Hypertension treatment and control rates.

Chart review in an academic family medicine clinic

Sara J. Houlihan; Scot H. Simpson, PharmD MSe; Andrew J. Cave, MB ChB MCISc FCFP FRCGP; Nigel W. Flook, MD; Mary E. Hurlburt, MD; Chris J. Lord, MB ChB; Linda L. Smith, MD; Harvey H. Sternberg, MD

ABSTRACT

OBJECTIVE To characterize hypertension management in an academic family medicine clinic.

DESIGN Cross-sectional chart review.

SETTING Academic family medicine clinic in Edmonton, Alta.

PARTICIPANTS A total of 210 patients with 1 or more visits for hypertension during the previous 3 years.

MAIN OUTCOME MEASURES Patient characteristics, current antihypertensive therapies, most recent blood pressure measurements, and compelling indications according to the 2006 Canadian Hypertension Education Program recommendations.

RESULTS A total of 185 subjects (88%) were prescribed antihypertensive medications, and 89 (42%) had controlled hypertension. Younger subjects, people with diabetes, and people not receiving antihypertensive medication therapy appeared less likely to have controlled hypertension. There were 76 subjects (36%) prescribed 1 antihypertensive medication, 65 subjects (31%) prescribed 2 antihypertensive medications, and 44 (21%) prescribed 3 or more antihypertensive medications. Angiotensin-converting enzyme inhibitors were prescribed for 51% of the subjects, diuretics for 47%, β-blockers for 27%, calcium channel blockers for 23%, angiotensin receptor blockers for 20%, and α-blockers for 1%.

CONCLUSION Hypertension treatment and control rates in this academic family medicine clinic appear to be better than those in the general population. Following the principles of a continuous quality improvement process, this information will serve as an important foundation for identifying areas to improve hypertension management in the clinic.

EDITOR'S KEY POINTS

- Hypertension is the most common reason for visiting a physician, accounting for more than 20 million visits a year, but its asymptomatic nature sometimes makes it difficult to identify and treat—and makes medication adherence challenging. As a result, hypertension is generally not well controlled.

- As part of a continuous improvement approach to management of patients with hypertension, the authors sought to compare rates of treatment and control of hypertension in their academic family medicine clinic with existing population data and found that their rates appeared to be higher than those among the general population. They also found that choice of antihypertensive medication was consistent with the Canadian Hypertension Education Program recommendations and that prescribed doses were consistent with clinical trials, suggesting good use of evidence-based medicine to guide therapy.

- Although prescribed antihypertensive therapy was consistent with current evidence and guideline recommendations, the overall treatment rate was not ideal. The next step in the quality improvement process will be to determine optimal treatment and control rates for hypertension and then identify barriers and facilitators to achieving these rates.

Hypertension is a leading modifiable risk factor for cardiovascular disease and has been estimated to account for 13% of deaths worldwide.[1] There is a direct relationship between blood pressure and risk of cardiovascular disease. For example, as baseline blood pressure increases from below 120/80 mm Hg, there is a stepwise increase in cardiovascular event rates.[2] Although hypertension is the most common reason for visiting physicians, accounting for more than 20 million visits to general practitioners and internists in 2006, management of this chronic disease has several challenges.[3] The asymptomatic nature of this disease presents a substantial challenge to identifying people with high blood pressure and providing optimal care.[4] In addition, the absence of symptoms renders medication adherence even more challenging.[5]

Despite the challenges, hypertension management has improved dramatically over the past decade, primarily in the areas of increased awareness and treatment.[6,7] Most patients, however, do not reach therapeutic goals and continue to be at high risk of cardiovascular events.[7] The last Canadian study to measure community rates of hypertension treatment and control was the Canadian Heart Health Study, conducted between 1985 and 1992.[8] According to this study, the prevalence of hypertension was 22%; 58% of hypertensive patients were aware of their condition, 39% were being treated, and 16% had controlled hypertension in 1992.[8] The Canadian Hypertension Education Program (CHEP) was initiated in 1999 to improve hypertension treatment and control in Canada and appears to have influenced patterns of antihypertensive medication prescription.[9,10] The most current North American measurement of hypertension management used the 2003 to 2004 cycle of the United States National Health and Nutrition Examination Survey (NHANES).[7] While 76% of hypertensive patients were aware of their condition, only 65% were treated with antihypertensive medications and only 37% had controlled hypertension.[7]

With hypertension management less than ideal, the first step in improving management within a clinic is to compare current practice patterns with external benchmarks, such as recent population-based observations, evidence-based practice guidelines, and clinical trials.[11] This objective comparison establishes a foundation for a clinical quality improvement strategy to improve overall management. With these issues in mind, the purpose of this study was to describe hypertension management in an academic family medicine clinic.

METHODS

Site and study subjects
This was a cross-sectional chart review of patients attending a multiphysician family medicine clinic. The clinic is a teaching site for family medicine residents and students in the allied health professions at the University of Alberta. The University of Alberta Research Ethics Board approved the study. Subjects were eligible for inclusion if they had 1 or more visits coded for hypertension (*International Classification of Diseases, Ninth Revision*, code 401) within the past 3 years. Subjects were excluded if they only had 1 recorded visit to the clinic, were younger than 18 years of age, were cognitively impaired, resided in an institution, were a student or employee of our health region or the University of Alberta, or did not communicate in English. The list of eligible subjects was then stratified based on the treating physician, and 35 subjects were randomly selected from each group to ensure a balanced representation from each physician (**Figure 1**).
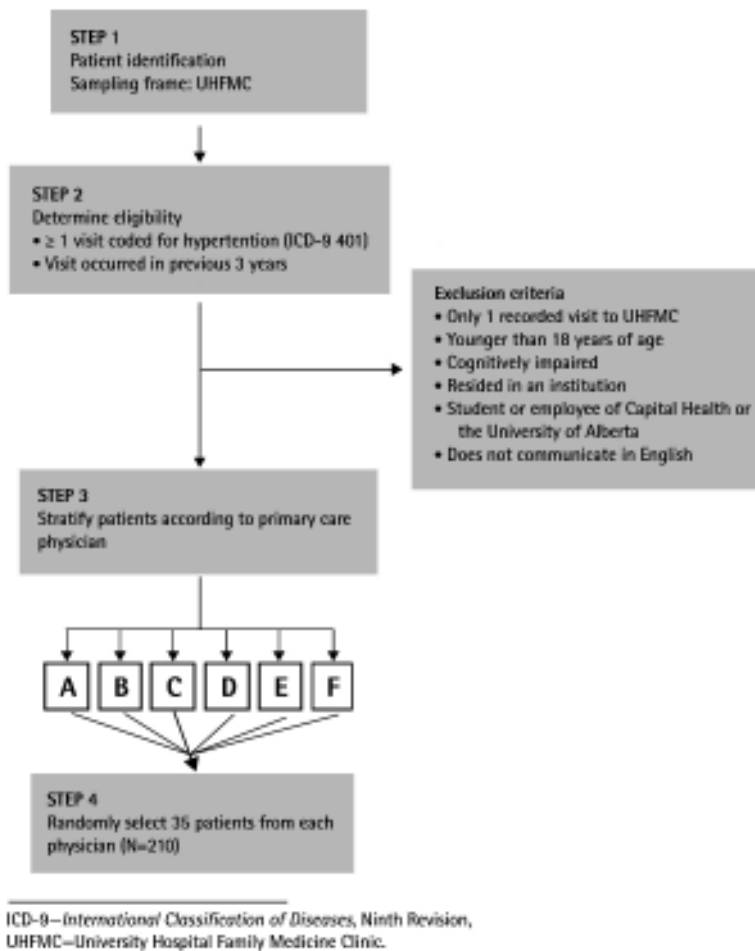
Data collection
A standardized case report form was used to abstract information from subjects' clinic records regarding date of birth, sex, most recent blood pressure measurements, antihypertensive medication therapies, compelling medical conditions as indicated in the 2006 CHEP recommendations, as well as smoking status and alcohol use.[12]

The most recent blood pressure measurement was defined as the last clinic visit with a recorded blood pressure. Medication lists recorded in the chart were reviewed to identify antihypertensive medications and medications known to induce hypertension according to the 2006 CHEP recommendations.[12] Each medication was recorded by its generic name and total daily dose in milligrams. Antihypertensive medications were categorized as *previous*, *current*, or *new* to characterize their potential effect on the most recent blood pressure measurement. *Previous* antihypertensive medications had been discontinued 3 months before the date of the most recent blood pressure measurement. In these cases, the date of discontinuation was also recorded. *Current* antihypertensive medications were considered ongoing therapy or medications that had been discontinued within 3 months of the most recent blood pressure measurement. *New* antihypertensive medications indicated a change in dose or addition of a new antihypertensive medication on or after the date of the most recent blood pressure measurement.

According to the 2006 CHEP recommendations, the approach to hypertension management might be influenced by specific compelling indications, including diabetes, chronic renal disease (CRD), ischemic heart disease, myocardial infarction, angina, dyslipidemia, heart failure, cerebrovascular accident, and left ventricular dysfunction.[12] For this study, such compelling indications were considered present if they were documented in the charts. Diabetes and angina were also considered present if antidiabetic medications or nitroglycerin products, respectively, were listed in subjects' medication lists.[13]

Figure 1. Flow chart of subject selection

STEP 1
Patient identification
Sampling frame: UHFMC

STEP 2
Determine eligibility
• ≥ 1 visit coded for hypertention (ICD–9 401)
• Visit occurred in previous 3 years

Exclusion criteria
• Only 1 recorded visit to UHFMC
• Younger than 18 years of age
• Cognitively impaired
• Resided in an institution
• Student or employee of Capital Health or the University of Alberta
• Does not communicate in English

STEP 3
Stratify patients according to primary care physician

A B C D E F

STEP 4
Randomly select 35 patients from each physician (N=210)

ICD-9—*International Classification of Diseases*, Ninth Revision,
UHFMC—University Hospital Family Medicine Clinic.

Sample size and analyses

During the design stage of this study, the most recent information from NHANES was based on the 2001 to 2002 cycle, in which 1038 of the 1696 participants (61%) with hypertension were treated with antihypertensive medications.[14] Using this published treatment rate as our external benchmark and assuming an α error of .05 and β error of .20, we determined that 187 subjects would be required to detect a 10% absolute difference in treatment rate. The sample size was increased to 210 subjects by selecting 35 hypertensive subjects from each of the 6 physicians in our clinic.

Patients were considered to be receiving treatment for hypertension if their medication history included at least 1 new or current antihypertensive medication. Controlled hypertension was defined as a blood pressure below 140/90 mm Hg or, if the subject had diabetes or CRD, below 130/80 mm Hg.[12]

All analyses of the extracted data were descriptive, using frequencies and means where appropriate. Differences in the characteristics of subjects with controlled versus uncontrolled hypertension were tested using χ^2 tests or 2-tailed t tests where appropriate. A P value less than .05 was considered statistically significant.

RESULTS

Mean age of the 210 subjects was 61.6 (SD 15.1) years, and 116 (55%) were women (**Table 1**). A total of 185 subjects (88%) were treated with antihypertensive medications, and 89 subjects (42%) had controlled hypertension. Younger people and those with diabetes appeared less likely to have controlled hypertension (**Table 1**).

A single antihypertensive medication was prescribed to 76 (36%) subjects, 2 antihypertensive medications were prescribed to 65 (31%) subjects, and antihypertensive regimens with 3 or more medications were prescribed to 44 (21%) subjects (**Figure 2**). Of the 185 subjects prescribed 1 or more antihypertensive medications, 84 (45%) had controlled blood pressure, compared with 5 of the 25 (20%) subjects not prescribed any antihypertensive medications (odds ratio 3.3, 95% confidence interval [CI] 1.3 to 8.8, $P<.02$) (**Figure 3**). The specific antihypertensive medications prescribed were angiotensin-converting enzyme (ACE) inhibitors in 51% of subjects, diuretics in 47%, β-blockers in 27%, calcium channel blockers in 23%, angiotensin receptor blockers (ARBs) in 20%, and an α-blocker in 1% (**Table 2**). As monotherapy, ACE inhibitors were the most frequently prescribed (46%), followed by diuretics (25%), ARBs (12%), β-blockers (12%), and calcium channel blockers (5%).
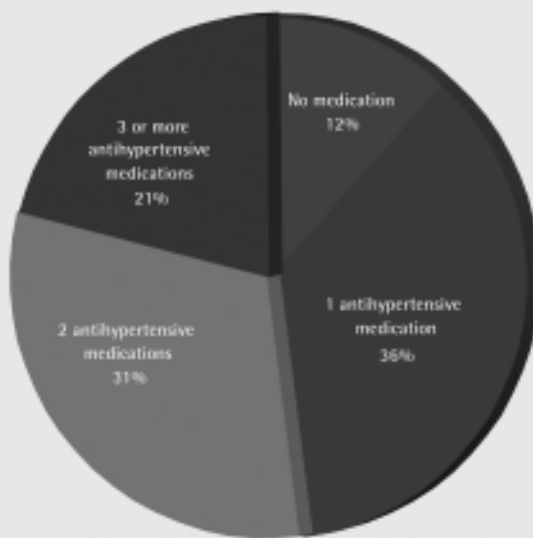
Medication use in this study group was also compared with the 2006 CHEP recommendations for management of patients with compelling indications (**Table 3** and **Box 1**[12]). Of the 36 patients with either diabetes or CRD, 23 (64%) were prescribed ACE inhibitors or ARBs with or without thiazide diuretics. Of the 12 patients with documented cerebrovascular disease, 6 (50%) were prescribed β-blockers and 7 (58%) were prescribed ACE inhibitors.

DISCUSSION

Since the last reported Canadian prevalence rate of 22% in 1992, the number of people with hypertension has steadily increased, with the most current estimate being 30% in the United States.[7,8] Prevalence of this important cardiovascular risk factor is expected to

Table 1. Subject characteristics

CHARACTERISTICS	CONTROLLED HYPERTENSION (N=89)	UNCONTROLLED HYPERTENSION (N=121)	TOTAL (N=210)
Age, mean y (SD)*	64.1 (14.4)	59.8 (15.3)	61.6 (15.1)
Female, n (%)	46 (51.7)	70 (57.9)	116 (55.2)
Taking medications that induce hypertension, n (%)	13 (14.6)	28 (23.1)	41 (19.5)
Compelling indications			
• Diabetes, n (%)*	4 (4.5)	26 (21.5)	30 (14.3)
• Chronic renal disease, n (%)	1 (1.1)	7 (5.8)	8 (3.8)
• Smoking, n (%)	10 (11.2)	18 (14.9)	28 (13.3)

*P<.05, t test.
†P<.05, χ^2 test.

Figure 2. Antihypertensive medication regimens in 210 hypertensive subjects

No medication 12%
3 or more antihypertensive medications 21%
2 antihypertensive medications 31%
1 antihypertensive medication 36%

continue to increase, especially as our population ages.[15] Therefore, it is paramount that clinicians optimize management. Although the last Canadian community study reported low treatment and control rates, observations from the various NHANES cycles illustrate that these rates are slowly improving.[7,8,14] Our cross-sectional chart review in an academic family medicine clinic determined that 88% of hypertensive subjects were prescribed antihypertensive medications and 42% had controlled hypertension. We also observed that subjects were 3 times more likely to have controlled hypertension if they were on at least 1 antihypertensive medication.

Although the difference in treatment and control rates between our clinic and the NHANES observations were initially anticipated, we did not test the statistical significance of this hypothesis for 2 reasons. First, the time gap between collection of the NHANES data, collected during the 2001 to 2002 and 2003 to 2004 cycles,[7,14] and our study data, recorded primarily in 2005 and 2006, is relevant, given the increasing

awareness and treatment of hypertension in recent years.[7,10] Furthermore, the number of antihypertensive agents introduced onto the market during this period could also affect physician prescribing patterns. Second, the study groups used for the NHANES cycles differ greatly from our clinic population. The NHANES data are derived from a nationally representative sample of 5000 people randomly selected from the general population.[6,7,14] The proportion of NHANES participants with regular family physicians is not known; in our study, all subjects had 1 or more visits to family physicians. There could, therefore, be a difference in accessibility of antihypertensive medications. Despite these differences, NHANES still provides the most current data characterizing hypertension treatment and control in North America and, therefore, serves as a reasonable benchmark for comparison.[11]

This study provided an opportunity to compare practice patterns with other important benchmarks. First, we identified that choice of antihypertensive medication was consistent with CHEP management recommendations for various compelling indications.[12] For example, ACE inhibitors and ARBs were commonly used in patients with diabetes or CRD. Similarly, recommended first-line agents were used in most patients with cerebrovascular disease. Second, we observed that 66% of patients prescribed ACE inhibitors were using ramipril at doses consistent with clinical trials,[16] suggesting good use of evidence-based medicine to guide therapy.

Our study suggested that younger age, diabetes, and no documented antihypertensive medications appeared to be associated with poor blood pressure control. Although it is well established that the hypertension control rate among those with diabetes is quite low,[17] it was unexpected that older age, a cardiovascular risk factor in itself, would be associated with a higher proportion of controlled hypertension. Given the limitations of a cross-sectional study, however, this information should be interpreted with caution.[11]

Limitations

A number of factors might have limited our findings.

Figure 3. Hypertension control according to antihypertensive medication use: *Odds ratio 3.33, 95% confidence interval 1.25 to 8.83.*
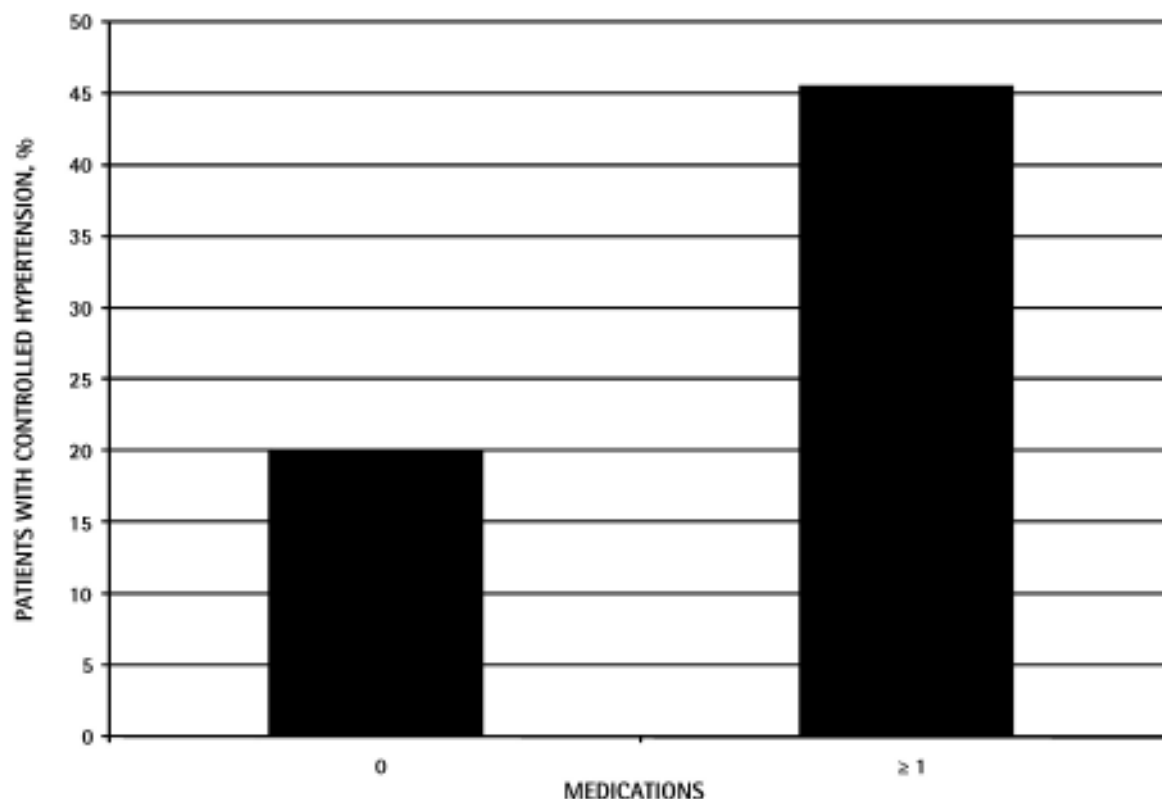

Table 2. Antihypertensive medications prescribed in 210 subjects

	PRESCRIBED MEDICATIONS		MOST COMMON AGENT	
MEDICATION CLASS	N (%)	AGENT	N (%)	
Angiotensin-converting enzyme inhibitor	106 (50.5)	Ramipril	70 (33.3)	
Angiotensin receptor blocker	41 (19.5)	Not applicable	Not applicable	
β-Blocker	56 (26.7)	Metoprolol	31 (14.8)	
Calcium channel blocker	49 (23.3)	Amlodipine	35 (16.7)	
Diuretic	98 (46.7)	Thiazide or thiazidelike	89 (42.4)	
α-Blocker	1 (0.5)	Terazosin	1 (0.5)	

Table 3. Antihypertensive medication use according to compelling indication

INDICATION	ACE INHIBITOR, N (%)	ARB, N (%)	β–BLOCKER, N (%)	CCB, N (%)	DIURETIC, N (%)	α–BLOCKER, N (%)
Diabetes or chronic renal disease (n = 36)	22 (61.1)	10 (27.8)	11 (30.6)	10 (27.8)	17 (47.2)	0 (0)
Ischemic heart disease (n = 38)	23 (60.5)	7 (18.4)	22 (57.9)	12 (31.6)	17 (44.7)	0 (0)
Cerebrovascular disease (n = 12)	7 (58.3)	2 (16.7)	6 (50.0)	5 (41.7)	7 (58.3)	0 (0)

ACE—angiotensin-converting enzyme, ARB—angiotensin receptor blocker, BB—β-blocker, CCB—calcium channel blocker.

These include the sensitivity of our inclusion criteria, variance in blood pressure measurements, white-coat hypertension, and our definition of treatment. First, we included subjects if they had any visits coded for hypertension within the previous 3 years because we believed subjects visiting their family physicians for hypertension management would likely have these visits coded as such. Although we expected this criterion to have high specificity, hypertensive patients visiting their family physicians for other indications, or patients

Box 1. Treatment recommendations from the Canadian Hypertension Education Program guidelines[12]

Diabetes or chronic renal disease: ACE inhibitor or ARB with or without thiazide diuretic

Ischemic heart disease: ACE inhibitor (or ARB) and β-blocker (or long-acting CCB)

Cerebrovascular disease: ACE inhibitor and diuretic combination

ACE—angiotensin-converting enzyme, ARB—angiotensin receptor blocker, CCB—calcium channel blocker.

with multiple comorbidities in addition to hypertension, might have been missed—contributing to a low sensitivity. Second, as this was a cross-sectional chart review, we were unable to standardize the method used for measuring blood pressure. As such, there would be variance in the blood pressure measurements among clinicians. Because these values were taken from the subjects' medical records, however, they would reflect the actual values clinicians used for treatment decisions. Third, we used blood pressure measurements recorded in the clinic to determine if the subject had controlled hypertension. These measurements could be confounded by 2 well-known phenomena in hypertension management—white-coat hypertension and masked hypertension.[4] A final limitation is that we restricted our definition of treatment to patients prescribed antihypertensive medications. This does not include lifestyle modifications, such as salt restriction and exercise advice.

Conclusion

This study used external benchmarks to examine hypertension management within our academic family medicine clinic. The hypertension treatment and control rates were qualitatively better than the most current NHANES measurements. Although prescribed antihypertensive therapy was consistent with current evidence and guideline recommendations, the overall treatment rate was not ideal. The next step in our quality improvement process will be to determine optimal treatment and control rates for hypertension and then identify barriers and facilitators to achieving these rates.[18-20] For example, it might be of benefit to develop an interdisciplinary program to improve antihypertensive drug use. The ultimate goal of this process will be to close the gap between evidence-based guidelines and current patient care. ✿

Ms Houlihan is a second-year medical student at the University of Alberta in Edmonton. At the time of this study, she was completing her undergraduate pharmacy degree. **Dr Simpson** is an Associate Professor with the Faculty of Pharmacy and Pharmaceutical Sciences at the University of Alberta, a Canadian Institutes of Health Research New Investigator, and a clinical pharmacist with the University Hospital Family Medicine Clinic. **Drs Cave, Flook, Hurlburt, Lord, Smith,** and **Sternberg** are general practitioners in the University Hospital Family Medicine Clinic and are affiliated with the Department of Family Medicine in the Faculty of Medicine and Dentistry at the University of Alberta.

Contributors
Ms Houlihan and **Drs Simpson, Cave, Flook, Hurlburt, Lord, Smith,** and **Sternberg** contributed to concept and design of the study; data gathering, analysis, and interpretation; and preparing the manuscript for submission.

Competing interests
None declared

Correspondence
Dr Scot Simpson, University of Alberta, Pharmacy, 3126 Dentistry/Pharmacy Centre, Edmonton, AB T6G 2N8; e-mail ssimpson@pharmacy.ualberta.ca

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Healthy habits prevent breast cancer: study

Nearly 40 percent of all breast cancer cases in the United States could be prevented if women kept a healthy weight, drank less alcohol, exercised more and breastfed their babies, according to a report published on Tuesday.

The report, which reviewed 81 new studies on the links between lifestyle and cancer, showed that 70,000 breast cancer cases could be prevented in the United States alone every year.

"We are now more certain than ever that by maintaining a healthy weight, being physically active and limiting the amount of alcohol they drink, women can dramatically reduce their risk," Dr. Martin Wiseman of the American Institute for Cancer Research/World Cancer Research Fund, who led the study, said in a statement.

"We estimate that almost 40 per cent of breast cancer cases in the United States, or about 70,000 cases every year, could be prevented by making these straightforward everyday changes," added the AICR's Susan Higginbotham.

The report, posted at *www.dietandcancerreport.org/*, recommends that people exercise for at least 30 minutes every day. Men should limit alcohol to two drinks a day and women should have just one.

Breast cancer kills 400,000 women and a few men globally every year, and 40,000 in the United States alone.

Many studies have shown a low-fat diet, regular exercise, keeping a lean weight and breastfeeding babies can prevent breast cancer. However, a significant percentage of cases are caused by faulty genes and not linked to lifestyle.

Source: *REUTERS/HEALTH* – Washington

Prostate cancer screening: More harm than good?

By Julie Steenhuysen

Routine screening for prostate cancer has resulted in more than 1 million U.S. men being diagnosed with tumors who might otherwise have suffered no ill effects from them, U.S. researchers said on Monday.

They said prostate cancer screening is a double-edged sword, catching serious cancers in a few but causing needless worry and expense for the majority of men, who may be getting treatment for tumors growing too slowly to do any harm.

The team looked to see how many additional men have been diagnosed with prostate cancer since the introduction in 1986 of a widely used blood test for prostate cancer that looked for a prostate-cancer specific antigen, or PSA.

"Our estimate is that number is about 1.3 million people in the United States. That is a huge effect," said Dr. H. Gilbert Welch of the VA Outcomes Group in White River Junction, Vermont, whose study appears in the Journal of the National Cancer Institute.

More than 1 million of those were treated, they found.

"These are men who could not be helped by treatment because their cancer was not destined to cause them symptoms or death," Welch said in a telephone interview.

The increased diagnosis rate more than tripled in men aged 50 to 59 and increased more than a sevenfold in men under age 50.

And while prostate cancer deaths have declined since the introduction of PSA testing, Welch said about 20 men had to be diagnosed and treated for every one who benefited.

Prostate cancer is the second most common cancer in men worldwide after lung cancer, killing 254,000 men a year globally. Doctors have routinely recommended PSA screening in men over 50 based on the assumption that early diagnosis and treatment is better than standing by and doing nothing.

All current forms of treatment – surgery, radiation or hormone therapy – can cause harm, resulting in impotence and incontinence in about a third of patients, Welch said.

Just being told you have cancer can do harm, causing anxiety and feelings of vulnerability. And having a cancer diagnosis can mean some people cannot get health insurance, Welch said.

A U.S. expert panel last year urged doctors to stop screening men over 75, but doctors still disagree about the right approach to PSA screening. Two large studies – one in Europe and one in the United States – that aimed to settle the matter produced conflicting results.

Instead of discarding the PSA test, one solution may to simply watch and wait for signs the tumor is growing. A study of more than 51,000 men published on Monday in the Journal of Clinical Oncology found men diagnosed with low-risk tumors who waited were still doing fine an average of eight years after diagnosis – and some as many as 20 years later.

If that were the standard approach for low-risk cancers, "…. it might help us avoid throwing the baby out with the bath water when it comes to the PSA test," Dr. Martin Sanda of Harvard Medical School, who worked on the study, said in a statement.

Welch said the right answer is not clear, but added that men should be fully informed about the risks of PSA testing.

"People have to weigh the small chance of a big benefit against the rather larger chance of a harm – and that harm being told you have cancer unnecessarily and treating it unnecessarily," he said.

Source: *REUTERS/HEALTH* – Chicago