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LEARNING OBJECTIVES

Upon successful completion of this lesson, you should be able to:

1. apply the information and key messages related to the management of uncomplicated hypertension as reviewed in the 2008 Canadian Hypertension Education Program (CHEP) recommendations
2. discuss the epidemiology, definitions and diagnosis of hypertension
3. recommend appropriate lifestyle modification for blood pressure (BP) prevention and management
4. develop individual patient care plans for uncomplicated hypertension management based on the understanding of target blood pressure and assessment of appropriate lifestyle and pharmacotherapy choices
5. educate patients on the proper use of a home monitoring blood pressure device
6. use strategies to assess and encourage patient adherence to lifestyle changes and taking medication

INSTRUCTIONS

1. After carefully reading this lesson, study each question in the post-test and select the one option you believe is the best answer. Although more than one option may be considered acceptable, only one option is the best answer.
2. To pass this lesson, a grade of at least 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.)

ANSWERING OPTIONS

- A. For immediate results, answer online at [www.pharmacygateway.ca](http://www.pharmacygateway.ca).
- B. Mail or fax the printed answer card to (416) 764-3937. Your reply card will be marked and you will be advised of your results within six to eight weeks in a letter from *Pharmacy Practice*.

Management of  
Uncomplicated  
Hypertension

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At the very least, one in five patients seen by the pharmacist is likely to have high blood pressure.<sup>1</sup> Additionally, blood pressure increases with age to the extent that 50% of patients over age 65 have hypertension (HTN).<sup>2</sup> For those who are normotensive at age 55, 90% will develop hypertension within their remaining years.<sup>2</sup>

The consequences of uncontrolled HTN can be devastating. On its own, high blood pressure damages the lining of the arteries, accelerating the atherosclerotic process. For those aged 40-70, the risk of cardiovascular disease (CVD) doubles for every 20 mmHg increase in systolic blood pressure (SBP) and 10 mmHg increase in diastolic blood pressure (DBP).<sup>3,4</sup> Recognized internationally as a leading cause of death,<sup>5</sup> uncontrolled hypertension can lead to heart failure (HF), coronary artery disease (CAD), stroke, renal disease, hypertensive retinopathy and peripheral artery disease (PAD) (all referred to as “target organ damage”).<sup>3,4,6</sup>

On a more positive note, substantial evidence shows early treatment and aggressive BP control can significantly reduce the risk of the above outcomes. As one example, controlling hypertension can cut the risk of HF by about 50%.<sup>3,4,6</sup>

Despite this awareness and effective anti-hypertensive therapy, 60-70% of HTN cases remain uncontrolled.<sup>3,7</sup> Two likely reasons are inadequate management and lack of patient adherence. Pharmacists see patients five times

more often than any other health professional and are uniquely situated to help educate and monitor those with high blood pressure.

This lesson focuses on managing uncomplicated hypertension (also called HTN “without compelling indications” or “comorbidities”), with a view to preventing target organ damage. Much of the content is based on recommendations from the Canadian Hypertension Education Program (CHEP). This group of > 50 multidisciplinary experts provides evidence-based recommendations on a yearly basis. Key messages from their 2008 report are included in this article, and full recommendations may be found online.<sup>1,2,5,8</sup>

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**table 1**

Blood pressure classification (mmHg) <sup>3,5</sup>			
Classification	Systolic		Diastolic
normal	< 140	and	< 90
high-normal	130-139	or	85-89
grade 1 hypertension	140-159	or	90-99
grade 2 hypertension	≥ 160	or	≥ 100
isolated systolic hypertension	≥ 160	and	< 90

## Diagnosis

Hypertension is diagnosed as SBP ≥ 140 mmHg and/or a DBP ≥ 90 mmHg (i.e., 140/90).<sup>5</sup> (Table 1) Diagnosis is relatively rigorous in order to prevent erroneously labeling an individual with HTN. When a person has a blood pressure (BP) reading of 140/90 or greater, he or she should schedule a doctor visit for initial assessment. Depending on BP and evidence of target organ damage, official diagnosis can take between two and five office visits. For example, readings of 160/100 or greater, averaged over three visits, confirms HTN. Lower readings of 140/90–159/99 are averaged over five visits before a HTN diagnosis is made.<sup>5</sup>

High-normal BP affects one in five Canadians and 60% of those will develop HTN within a four-year period.<sup>1</sup> Although not a disease per se, it alerts patients and healthcare providers that preventative measures (i.e., increased monitoring and lifestyle changes) are needed to stop its progression.<sup>1,3,9</sup>

## SYSTOLIC VS DIASTOLIC BLOOD PRESSURE

For years doctors focused primarily on DBP, with the theory that the body could tolerate occasional increases in SBP.<sup>10</sup> It is now known SBP is at least as important as DBP, and an even more accurate predictor of mortality and CVD than DBP in those over age 50.<sup>4,10,11</sup> This highlights the importance of reaching target pressures with both DBP and SBP. Some patients still believe “only the bottom number” is important, and should be corrected when needed.

Isolated systolic hypertension (ISH) occurs in about 2/3 of hypertensive patients over age 65.<sup>12</sup> As the name implies, SBP is relatively high, with a normal or low DBP. ISH results primarily from an age-related decrease in elasticity of the large arteries, sometimes extending to the aorta.<sup>11-13</sup> Also contributing to the wider gap between SBP and DBP, SBP tends to increase gradually with age, while DBP tends to stabilize or decrease after age 55-60.<sup>12</sup>

**table 2**

Tools and resources for hypertension	
<b>Dietary Approaches to Stop Hypertension (DASH)</b>	A validated and highly recommended dietary plan for preventing and treating high blood pressure. Includes healthy recipes. Downloadable (65-page pdf), read online, or available through bookstores. <a href="http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf">http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf</a> (accessed October 2008)
<b>Blood Pressure Canada*</b>	Blood Pressure Information Lifestyle Choices: focus is details about sodium needs and food-related content. Links to more information on the role of sodium in hypertension. <a href="http://hypertension.ca/bpc/blood-pressure-information/lifestyle-choices/">http://hypertension.ca/bpc/blood-pressure-information/lifestyle-choices/</a> (accessed August 2008)
<b>Pharmacy Practice</b>	Management of Adult Obesity: applies recommendations from the Canadian Clinical Practice Guidelines for the Management of Obesity in Adults and Children <sup>15</sup> to a pharmacy setting. Provides safe and practical suggestions for altering calorie intake, physical activity, lifestyle habits and behavioural modification. Has graduated health risks for BMIs and waist circumferences, as well as links to 9 other weight loss sites, including Canada's Food Guide (2007), Canada's Physical Health Guide, Dietitians of Canada, and multiple tools to help patients meet their weight loss goals. <a href="http://www.pharmacygateway.ca/pdfs/CE/2008/ce_ppractice_july08.pdf">www.pharmacygateway.ca/pdfs/CE/2008/ce_ppractice_july08.pdf</a> (accessed November 2008)
<b>Blood Pressure Canada*</b>	Hypertension 2008 Public Recommendations: a version of CHEP's 2008 recommendations designed for patient and public education. Excellent review of most patient-related information, especially benefits and lifestyle. Downloadable, or bulk orders (> 24 copies) via <a href="mailto:hyperten@ucalgary.ca">hyperten@ucalgary.ca</a> . <a href="http://hypertension.ca/bpc/wp-content/uploads/2008/02/2008publicrecommendations.pdf">http://hypertension.ca/bpc/wp-content/uploads/2008/02/2008publicrecommendations.pdf</a> (accessed August 2008)
<b>Heart and Stroke Foundation</b>	Blood Pressure Action Plan (BPAP): Outstanding interactive tool to assess BP risk and follow-up. Starts with 26 clearly presented questions (taking 5-7 minutes) including demographics and risk factors which culminate to a personalized “action plan.” The latter provides detailed risk management tips with multiple links to tools and more information (e.g., answering ‘yes’ to smoking gives practical steps for stopping plus links to six tools and related sites). Even checking a non-hypertension disorder (e.g., depression) provides links to that disease. A “must-do” for all adults (including pharmacists) and those with hypertension. <a href="http://www.thecustomersmind.com/heartstroke/survey.asp">www.thecustomersmind.com/heartstroke/survey.asp</a> (accessed November 2008)
<b>Canadian Hypertension Society*</b>	Devices/Endorsements: brief introduction to home BP monitors with up-to-date listing and pictures of CHS approved machines. <a href="http://www.hypertension.ca/chs/deviceendorsements/devices-endorsed-by-chs/">www.hypertension.ca/chs/deviceendorsements/devices-endorsed-by-chs/</a> (accessed October 2008)
<b>World Hypertension League*</b>	Coordinators of yearly World Hypertension Day (May 17). Downloadable 2008 poster and brochure on home BP measurement. Theme for 2009 is Salt and Hypertension. Also materials for patients (e.g., Cardiovascular Risk Factors: The Importance of Controlling Them). Many journal and scientific articles for health professionals. <a href="http://www.worldhypertensionleague.org/Pages/Home.aspx">www.worldhypertensionleague.org/Pages/Home.aspx</a> (accessed October 2008)

\* Suggestion: These sites have considerably more patient and health professional information. Go to Home Page and explore.

Regardless of the initial blood pressure, all hypertensive patients should be “treated to target.” This simply means the goal of treatment is to reduce and maintain BP at a normal level (i.e., office-based readings less than 140/90 and for those with diabetes or chronic kidney disease, less than 130/80).<sup>1</sup>

## Treatment

The treatment of hypertension is two-fold: lifestyle management, as needed, and pharmacological therapy.

### LIFESTYLE MANAGEMENT

Lifestyle management is central to the control of HTN. Pharmacists don't always counsel patients on lifestyle modification but there are at least three reasons a healthy lifestyle should be viewed—and reviewed—as a critical component of HTN management: **1)** in

patients with high-normal blood pressure, lifestyle changes can prevent progression to HTN; **2)** on its own, lifestyle management may be all that lower BP level hypertensive individuals need; and **3)** for those who require pharmacotherapy, fewer medications and/or doses may be needed for BP control.<sup>1,2,4,5</sup> The latter should be particularly appealing to patients.

Like many other conditions, lifestyles that favorably affect blood pressure include healthy weight, healthy diet, regular physical activity, limited alcohol (often an unrecognized cause of BP elevation) and reduced sodium.<sup>5,8,14</sup> For all factors, the pharmacist should provide specific counselling to any patient who falls outside any lifestyle parameters. Table 2 provides a number of useful resources for this activity, while Table 3 details CHEP recommendations plus illustrates BP advantages for each lifestyle modification. The latter pro-

**table 3**

Lifestyle management and possible BP reductions		
Goal	Recommendation <sup>5</sup>	SBP/DBP Change (mmHg) with: <sup>14,a</sup>
<b>Healthy Diet</b>	Adopt a diet of fruits, vegetables, low-fat dairy products, dietary and soluble fiber, whole grains, and plant-source protein reduced in saturated fat and cholesterol (DASH diet) <sup>b</sup>	DASH diet hypertensive: -11.4/-5.5 normotensive: -3.0/-2.1
<b>Healthy Weight</b>	Aim for BMI = 18.5–24.9, and a healthy waist circumference for race and gender (e.g., less than 102 cm and less than 88 cm for Caucasian men and women respectively) <sup>5,15</sup>	per kg lost (based on 5000 overweight or obese patients) -1.1/-0.9
<b>Physical Activity</b>	Add 30–60 minutes moderate-intensity dynamic (aerobic) physical activity (e.g., brisk walking, jogging, cycling, swimming) 4–7 days/week to activities of daily living.	120–150 min/week hypertensive: -4.9/-3.7 normotensive: -4.0/-2.3
<b>Reduced Sodium</b>	Prevention: limit to <2300 mg/day <sup>b</sup> Treatment: limit to 1495–2300 mg/day	maximum 1800 mg/day hypertensive: -5.0/-2.7 normotensive: -2.0/-1.0
<b>Limited Alcohol</b>	Follow low-risk drinking guidelines of no more than 2 standard drinks/day, no more than 14 standard drinks/week for men and no more than 9 standard drinks/week for women. <sup>c</sup> (N/A if told “no alcohol”)	reduction from 3–6 to 1–2 drinks/day hypertensive: -3.9/-2.4 normotensive: -3.6/-1.8

Note: Smoking doesn't raise BP chronically but should be stopped for overall cardiovascular risk reduction. BMI = body mass index; DASH = Dietary Approaches to Stopping Hypertension; DBP = diastolic blood pressure; N/A = not applicable; SBP = systolic blood pressure  
<sup>a</sup> combining two or more lifestyle changes is likely to achieve even better results<sup>3</sup>  
<sup>b</sup> similar to Health Canada's Food Guide in composition,<sup>14</sup> and sodium content<sup>5</sup>—available at [www.hc-sc.gc.ca/fn-an/food-guide-aliment/index\\_e.html](http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/index_e.html)  
<sup>c</sup> one “standard drink” = approximately 12 oz 5% beer, 5 oz 12% wine; 1.5 oz 40% spirits (i.e., 17.2 ml ethanol)<sup>5</sup>

vides “hard” numbers which are often more meaningful to patients.

Readers are particularly referred to weight control. It is well known that weight gain and obesity (especially abdominal obesity) are strong independent risk factors for hypertension,<sup>4,5,15</sup> and an estimated 60% of hypertensive patients are more than 20% overweight.<sup>4,7</sup> CHEP recommendations for body mass index (BMI) and waist circumference (which measures abdominal obesity) fall into “normal” or “least risk for health problems” categories, respectively.<sup>15</sup>

Patients may be surprised at how little weight they need to lose to reduce BP. Adding regular physical activity facilitates weight loss and decreases blood pressure on its own.<sup>4,5</sup> There are many ways pharmacists can help patients achieve weight loss goals, and readers are referred to a recent article on this topic.<sup>16</sup> (Table 2)

Dietary sodium deserves special mention, underscored by the fact that about 30% of Canadians have hypertension because they consume too much salt<sup>17</sup>—currently about 3500 mg/day.<sup>18</sup> According to Health Canada, sodium intake of 1200–1500 mg/day is “adequate” for adults, and an intake of 2300 mg/day is the “tolerable upper limit” for health (meaning this is the most one should consume in any given day without possible harm).<sup>19</sup> These numbers are certainly in line with CHEP recommendations for safety, and hyper-

tension prevalence is estimated to decrease by 30% if Canadians reduce their average sodium intake by 1800 mg/day (i.e., from 3500 mg/day to 1700 mg/day).<sup>18</sup>

Decreasing sodium is easier said than done. Many hypertensive patients already eliminate table and cooking salt. Unfortunately, about 80% of dietary sodium is added to food in processing, so fast foods, restaurant food, and/or processed foods can add significant amounts of sodium to a person's diet without their knowledge.<sup>18</sup> One suggestion is to avoid processed foods and drinks with > 400 mg sodium/portion.<sup>20</sup> An immediate 50% sodium reduction is usually unpalatable, while gradual reduction (e.g., 10% at six-week or longer intervals) tends to be more acceptable.<sup>18</sup> A sodium-related precaution is the use of potassium chloride as a salt substitute in patients who take a potassium supplement, potassium-sparing diuretic, angiotensin receptor blocker (ARB) or angiotensin converting enzyme inhibitor (ACEI) to avoid adding to the potential for hyperkalemia.<sup>21</sup> (see below)

An important footnote to all of the above is that lifestyle modification should be continued throughout hypertensive therapy, whether or not the patient is taking medication. A recent Harris poll found numerous misconceptions in this regard, with 40–70% of respondents believing they could discontinue various lifestyle changes (e.g., reduced alcohol consumption) once they started pharmacotherapy.<sup>7</sup>

**PHARMACOTHERAPY**

When lifestyle measures fail to achieve target blood pressures, or if the need for blood pressure-lowering is required more immediately, antihypertensive drugs are prescribed. Figure 1 shows the drug classes recommended by CHEP for managing uncomplicated systolic-diastolic hypertension.

Considerable variation exists in individual responses to different classes of antihypertensive agents. Selection of an antihypertensive, whether as monotherapy or in combination, needs to consider parameters such as age, severity of HTN, other CVD risk factors, and drug-drug and drug-disease interactions. Agents that are convenient to take and associated with minimal side effects should also be used whenever possible.<sup>3,4,6</sup>

**Uncomplicated diastolic-systolic hypertension**

*Thiazide diuretics* have long been a mainstay of antihypertensive therapy, and numerous studies continue to show their value in lowering blood pressure.<sup>4,20,21</sup>

These agents work in two ways—by increasing sodium excretion and by independent hypotensive activity from direct arteriolar dilation.<sup>25</sup> Their ease of use, low cost and relative efficacy and safety make low-dose thiazides a popular starting point for treating HTN.

Some clinicians are reluctant to use thiazides out of concern for increased risk of hyperglycemia and/or new-onset diabetes. But lower dose thiazides are less likely to cause metabolic effects (e.g., hydrochlorothiazide maximum of 50 mg/day, starting with 25 mg/day and 12.5 mg/day in the elderly).<sup>4,22</sup> Hypokalemia can also cause glucose intolerance, so patients' potassium levels should be monitored and consideration given to prophylactically adding a potassium supplement or potassium-sparing diuretic.<sup>22</sup>

Few studies have compared ACEIs and ARBs in uncomplicated HTN. However, a recent review supports the thinking that they are roughly equivalent in efficacy.<sup>23</sup> With respect to adverse effects, ACEIs have consistently shown a greater risk of dry cough (approximately 15% of patients) than ARBs.<sup>24</sup> Especially when higher doses are used, a particular concern is the propensity of both agents to cause hyperkalemia.<sup>24</sup> Patients should be monitored regularly, with extra precaution if they are taking, or have been prescribed, a potassium supplement, potassium-sparing diuretic, or an ACEI/ARB combination. They should also be asked about herbal remedies as a number of these are a hidden source of potassium.<sup>24</sup>

*Calcium channel blockers (CCBs)* are a heterogeneous group of drugs comprised of dihydropyridine derivatives (e.g., nifedipine)

and nondihydropyridine derivatives (e.g., diltiazem, verapamil).<sup>4,25</sup> The former are typically used in HTN as they have greater vasodilator activity than the latter, which act primarily on cardiac conduction pathways.<sup>25</sup> Both are metabolized via CYP 3A4 and are therefore subject to numerous potential drug interactions. Two of note are grapefruit juice, which patients should be advised to completely discontinue, and St. John's wort, which the pharmacist may or may not know a patient is taking.<sup>25-27</sup>

**Beta-blockers** (BBs) lower blood pressure by decreasing cardiac output due to reducing heart rate and contractility. Other proposed mechanisms include decreased sympathetic outflow from the CNS and inhibition of renin release.<sup>4,23,29</sup> There appears to be no difference in antihypertensive activity between cardioselective and nonselective agents.<sup>4</sup> A reminder that cardioselectivity decreases with increasing doses—for example, bronchoconstriction is more likely with metoprolol doses > 100 mg daily.<sup>23</sup>

BBs are not recommended for uncomplicated HTN in patients over age 60, due to the fact they reduce cerebrovascular events to a lesser extent than other BP lowering drugs in older patients.<sup>30</sup> This recommendation stands to reason, given the pathophysiology of HTN in older individuals (see ISH) and the way BBs work to lower BP. This efficacy, or lack thereof, is supported by a relatively recent meta-analysis of 21 placebo-controlled clinical trials involving nearly 146,000 patients, which found BBs to be a reasonable choice for younger hypertensive patients, but the risk of stroke secondary to uncontrolled HTN significantly higher in older individuals.<sup>13</sup> This recommendation relates only to efficacy, and applies only to uncomplicated HTN. In general terms, BBs don't harm older adults and are still strongly indicated for comorbidities such as angina, post-MI, and/or HF, even when a patient also has HTN.<sup>30</sup> In other words, a patient being treated with a BB for other reasons can continue that therapy, but is likely to require a different class of drugs for BP control.

Remember that when stopping (or switching) a BB, gradual withdrawal is needed. Downtitration timing depends on which BB is being withdrawn, but tapering should be to the lowest dose for at least one week before discontinuation. Close observation for rebound HTN or "unmasking" of CAD and myocardial ischemia is also advised.<sup>29-33</sup>

### Isolated Systolic Hypertension

Figure 2 shows the ISH CHEP recommendations as a thiazide diuretic, ARB and/or long-acting dihydropyridine CCB. Beta-blockers are not included as most individuals with ISH are over age 60. ACEIs are also excluded, possibly because few if any good randomized trials had

**table 4**

### Medications that may induce or aggravate hypertension<sup>\* 4,5,5,4</sup>

• oral contraceptives
• corticosteroids and anabolic steroids
• sympathomimetics/decongestants
• nonsteroidal anti-inflammatory drugs including cyclooxygenase -2 (COX 2) inhibitors
• cocaine
• amphetamines
• erythropoietin and analogues
• monoamine oxidase inhibitors
• cyclosporine, tacrolimus
• midodrine
• licorice
• over-the-counter supplements (e.g., ephedra, ma huang, bitter orange)
<small>*not exhaustive; other drugs may induce or aggravate hypertension</small>

shown benefit from this class of drugs in older individuals. Thiazide diuretics are especially effective in the elderly and their effect, as well as that from CCBs, appears to be enhanced in many older patients with ISH.<sup>12</sup> Concerns about pharmacotherapy in the very old may be unfounded.<sup>34</sup> A recent study of patients over age 80 with ISH presented overwhelming results in terms of all-cause mortality, to the point the study had to be prematurely discontinued.<sup>35</sup> As pointed out in an accompanying editorial, many patients can be safely treated during their remaining lifetime.<sup>36</sup>

### Combination therapy

A key CHEP 2008 message is that, for newly diagnosed patients, two first-line drugs may be combined for initial treatment of HTN if SBP is 20 mmHg or more above target or DBP is 10 mmHg or more above target.<sup>8</sup> The rationale for this recommendation lies with the fact that, in most single-agent studies, a typical BP decrease is 12-15/8-10 mmHg.<sup>4</sup> As such, it's unlikely the above BP levels would be adequately controlled with a single drug.<sup>3,20</sup> Equally, for most agents, BP reduction at half-standard doses is only about 20% less than at standard doses. Appropriate combinations of agents at these lower doses may have additive, or almost additive, effects on blood pressure, with a lower incidence of side effects.<sup>3,4</sup> Still, one precaution is when a substantial fall in BP may be more likely, or more poorly tolerated<sup>5</sup>—for example, the elderly (especially those with ISH), diabetics and those taking venodilators.<sup>3</sup> Ways to help reduce this out-

come include avoiding volume depletion and rapid dose titration.<sup>3</sup>

Regardless, most patients will eventually require more than one drug to achieve blood pressure goals.<sup>1</sup> It's generally recommended to add a second antihypertensive that complements the first. For example, based primarily on the manner in which they lower BP, typical combinations are a thiazide or CCB with a BB, ACEI or ARB.<sup>5</sup> Having said that, pharmacists are likely to see other combinations, especially if there are compelling indications.

One combination that should be avoided is a BB with a nondihydropyridine CCB, due to the likelihood of additive suppression of the sinoatrial and/or atrioventricular nodes, with subsequent risk of bradycardia and heart block.<sup>25,30</sup>

When patients have a poor response to therapy, possible reasons need to be considered. From a pharmacy perspective, these minimally include possible drug-induced increases in BP (Table 4), proper home BP monitoring and adherence to therapy.

### Home blood pressure monitoring

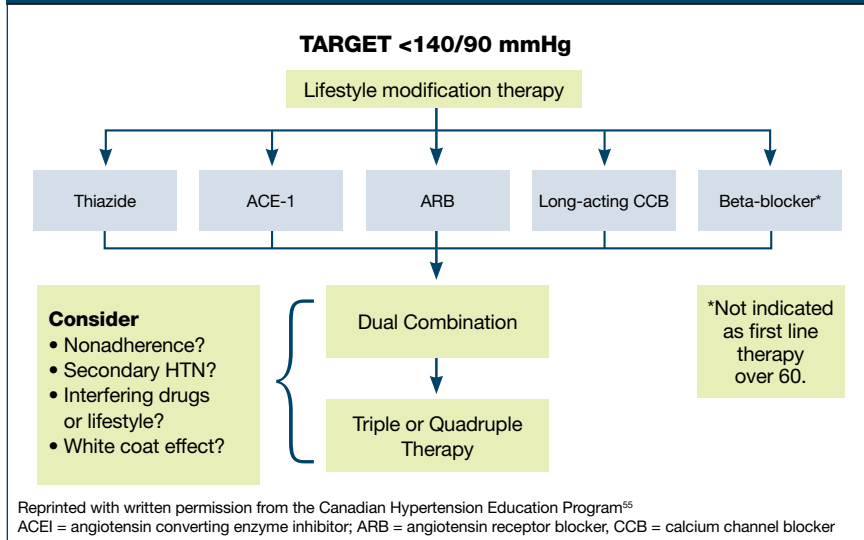
The main 2008 CHEP theme is "the need to encourage assessment of home blood pressure in all appropriate hypertensive adult Canadians."<sup>38</sup> Home-based BP seems to be a stronger predictor of target organ damage, cardiovascular events and morbidity than office-based readings.<sup>3,7</sup> This may be due to the fact that home BP monitoring is more likely to identify both white coat and masked HTN.<sup>5</sup> Greater patient involvement in care may also improve treatment and control, along with adherence.<sup>37,38</sup> With respect to the latter, some patients react very positively to immediate feedback, with the feeling of empowerment helping to improve their lifestyle and medication-taking behaviour.

Pharmacists are likely to see more requests for blood pressure monitors, and to continue helping patients select an appropriate monitor, as well as train (or retrain) them to properly assess BP.<sup>5</sup> A number of resources have been prepared by CHEP and associated organizations for this purpose. One example is Table 5 which lists brief instructions for patients to measure BP at home.

A starting point is for the patient to have a validated BP machine. Ideally, patients should buy one that has been approved by the Canadian Hypertension Society (CHS). These should have the words "recommended by the Canadian Hypertension Society" on the packaging, with or without the CHS logo (heart with a check mark).<sup>39</sup> Additionally, or coincidentally, machines that meet standards of the following may be used: Association for the Advancement of Medical Instrumentation,

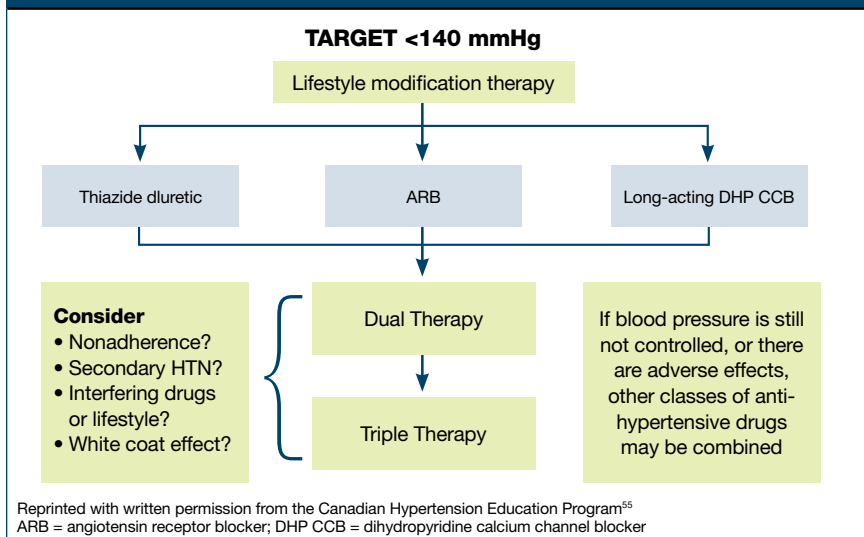
**figure 1**

**Treatment of Systolic-Diastolic Hypertension without Other Compelling Indications**



**figure 2**

**Treatment of Isolated Systolic Hypertension without Other Compelling Indications**



British Hypertension Society protocol, or the International Protocol for validation of automated BP measuring devices.<sup>5</sup> Fingertip monitors have been found to be inaccurate and are no longer recommended.<sup>3</sup> This raises the point that some patients may be using a BP device purchased prior to the CHEP guidelines. In this case, the pharmacist may need to encourage the purchase of an updated machine. A link to a list of CHS-approved machines is found on Table 2.

People are more likely to follow instructions

if they understand their rationale and at least some points in Table 5 may need supplemental explanation. One example is cuff size, where the cuff should surround at least 80% of the arm circumference.<sup>40</sup> If a cuff is too small, BP tends to be overestimated and if too large, underestimated, with the magnitude of error as great as 30%.<sup>41</sup> To test circumference, patients should be able to slide one finger between the cuff and their arm. Cuff placement is the upper arm and, for length, the lower edge should be one inch (2.5 cm) above the elbow.<sup>4,40</sup>

One challenge is patients whose upper arms are larger than available arm cuff sizes (e.g., very obese patients). In these cases, a wrist monitor may be needed, as wrist diameter is rarely affected by obesity.<sup>4</sup> These are convenient, but tend to be more expensive and may not be as accurate as arm cuff monitors.<sup>3</sup>

Many other factors can affect BP readings, including exercise, muscle tension, talking and background noise.<sup>40</sup> It is for these reasons that a rest period is important before BP measurements. CHEP recommends five minutes for rest and relaxation,<sup>2</sup> but the optimal time may still be undefined. For example, a relatively recent study suggests a 10-minute rest period may improve precision and accuracy.<sup>42</sup> At the very least, this finding underscores the importance of emphasizing a full five-minute rest period.

Caffeine or nicotine may also alter the accuracy of BP readings. A recent review found that caffeine can elevate BP by as much as 15 mmHg/13 mmHg, increasing BP levels within 30 minutes, peaking between one to two hours and lasting for four or more hours.<sup>43</sup> But the effect of caffeine is different for each person, so individuals can either measure their BP before caffeine ingestion, wait a couple of hours after ingestion, and/or record their caffeine intake relative to BP measurement. Nicotine is somewhat similar, but a 30-minute wait is acceptable. Smoking a cigarette can raise BP acutely but the level generally returns to base within about 15 minutes.<sup>3</sup>

Posture also affects blood pressure—increasing from lying to sitting or standing. But in most people, as long as the arm is placed correctly, using any one of these positions is unlikely to lead to significant error.<sup>40</sup> Arm position on the other hand is critical, where the arm in which BP is being measured should be supported, horizontal, and placed at the level of the heart. BP tends to be higher in an unsupported arm. A level lower than the heart can overestimate BP while a level higher than the heart can underestimate BP, both by as much as 10 mmHg in systolic and diastolic BP.<sup>41</sup> An unsupported back and crossing the legs may also increase BP.<sup>40</sup>

One reason for home measuring on opposite ends of the day is that BP tends to be higher in the early morning, soon after waking, while nighttime BP is generally 10–20% lower than daytime readings.<sup>4</sup> Patients should be made aware of this difference so they don't become unduly concerned.

CHEP guidelines suggest two readings, taken about a minute apart, be averaged to provide a number for each sitting.<sup>2</sup> Recording the numbers is easiest if the patient has an automated device with a printout or memory for storing readings.<sup>39</sup> If they don't, they'll need

**table 5\***

### Patient instructions for home blood pressure measurement<sup>2\*\*\*</sup>

- Buy a machine that has been approved by the Canadian Hypertension Society. Try to purchase a device that can record and store blood pressure data for you. Ask for help if you are unsure.
- Ensure that the device has a cuff size that is correct for you.
- Follow the manufacturer's directions.
- Check the accuracy of the machine with a health care provider.
- Only measure and record blood pressure if you have the time to do it correctly.
- Rest and relax for five minutes in a quiet comfortable place with no distractions (e.g., TV or talking) before measuring your blood pressure.
- Wait for at least two hours after a big meal and at least one-half hour after drinking coffee or smoking.
- Empty your bladder or bowels if it is uncomfortable before taking a reading.
- Put the cuff on a bare arm.
- Do not measure blood pressure when you are uncomfortable, cold, anxious, stressed or in pain.
- Sit in a chair that supports your back and beside a table that can support your arm. If required, put a pillow or towel under your arm so that it rests at heart level. Do not cross your legs.
- Measure blood pressure in the morning before medications and eating and in the evening before going to bed, bathing or taking medications.
- Take at least two readings and record them with the date and time.

\* A version of this table, with a figure showing arm-to-heart level, may be found on page 6 of reference 2. It may be downloaded or photocopied; \*\* Points may vary depending on the doctor's instructions, patient characteristics and /or the type/model of home blood pressure monitor used.

to manually record the DBP, SBP and the date and time of readings. Patients should understand that the doctor looks at all readings taken over a course of time, not just one reading at random. It's probably wise to explain this concept from the patient's perspective, in that one high (or one low) reading by itself should not be cause for concern.

Finally, patients should know when they are to see the doctor for home BP assessment and especially if they're to call at any other time based on specific results. Home BP readings tend to be consistently lower than office readings by about 5 mmHg, with 135/85 considered the upper limit of normal.<sup>5</sup> Since patients may have seen the office figure of 140/90 they should be apprised of this difference.

### Role of the pharmacist—adherence to therapy

It's well known that patients with HTN tend to be non-adherent with therapy. In general,

patients with chronic diseases, including HTN, typically take about 50% of prescribed doses.<sup>44</sup> Although it's been known for years, these numbers still persist. One of the few recent HTN studies found, using electronic monitoring (i.e., electronic detection of opening a container) that of 4,783 patients taking a once-daily antihypertensive, about one-half had completely stopped it within the first year. For those who persisted, 43% of omissions were a multi-day sequence, often occurring at least several times a year.<sup>45</sup>

There are a multitude of reasons for inadequate adherence, and just as many adherence-improving strategies. The following focuses primarily on unintentional non-adherence and, recognizing the time factor, suggests approaches for effective and efficient patient education.

Adherence assessment is recommended at each patient visit.<sup>5</sup> Given the number of reasons patients may not take their drugs as directed, it's impossible to predict adherence, or the reason for non-adherence, in any one individual. Assessing adherence can also be challenging since many patients are reluctant to admit they've not "done what the doctor said."

Empathy and a non-judgmental approach are likely to elicit more accurate information. For example, instead of asking "Are you taking these as directed?" (to which most people simply say "yes"), try something like one of the following:

*I know it's hard to take medication when you're feeling well. How do you manage with this?*

*A lot of people I talk with say they sometimes can't remember if they've actually taken a dose. Is this something you've noticed?*

For the latter, if a patient tells you "I set an alarm clock, my husband reminds me, and I always take it just before I brush my teeth in the morning," the pharmacist can quickly feel quite assured that the patient takes his or her medication as directed. This response is overstated to make the point that getting people to tell you what they do can save time in the long run. From time to time everyone does forget if they've taken a dose, so a response to the second question: "Oh, that never happens" suggests possible non-adherence.

When non-adherence has been identified, the next step is to determine its degree. Notably, for HTN, patients need to take 80% or more of their medication for it to work.<sup>46</sup> This can be determined with another simple question such as "How often, say in an average week, would you say this happens?" Additional follow-up questions can help determine the degree and nature of non-adherence.

The Health Belief Model provides a practical framework for discussing adherence-

improving strategies. Simply stated, this model says patients are more likely to follow directions if they believe the benefits outweigh risks, and they experience a cue to action.

Since patients with HTN have no symptoms, discussing benefits of therapy is paramount. For first time prescriptions, an efficient way to start the discussion is something along the lines of: "I'd like to take a couple of minutes to go over your prescription. What do you know about this drug so far?" "Know" is used preferentially to "what did your doctor tell you" as patients may have information from other sources (e.g., friends, magazines, Internet). Depending on the response, this may be followed with a more direct question such as "Did your doctor explain why he was giving you this medication?"

A discussion of benefits can then ensue, filling in gaps and/or correcting misconceptions. One suggestion is to focus on the prevention of complications as opposed to negative outcomes. Family members should also be educated about the benefits of HTN control. The entire discussion doesn't have to happen all at once—in fact, doing so may be overwhelming. But even something simple like handing the patient a brochure, which specifically includes long-term benefits, can be helpful for all family members. Even more helpful is to phone the patient (for example, the following week) to review the information and see if he or she has any questions.

Counselling on benefits includes the need to anticipate misconceptions and pay particular attention to terminology. One example is simply the words "hypertension" and "high blood pressure." Many times a patient has said, "Oh, I haven't been tense (or under pressure), so I didn't need my pills" or "I only take my pills when I feel my pressure going up."

An analogy can help prevent this misconception. Many pharmacists probably use the "balloon" to explain HTN pathophysiology. Patients are told that, in high BP, their arteries (blood vessels) are like a balloon completely expanded with water, and even though they can't feel it, if not corrected, the pressure will eventually harm other parts of the body. The pharmacist can then explain how different drugs work to decrease the pressure in the balloon (or their arteries) and reinforce adherence with: "That's why you need to take it every day, even though you're feeling well."

Another common example is diuretics, which are often referred to as "water pills." But in HTN they're used for fluid retention, vasodilation, and to augment effects of other antihypertensives. Calling them water pills suggests their only action is increased urination, and when this wears off, some patients stop taking them. In fact, a Quebec survey found that patients

were significantly less adherent with diuretics than any other antihypertensive drug class.<sup>47</sup> In this case, explaining the mechanism of action would help prevent both intermittent and early discontinuation.

The benefits of antihypertensive therapy doesn't have to take place during one conversation and, in fact, should be an on-going process. The importance of doing so is underscored by the finding that 2/3 of a large group of Canadians considered HTN as "not serious."<sup>48</sup>

For patients to accept that benefits do outweigh risks, practitioners need to minimize an individual's perception of adverse effects, without omitting important information. The following are selected ways for doing this:

1. Understand that antihypertensives have a reputation for causing side effects,<sup>49</sup> so even if a patient doesn't say anything, he or she is likely expecting to feel worse.
2. Explain that a lot of side effect information comes from older studies that used higher doses.<sup>49</sup>
3. If possible, withhold computer printouts of the drug. These usually contain a lengthy, and often alarming, list of every possible adverse effect.<sup>49</sup>
4. If a written handout is used, verbally review and put adverse effects into context. For example, differentiate between those that may be anticipated versus those that are rare, and point out ones that are mild and/

or transient with time frames for the latter. Also review how to prevent and/or handle more common or expected adverse reactions.

5. Put side effects in perspective. For example, a drug that causes an adverse reaction in 1% of the population means 99% won't experience that reaction.
6. Avoid the wording "*you will experience*" in favour of "*some people find....*" which in fact is more accurate, and patients are less likely to develop "psychologically-induced" side effects.
7. Stress the importance of contacting the doctor or yourself if a patient notices anything unusual or bothersome, making sure they know that if a side effect does occur, something can very likely be done about it. Information about side effects is much easier to take if a patient knows there's a probable solution to any problem they might experience.
8. Finally, conclude the conversation by reiterating the benefits of therapy so that's the last message a patient hears.


Interference with daily routine is another "risk," or at least a negative consequence of medication-taking. Continuing with the diuretic example, patients often skip an AM dose when they're going out of the house. Anticipating this, pharmacists should discuss the duration of action and, if needed, help patients incorporate dose(s) at some other time of the day.

As the term implies, cue to action simply means there's a reminder to take each dose. The most straightforward, and generally effective strategy, is to have the patient decide the best "link" based on their schedule and lifestyle—for example, with breakfast or supper, brushing the teeth, or anything else the patient does each day.

There are numerous other adherence-improving strategies, with a full discussion well beyond the scope of this lesson. Readers are referred to the literature for more ideas to help patients accept and integrate necessary changes into their daily lives.<sup>44,46-53</sup>

A final note is for the patient or yourself (with the patient's permission) to let the doctor know when non-adherence has been identified and/or corrected. Doing so can help prevent unnecessary addition of drugs, and especially if adherence is significantly improved (e.g., from zero or even 50% back to 100%), a return to upward titration may be needed to prevent adverse effects.

## Summary

HTN is an important risk factor for numerous diseases and a condition with numerous treatment options as well as evidence-based management guidelines. The pharmacist's expertise and accessibility offer a unique opportunity to play a key role in optimizing management of this common chronic disease. 

## Questions

To answer online, go to [www.pharmacygateway.ca](http://www.pharmacygateway.ca), CE section, CE Online, Pharmacy Practice

**NOTE: all CASE patients have uncomplicated hypertension unless otherwise noted. A reminder you will need access to the Internet and a recent (e.g., 2008) edition of the CPS.**

**1** What percentage of normotensive Canadians age 55 can expect to develop hypertension?

- a) 20%
- b) 50%
- c) 60%
- d) 70%
- e) 90%

**CASE ONE: Questions 2, 3**

**2** M.T. is a 39-year-old male with mild hypertension, mild controlled asthma, and a family history of diabetes. Hydrochlorothiazide 100 mg OD has kept his BP under control, but his last lab report showed a decrease in glucose tolerance. The doctor asks what you think about using a thiazide in this case. You recommend:

- a) Decrease hydrochlorothiazide to 50 mg OD, then evaluate M.T.'s blood pressure.
- b) Substitute chlorthalidone for hydrochlorothiazide.
- c) Add a K-sparing diuretic.
- d) Both a) and c)
- e) None of the above

**3** About three months later M.T.'s BP has risen slightly, to the point the physician thinks a second agent should be added. M.T. brings in a prescription for metoprolol 200 mg BID, saying he'll pick it up after his daily long-distance run. Your comments about this prescription include:

- a) The dose is too high. It should be initiated slowly, generally starting with 50 mg BID.
- b) Its cardioselectivity increases with the dose, making this a good choice for M.T.'s asthma.
- c) At any dose, it can increase exercise tolerance, so it won't interfere with M.T.'s running.
- d) Both a) and b)
- e) All of the above

**CASE TWO: Questions 4-7**

**4** B.J. is a 45-year-old lawyer who comes in for a refill of her hydrochlorothiazide 50 mg OD. Her profile shows this is the only drug she takes, but that she's routinely at least one week late for her refills. Reasons for the latter you should assess include the possibility B.J. may:

- a) take it only when she notices fluid build-up, not realizing it also has vasodilatory action
- b) omit doses on days she's in court

- c) thinks she needs to take it only when she doesn't follow lifestyle changes (e.g., sodium intake)
- d) both b) and c)
- e) all of the above

**5** B.J. tells you she has a new written prescription for a second BP medication. Apparently her doctor wants to reduce her DBP by about another 5 mmHg, but she hasn't decided whether to take it. The best course of action at this time would be for her doctor to add:

- a) nifedipine
- b) furosemide
- c) bisoprolol
- d) ramipril
- e) none of the above

**6** The target BP goal for B.J. is an office-based reading less than or equal to 140/90.

- a) true
- b) false

**7** Throughout your discussion with B.J. you get the impression she doesn't understand the benefits of BP control. Which of the following would you review with her?

- a) Although she can't feel it, high BP in her arteries is damaging their lining.
- b) Even a 10 mmHg increase in DBP can double her risk for CVD.

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# ce lesson

PHARMACY PRACTICE NATIONAL CONTINUING EDUCATION PROGRAM  
Management of Uncomplicated Hypertension

## Questions

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- c) Controlling her BP now reduces the chances of eventual damage to her eyes and kidneys.  
d) All of the above.

### **CASE THREE: Questions 8-11**

**8 A.C. is a 50-year-old male whose BP after five office visits averages 137/89. He is currently overweight with his only physical activity being a 15-minute relaxing walk after dinner. Which of the following is/are true?**

- a) A.C. should start on one of CHEP's first-line systolic-diastolic antihypertensives.  
b) At this level of BP, A.C. should definitely begin lifestyle modifications.  
c) A.C. has a 1 in 5 chance of developing chronic high BP over the next four years.  
d) Both a) and b).  
e) All of the above.

**9 A.C.'s doctor has advised him to change his dietary habits especially for weight loss. Which of the following would you not suggest?**

- a) A.C. should aim for a healthy weight classification for BMI and waist circumference.  
b) Losing even about 5 kg could result in about a 5 mmHg decrease in both his DBP and SBP.  
c) A.C. should increase his physical activity to a brisk walk for at least 30 minutes most evenings.  
d) A.C. will likely have to reduce his sodium intake by about 1200 mg/day before his doctor's appointment in two months.

**10 The DASH eating plan should not be recommended for hypertension due to its relatively high salt content.**

- a) true                      b) false

**11 A.C. asks if you have any information on high BP, upon which you give him a copy of Hypertension 2008 Public Recommendations (Table 2). Reading this, he correctly learns all of the following except:**

- a) Regular BP monitoring (e.g., home monitoring) is especially important for those with his BP level.  
b) To help reduce sodium, he should look for

- products with 10% or less of his daily value.  
c) He may have "masked" hypertension—elevated BP readings in the doctor's office but not on a day-to-day basis.  
d) Hypertension may cause sexual problems.

### **CASE FOUR: Questions 12-14**

**D.S. is a 63-year-old man whose hypertension has been relatively well controlled for the past five years. However, his home BP readings have lately averaged roughly 160/100, with his current regimen of a BB and a long-acting dihydropyridine CCB. His doctor is concerned that he can't seem to lower D.S.' BP.**

**12 Which of the following medication-related changes would be reasonable for D.S.?**

- a) Change his CCB to a nondihydropyridine derivative.  
b) Substitute his BB with another drug class, such as an ACEI.  
c) Add a thiazide diuretic as part of a two- or three-drug regimen.  
d) b) and/or c)  
e) None of the above

**13 D.S.' doctor asks if you would mind checking his home BP monitoring technique. D.S. tells you he: 1. relaxes for 30 minutes before taking his BP; 2. sits in his recliner with the back down and footrest up; 3. watches TV and has a couple of cigarettes while relaxing; 4. rests his arm on the side of the recliner; and 5. takes two readings at each sitting. Using the numbers, which of these is likely to overestimate his actual BP?**

- a) 1, 2, 3                      b) 3, 4  
c) 2, 4, 5                      d) 1, 2, 3, 4

**14 D.S. may be having some side effects from his BB (bisoprolol 20 mg OD), which his doctor has decided to stop. Particularly in D.S.' case, this drug should be completely stopped immediately.**

- a) true                      b) false

### **CASE FIVE: Questions 15-17**

**15 R.M. is an otherwise healthy 70-year-old woman who, after three office visits, has an average BP of 169/85. Since her DBP is < 90 R.M. has high-normal BP.**

- a) true                      b) false

**16 Is R.M. a candidate for initiating therapy with two first-line agents?**

- a) yes                      b) no

**17 Since most patients with hypertension eventually require more than one antihypertensive, which of the following would be the best combination for R.M.?**

- a) thiazide and BB  
b) thiazide + ACEI  
c) thiazide + ARB  
d) thiazide + dihydropyridine CCB  
e) ACEI + ARB

**18 Which of the following is/are true with respect to using an ACEI versus an ARB for uncomplicated systolic-diastolic hypertension?**

- a) ACEIs seem to be more effective than ARBs.  
b) An ARB is more likely than an ACEI to cause dry cough.  
c) Both drug classes have a similar tendency to cause hyperkalemia.  
d) All of the above.  
e) None of the above.

**19 The risk of hyperkalemia can be increased by:**

- a) certain salt substitutes  
b) certain herbal remedies  
c) combining an ARB and ACEI  
d) both a) and b)  
e) all of the above

**20 Omeprazole is one of the drugs that may explain a patient's poor response to anti-hypertensive therapy.**

- a) true                      b) false

## ce faculty

### **THIS MONTH**

Management of Uncomplicated Hypertension

### **AUTHOR**

**Dr. Dattani** has given presentations and authored articles in the areas of hypertension, lipid management and cardiovascular risk reduction. She also leads the cardiovascular module in two clinical pharmacology courses at the University of Ottawa in the department of cellular and molecular medicine (nursing program). Her clinical practice area is in the coronary care/intensive care unit.

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patients and conducted research into effective methods for improving knowledge and adherence in this population.

All lessons are reviewed by a minimum of six pharmacists for accuracy, currency and relevance to current pharmacy practice.

This lesson is valid until August 18, 2011. Information about hypertension may change over the course of this time. Readers are responsible for determining the most current aspects of this topic.

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This lesson is published by Rogers Publishing Ltd., One Mount Pleasant Rd., 7th floor, Toronto, ON M4Y 2Y5. Editorial office: Tel: (416) 764-3926 Fax: (416) 764-3931. CE queries: Tel: (416) 764-3879 Fax: (416) 764-3937 [mayra.amos@rci.rogers.com](mailto:mayra.amos@rci.rogers.com). No part of this CE lesson may be reproduced, in whole or in part, without the written permission of the publisher.

Brenda McBean Cochran (co-author) discloses she is the Pharmacy Practice CE Clinical Coordinator. This lesson is supported by an unrestricted grant from Genpharm Inc.

 **ROGERS**

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