium channel blockers
c) thiazide diuretics
d) ACE inhibitors

14. Mr. A.P. was initiated on an agent for his hypertension by his physician and 4 weeks later comes to see you to get his prescription refilled. While chatting with you, you notice that his dental hygiene has apparently taken a turn for the worse and that his gums seem to be rather prominent. The class of agents most likely to cause this are:
a) ACE inhibitors
b) calcium channel blockers
c) ARBs
d) diuretics

15. A year later, Mr. A.P. has undergone several changes to his blood pressure regimen, however he tells you that he still can't seem to get his blood pressure under control. He is frustrated and concerned about the possible negative health outcomes. In discussing this with him, you determine that he has never taken more than one agent at any given time for his blood pressure. You decide to recommend a combination product to A.P.'s physician, based on your discussion with him. Which of the following are included in your rationale to A.P.'s MD?
a) greater efficacy for combination products than single products
b) it is extremely common to require more than a single therapy to adequately control blood pressure
c) lower rates of side-effects if multiple agents are used at lower doses
d) all of the above

16. Recent trials that have helped elucidate the role of various hypertensive agents include all of the following EXCEPT:
a) ALLHAT
b) ANBP2
c) LIFE
d) TOMHS

17. Adherence rates to antihypertensive agents are thought to be less than which of the following rates at one year?
a) 80%
b) 70%
c) 60%
d) 50%

18. Provider strategies that have demonstrated benefit in improving adherence include all of the following EXCEPT:
a) Foster effective communication with patients
b) Provide clear, direct messages about importance of behaviour or therapy
c) Include patients in decisions about prevention and treatment goals
d) Threaten patients with impending death

19. Patient-specific strategies for enhancing adherence include all of the following EXCEPT:
a) Understand rationale of treatment, importance of gaining control of blood pressure
b) Use reminder systems (dosettes, medication calendars, etc.)
c) Use self-monitoring skills (home blood pressure monitoring)
d) Use self-will alone without other tools to control blood pressure

20. Potential roles for pharmacists in enhancing hypertensive outcomes include:
a) identifying patients at risk and referring them to their physician for assessment
b) working with the patient and the patient's physician to optimize non-pharmacologic and pharmacologic treatment plans
c) working with the patient to optimize adherence
d) all of the above

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Feedback on this CE lesson

1. Do you now feel better able to provide pharmaceutical care to patients with hypertension? ❑ Yes ❑ No
2. Was the information in this lesson relevant to your practice? ❑ Yes ❑ No
3. Will you be able to incorporate the information from this lesson into your practice? ❑ Yes ❑ No
4. Was the information in this lesson... ❑ Too basic ❑ Appropriate ❑ Too Difficult
5. Do you feel this lesson met its stated learning objectives? ❑ Yes ❑ No
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