Home blood pressure monitoring among Canadian adults with hypertension: Results from the 2009 Survey on Living with Chronic Diseases in Canada

Christina M Bancej PhD[1], Norm Campbell MD[2], Donald W McKay PhD[3], Marianne Nichol MSc[1], Robin L Walker MSc[4], Janusz Kaczorowski PhD[5]

CM Bancej, N Campbell, DW McKay, M Nichol, RL Walker, J Kaczorowski. Home blood pressure monitoring among Canadian adults with hypertension: Results from the 2009 Survey on Living with Chronic Diseases in Canada. Can J Cardiol 2010;26(5):e152-e157.

BACKGROUND: Canadians with hypertension are recommended to use home blood pressure monitoring (HBPM) on a regular basis.
OBJECTIVES: To characterize the use of HBPM among Canadian adults with hypertension.
METHODS: Respondents to the 2009 Survey on Living with Chronic Diseases in Canada who reported diagnosis of hypertension by a health professional (n=6142) were asked about blood pressure monitoring practices, sociodemographic characteristics, management of hypertension and blood pressure control.
RESULTS: Among Canadian adults with hypertension, 45.9% (95% CI 43.5% to 48.3%) monitor their own blood pressure at home, 29.7% (95% CI 41.1% to 46.3%) receive health professional instruction and 35.9% (95% CI 33.5% to 38.4%) share the results with their health professional. However, fewer than one in six Canadian adults diagnosed with hypertension monitor their own blood pressure at home regularly, with health professional instruction, and communicate results to a health professional. Regular HBPM was more likely among older adults (45 years of age and older); individuals who believed they had a plan for how to control their blood pressure; and those who had been shown how to perform HBPM by a health professional – with the latter factor most strongly associated with regular HBPM (prevalence rate ratio 2.8; 95% CI 2.4 to 3.4).
CONCLUSIONS: Although many Canadians with hypertension measure their blood pressure between health care professional visits, a minority do so according to current recommendations. More effective knowledge translation strategies are required to support self-management of hypertension through home measurement of blood pressure.

Key Words: *Home blood pressure monitoring; Hypertension; Patient education; Self-management*

La surveillance de la tension artérielle à domicile chez les adultes canadiens hypertendus : Les résultats de l'enquête de 2009 sur la vie avec une maladie chronique au Canada

HISTORIQUE : On recommande aux Canadiens hypertendus de procéder régulièrement à la surveillance de leur tension artérielle à domicile (STAD).
OBJECTIFS : Caractériser l'utilisation de la STAD chez les adultes canadiens hypertendus.
MÉTHODOLOGIE : Les répondants à l'enquête de 2009 sur la vie avec une maladie chronique au Canada qui ont déclaré un diagnostic d'hypertension confirmé par un professionnel de la santé (n=6 142) ont été interrogés au sujet de leurs pratiques de surveillance de la tension artérielle, de leurs caractéristiques démographiques, de la prise en charge de leur hypertension et du contrôle de leur tension artérielle.
RÉSULTATS : Chez les adultes canadiens hypertendus, 45,9 % (95 % IC 43,5 % à 48,3 %) surveillent leur tension artérielle à domicile, 29,7 % (95 % IC 41,1 % à 46,3 %) ont reçu les directives d'un professionnel de la santé et 35,9 % (95 % IC 33,5 % à 38,4 %) transmettent les résultats à leur professionnel de la santé. Cependant, moins d'un adulte canadien sur six ayant un diagnostic d'hypertension surveille régulièrement sa tension artérielle à domicile conformément aux directives d'un professionnel de la santé et communique les résultats à un professionnel de la santé. La STAD régulière était plus susceptible d'être respectée par les adultes plus âgés (45 ans et plus), les personnes qui pensaient avoir un plan pour contrôler leur tension artérielle et celles à qui un professionnel de la santé avait expliqué comment procéder à la STAD, le dernier facteur étant le plus fortement associé à une STAD régulière (ratio du taux de prévalence de 2,8; 95 % IC 2,4 à 3,4).
CONCLUSION : Même si de nombreux Canadiens hypertendus mesurent leur tension artérielle entre leurs rendez-vous avec un professionnel de la santé, la minorité le fait selon les recommandations à jour. Des stratégies de transfert du savoir plus efficaces s'imposent pour appuyer la prise en charge autonome de l'hypertension au moyen de la mesure de la tension artérielle à domicile.

High blood pressure is the world's leading risk factor for premature death. In Canada, an estimated 5.9 million Canadian adults are currently diagnosed with this condition (1). Hypertension imposes substantial health, economic and social costs on individuals, families and health care systems (2). Self-management of chronic conditions, including hypertension, can help reduce the burden on the health care system and improve patient outcomes (3,4). Home blood pressure monitoring (HBPM) is an important component of hypertension self-management.

[1]*Public Health Agency of Canada, Ottawa, Ontario;* [2]*Departments of Medicine, Community Health Sciences and Physiology and Pharmacology, University of Calgary, Calgary, Alberta;* [3]*Faculty of Medicine, Memorial University of Newfoundland, St John's, Newfoundland;* [4]*Department of Community Health Sciences, University of Calgary, Calgary, Alberta;* [5]*Department of Family Practice, University of British Columbia and Primary Care and Community Research Child & Family Research Institute, Vancouver, British Columbia*
Correspondence: Dr Norm Campbell, Department of Medicine, University of Calgary, Teaching, Research and Wellness Building, 3280 Hospital Drive Northwest, Calgary, Alberta T2N 4Z6. Telephone 403-210-7961, fax 403-210-9837, e-mail ncampbel@ucalgary.ca
Received for publication March 5, 2010. Accepted March 9, 2010

The Canadian Hypertension Education Program guidelines, as well as management guidelines from other nations, provide resources that facilitate and encourage HBPM (5-9). HBPM can be used to confirm the diagnosis of hypertension, identify and reduce the need for medications in those with white coat effect, identify those with masked hypertension (blood pressure that is higher outside of the health professional's office), improve medication adherence, and assist in the management of blood pressure in patients with diabetes and chronic renal disease (5,7-15).

Despite the importance of HBPM, little is known about the HBPM practices or about the adequacy of HBPM training received by Canadian adults (16). The objectives of the present study were to describe the prevalence of current HBPM practices among Canadian adults with hypertension, examine their association with self-reported and self-perceived blood pressure control, and identify individual and management practices associated with regular (ie, at least weekly) HBPM. The information obtained from the present study may assist in the development of new educational resources and revision of current educational resources with a goal of improving HBPM practices in Canada.

METHODS

Data source

The hypertension component of the 2009 Survey on Living with Chronic Diseases in Canada (SLCDC) is a cross-sectional survey of adults 20 years of age or older living in private dwellings in the 10 Canadian provinces. Participants for the SLCDC were drawn from among respondents to the 2008 Canadian Community Health Survey (CCHS) who reported having been diagnosed with hypertension by a health professional. Residents of the three territories, persons living on Indian reserves, residents of institutions and full-time members of the Canadian Armed Forces were excluded from the survey. Together, those excluded represent less than 2% of the Canadian population.

The hypertension component of the 2009 SLCDC consisted of a 30 min telephone interview about the impact and management of hypertension. Interviews were conducted in the official language of choice of the respondents (either English or French) during February and March of 2009. Respondents' data from the 2009 SLCDC were linked, with their consent, to their 2008 CCHS interview data to gather additional data including detailed sociodemographic information.

The questionnaire for the hypertension component of the SLCDC was developed by the Public Health Agency of Canada and Statistics Canada in consultation with an expert working group on hypertension, comprised of members of the Canadian Hypertension Education Program.

Study population

A total of 6142 of 7862 eligible survey respondents participated in the hypertension component of the 2009 SLCDC, consented to share their data with the Public Health Agency of Canada, Health Canada and provincial governments, and consented to link their SLCDC responses to the 2008 CCHS, for a participation rate of 78.2% (17,18). A total of 21 respondents did not know or did not respond to the question about where they measured their own blood pressure and were excluded from the analysis, leaving 6121 study participants.

Measures

HBPM: The SLCDC's HBPM module included questions about blood pressure monitoring performed outside of a health professional's clinic or office by the respondents themselves (18). Respondents were asked about where they monitored their blood pressure outside health professional settings (ie, at home, at a pharmacy, workplace, gym or fitness facility, or other setting), the frequency of monitoring, whether they had health professional instruction in HBPM, whether they shared the results of their own measurements with their health professional and what actions they took when confronted with readings they considered to be high.

A respondent was considered to practice HBPM if he or she reported 'at home' among the locations outside of health professional settings where they monitored their own blood pressure. Regular HBPM was defined as a respondent's self-report of monitoring his or her own blood pressure at home, and monitoring his or her own blood pressure at least weekly.

Potential correlates of regular HBPM: The factors assessed for their potential association with regular HBPM included sociodemographic factors (ie, sex, age, educational attainment, income adequacy and marital status) and management factors (ie, health professional discussed a target blood pressure, respondent believed he or she had a plan for how to control their blood pressure, received instruction on how to measure their own blood pressure at home, and believed they had sufficient information to self-manage their blood pressure).

Blood pressure control: Perceived blood pressure control was determined based on responses to the following question: "In general, do you consider your blood pressure to be…Well-controlled (normal, fine, ok)? Borderline? High? Low?". Individuals who reported low or well-controlled blood pressure were defined as controlled, while individuals who reported borderline or high blood pressure were defined as uncontrolled. Individuals were also asked the following question: "The last time your blood pressure was measured by a health professional, were you told that your blood pressure was: Well-controlled (normal, fine, ok)? Borderline? High? Low?". Individuals who reported low or well-controlled blood pressure the last time blood pressure was assessed by a health professional were considered to be controlled.

Statistical analysis

To account for sample allocation and survey design, all estimates were weighted, using weights generated by Statistics Canada reflecting the number of people a respondent represents in the population, allowing inferences to be made at the population level (17,18).

Generalized linear models (19,20) were used to estimate the prevalence rate ratios (PRRs) for associations between sociodemographic and management factors and regular HBPM. Factors found to be significant in the crude analyses were subsequently included in the fully adjusted models. Variables no longer significantly associated with regular HBPM after controlling for other eligible factors were removed using backward elimination. The 95% CIs around prevalence estimates and PRRs were calculated using exact standard errors generated through bootstrap resampling methods (21).

RESULTS

Characteristics of the study population

The HBPM questions from the hypertension component of the 2009 SLCDC were completed by 6121 respondents who had a mean (± SD) age of 65.1±13.8 years (range 20 to 97 years) at the time of the interview. One-half of respondents had been diagnosed with hypertension by a health professional 10 or more years ago. More than one-half (53.3%) of the respondents were women.

HBPM behaviours

Nearly one-half of Canadian adults with hypertension reported monitoring their own blood pressure at home (45.9%; 95% CI 43.5% to 48.3%), and a further 25.5% did not measure their own blood pressure at home, but measured it at a location outside of a clinic or medical setting, usually a pharmacy. A small proportion (2.5% or less) also reported measuring their blood pressure at other locations including the workplace, gym or fitness facility. HBPM was equally common among men and women, irrespective of age (data not shown), but was substantially higher among older adults than among younger adults (Table 1). Less than one-third (31.5%; 95% CI 25.6% to 37.4%) of those between 20 and 44 years of age reported practicing HBPM, whereas approximately one-half of those 65 years of age and older (48.8%; 95% CI 46.1% to 51.5%) reported doing so (Table 1).

Fewer than one in three adults with hypertension reported practicing HBPM and having been shown how to do so by a health

TABLE 1
2009 Survey on Living with Chronic Diseases in Canada: Prevalence of home blood pressure monitoring (HBPM) practices among 6121 Canadian adults 20 years of age and older with hypertension according to age group

	Prevalence according to age group (years), % (95% CI)			
HBPM practice	**20–44**	**45–64**	**65+**	**All ages 20+**
Do not monitor own blood pressure at home	68.5 (62.6–74.5)	53.7 (49.5–57.8)	51.2 (48.6–53.9)	54.1 (51.7–56.5)
Monitor own blood pressure at home	31.5 (25.6–37.4)	46.3 (42.2–50.5)	48.8 (46.1–51.5)	45.9 (43.5–48.3)
Daily	3.1 (1.6–4.6)	7.0 (5.1–9.0)	9.0 (7.6–10.5)	7.5 (6.4–8.6)
Weekly	14.6 (10.1–19.1)	19.5 (16.2–22.9)	18.7 (16.6–20.7)	18.7 (16.8–20.5)
Monthly	9.0 (5.5–12.4)	11.5 (8.4–14.7)	13.5 (11.2–15.7)	12.1 (10.2–14.0)
Less often	4.8 (2.1–7.4)	8.3 (5.7–10.8)	7.6 (6.3–9.0)	7.6 (6.3–9.0)
Have been shown how to measure blood pressure by health professional*	17.5 (33.6–45.7)	30.7 (40.4–49.2)	31.3 (40.6–46.0)	29.7 (41.1–46.3)
Share measures from taking own blood pressure with health professional†	22.2 (17.5–27.0)	37.5 (33.2–41.7)	37.5 (34.9–40.0)	35.9 (33.5–38.4)

**Prevalence of Canadians with hypertension who monitor their own blood pressure at home and have been shown how by a health professional; †Prevalence of Canadians with hypertension who monitor their own blood pressure at home and share measures with a health professional*

professional (29.7%; 95% CI 41.1% to 46.3%). This prevalence was much lower (less than one in five) among younger adults (Table 1). Overall, only slightly more than one in three (35.9%; 95% CI 33.5% to 38.4%) adults with hypertension reported performing HBPM and sharing the blood pressure measurements they took with their health professional; this proportion was lower (one in four) among adults 20 to 44 years of age (Table 1). Only 15.8% of Canadian adults with hypertension reported monitoring their own blood pressure at home regularly (at least weekly), having been shown how by a health professional, and sharing the measurements with their health professional (data not shown).

When confronted with measurements they considered to be too high during self-monitoring, Canadians with hypertension who practiced HBPM most often reported that they would contact a health professional (28.4%, 95% CI 25.4% to 31.3%), followed by continuing to monitor to determine whether readings were consistently high, and resting (data not shown). More than one in 10 respondents (12.1%, 95% CI 10.1% to 14.2%) reported that they would do nothing.

Correlates of regular (at least weekly) HBPM

Among Canadian adults with hypertension, regular HBPM was reported more frequently among those older than 45 years of age, those who were married, those who believed they had a plan for how to control their blood pressure, and those who had been shown how to monitor their blood pressure at home (Table 2). Having been shown how to monitor blood pressure at home by a physician or other health professional was the factor most strongly associated with regular HBPM (PRR 2.84, 95% CI 2.40 to 3.37; adjusted PRR 2.75, 95% CI 2.31 to 3.28). Men and women reported similar rates of regular HBPM. The perception of having enough information to manage one's high blood pressure was also not associated with HBPM (Table 2).

Associations between HBPM practices and prevalence of self-reported blood pressure control

Among Canadians with hypertension, those who monitored their own blood pressure at home and those who reported sharing the results of their measures with their health professional were equally likely as those who did not to report their blood pressure as well controlled the last time it was measured by a health professional, or to perceive their blood pressure as well controlled in general (Table 3). Among those who monitored their own blood pressure at home, those who reported taking particular actions when confronted with concerns about a home reading being too high (eg, contacted a health professional, continued to monitor blood pressure to see whether readings are consistently high) were equally likely as those who reported that they would do nothing to report their blood pressure as well controlled the last time it was measured by a health professional, and to perceive their blood pressure as well controlled (Table 3).

DISCUSSION

People who involve themselves in the management of their hypertension have been shown to have better blood pressure control (3,4,22). HBPM is a major component of the self-management of hypertension. In randomized controlled trials, hypertensive people who measure their blood pressure at home have lower blood pressures and are more likely to achieve blood pressure control, likely because they also have better adherence to therapy (5-9,15). Like any therapy or therapeutic adjunct, to be effective, HBPM must be used. The present study demonstrates that nearly one-half of Canadians who report having hypertension as diagnosed by a health professional reported engaging in HBPM. Another one-quarter of Canadians with hypertension have their blood pressure measured outside of a clinical or medical setting, most often a pharmacy. Taken together, approximately 70% of Canadians with hypertension assess their own blood pressure between visits to health professionals. Conversely, almost 30% of Canadians with hypertension report relying exclusively on blood pressure measurements taken during a health care visit to monitor and manage their hypertension.

The regular monitoring of blood pressure at home may allow people with hypertension to assess the effectiveness of lifestyle and pharmacological interventions in its management. Given the evidence of the benefit of HBPM in increasing the ability to predict cardiovascular risk, promoting adherence to antihypertensive drug therapy and controlling blood pressure, hypertension management in Canada likely could be improved, and cardiovascular, cerebrovascular and renal disease risks mitigated, by an increase in the use of HBPM (5,7-14). In the present study, only slightly more than one-third of respondents reported measuring their blood pressure at home on a monthly or more frequent basis.

In the present study, instruction in HBPM by a health care professional was the strongest factor associated with regular HBPM. Reporting having a plan to control blood pressure was also associated with regular HBPM. Interdisciplinary teams have been shown to be effective in facilitating improved self-management of hypertension (3,23). Such teams may have a role in instructing people on HBPM, and in assisting them to develop a management plan to support blood pressure control. Availability of instruction may encourage HBPM in the majority of hypertensive Canadians who do not measure their blood pressure at home.

In the present study, only approximately one-third of Canadian adults with hypertension practiced HBPM and communicated results to a health professional. One way around the issue of patients not bringing records with them to the clinic is to have records telemonitored or communicated using the Internet. This appears to be an effective and patient-acceptable method to improve blood pressure control (24,25).

Special consideration may need to be given to younger Canadian adults with hypertension. It is noteworthy, but perhaps anticipated,

TABLE 2
2009 Survey on Living with Chronic Diseases in Canada: Sociodemographic and management correlates of regular (at least weekly) home blood pressure monitoring (HBPM) among Canadian adults 20 years of age and older with hypertension

Characteristic	Prevalence of regular HBPM, % (95% CI)	Prevalence rate ratio (95% CI)	
		Crude	Adjusted
Sociodemographic			
Age, years			
20–44	17.7 (13.0–22.4)	0.64 (0.47–0.87)	0.72 (0.55–0.94)
45–64	26.6 (22.9–30.2)	0.96 (0.84–1.09)	0.96 (0.82–1.12)
65–97	27.7 (25.5–29.9)	1 (referent)	1 (referent)
Sex			
Female	24.7 (22.0–27.4)	0.89 (0.76–1.04)	Not included (P>0.05)
Male	27.8 (24.8–30.9)	1 (referent)	
Income adequacy			
1st (lowest) quintile	22.8 (17.9–27.8)	1.00 (0.74–1.36)	Not included (P>0.05)
2nd quintile	27.0 (22.8–31.1)	1.19 (0.91–1.54)	
3rd quintile	28.7 (23.6–33.7)	1.26 (0.96–1.67)	
4th quintile	27.0 (22.2–31.8)	1.19 (0.91–1.55)	
5th (highest) quintile	22.7 (17.8–27.7)	1 (referent)	
Educational attainment			
Less than secondary school	22.5 (19.0–26.1)	0.79 (0.67–0.92)	Not included (P>0.05)
Secondary school graduate	24.8 (19.7–29.9)	0.87 (0.64–1.18)	
Some postsecondary	24.3 (16.0–32.6)	0.85 (0.61–1.19)	
Postsecondary graduate	28.5 (25.6–31.5)	1 (referent)	
Marital status			
Widow	23.3 (19.8–26.8)	0.82 (0.69–0.98)	0.90 (0.76–1.06)
Single	14.6 (9.6–19.6)	0.51 (0.36–0.73)	0.59 (0.42–0.85)
Married	28.4 (25.8–31.0)	1 (referent)	1 (referent)
Management			
Believe they have a plan for how to control their blood pressure			
Yes	28.1 (25.9–30.3)	1.80 (1.37–2.34)	1.51 (1.18–1.94)
No	15.7 (11.5–19.8)	1 (referent)	1 (referent)
Health professional discussed a target level for their blood pressure			
Yes	30.7 (27.3–34.1)	1.37 (1.16–1.62)	Not included (P>0.05)
No	22.4 (19.8–25.0)	1 (referent)	
Had been shown how to measure their blood pressure by a health professional			
Yes	41.2 (37.8–44.6)	2.84 (2.40–3.37)	2.75 (2.31–3.28)
No	14.5 (12.3–16.6)	1 (referent)	1 (referent)
Believe they have enough information to help them control their blood pressure			
Yes	26.2 (24.1–28.2)	0.96 (0.68–1.34)	Not included (P>0.05)
No	27.2 (18.1–36.5)	1 (referent)	

that in the present study, younger adults with hypertension were less likely to regularly monitor their blood pressure at home. They were also less likely to have been shown how to measure their own blood pressure by a health professional, or to share their home readings with their health professional. A previous study found that younger hypertensive Canadians were often not pharmacologically treated for diagnosed hypertension, even if they had multiple risk factors (26). Increased instruction by health professionals, as well as programs promoting self-management of hypertension that are integrated into the community and workplace may encourage younger hypertensive Canadians to become more engaged in their hypertension management.

Over the past several years, groups including Blood Pressure Canada, the Canadian Hypertension Society, the Quebec Hypertension Society, and the Canadian Hypertension Education Program have developed resources aimed at encouraging Canadians with hypertension to measure their blood pressure at home (available at www.hypertension.ca/tools). While the SLCDC was being conducted, new educational interventions were developed to facilitate HBPM. These include a video that provides careful instruction on how to assess blood pressure (available for download at www.hypertension.ca/video) as well as printed instructions (available for download at www.htnupdate.ca or www.hypertension.ca/tools). In addition, just before the introduction of the SLCDC, the Heart and Stroke Foundation of Canada developed a Web site that allows Canadians to monitor and track their home blood pressure measurements (www.heartandstroke.ca/bp). A new Web site (www.MyBPsite.ca) has been launched to provide Canadians with hypertension information and resources to improve their self-management. Broad dissemination of this information and these resources may increase the number of hypertensive Canadians measuring their blood pressure at home, improve the quality of their measurements, and increase sharing of home readings with health professionals. This may be reflected in a greater number of Canadians with hypertension reporting good control of blood pressure. Because the SLCDC is the first detailed examination of HBPM practices in Canada, the impact of past and current education programs on home measurement of blood pressure cannot be ascertained. However, the present results will form a basis for determining the impact of future interventions in HBPM in Canada, and suggest areas for improvement.

The SLCDC was designed to provide data that are representative of the Canadian household population that has been diagnosed with hypertension by a health professional. Even though the response rate

TABLE 3
2009 Survey on Living with Chronic Diseases in Canada: Association of home blood pressure monitoring (HBPM) practices with prevalence of perceived blood pressure control among Canadian adults 20 years of age and older with hypertension

	Blood pressure control	
HBPM practice	Prevalence of self-reported blood pressure 'well-controlled' last time measured by health professional*, % (95% CI)	Prevalence of 'well-controlled' self-perceived blood pressure in general†, % (95% CI)
Do not monitor own blood pressure at home	72.1 (69.1–75.0)	78.1 (75.4–80.7)
Monitor own blood pressure at home	69.8 (66.1–73.5)	77.8 (74.3–81.4)
Daily	56.9 (49.0–64.9)	69.0 (61.0–77.1)
Weekly	70.4 (65.4–75.5)	76.9 (72.0–81.8)
Monthly	75.2 (67.7–82.7)	85.6 (80.6–90.5)
Less than monthly	72.2 (61.3–83.0)	76.6 (65.2–87.9)
Shares blood pressure measurements with a doctor or health professional‡		
Yes	68.9 (64.5–73.3)	79.0 (75.5–82.9)
No	72.2 (69.5–74.9)	77.4 (74.7–80.0)
Action taken if blood pressure too high‡		
Contact health professional	72.6 (66.7–78.4)	78.2 (72.5–83.8)
Continue to monitor	70.6 (63.6–77.7)	80.7 (74.2–87.3)
Rest	68.4 (61.3–75.5)	73.3 (66.4–80.2)
Do nothing	64.8 (56.8–72.9)	71.6 (64.4–78.9)

**102 respondents were missing values for self-reported control for the last time they were assessed by a health professional and were excluded from estimates; †51 respondents were missing values for self-perceived blood pressure control in general and were excluded from estimates; ‡Among the 2782 subjects who monitored their own blood pressure at home*

was 78%, certain segments of the Canadian population may be underrepresented. Moreover, certain groups, including those living in institutions, were not captured in the sample. Furthermore, the self-report measures assessed in the present survey cannot ascertain whether appropriate HBPM methods were used by respondents, or whether their self-reported hypertension control would be valid relative to more objective physical measures. It is noteworthy, however, that the levels of hypertension control reported in the SLCDC are comparable with those reported for Canadians who were aware of their hypertension in the recent Canadian Health Measures Survey (27).

In the present study, HBPM practices had no clear association with self-reported blood pressure control. This was an unanticipated finding given the evidence that people who involve themselves in the management of their hypertension generally have been shown to have better blood pressure control (3). Given that fewer than one-half of all Canadians reporting hypertension engaged in HBPM, it is possible that patients and their health professionals may choose to practice HBPM when there are concerns about blood pressure control.

The 2009 SLCDC hypertension component shows that most Canadians with hypertension monitor their blood pressure at home or at some other place outside of visits to their health professional. These data provide the baseline to evaluate the effectiveness of future interventions to improve HBPM, and suggest that increasing instruction in HBPM by health professionals is an important intervention target. The use of surveys such as the SLCDC allow the identification of care and knowledge gaps and, with repeated surveys, will allow assessment of interventions to improve hypertension management and the health of Canadians.

REFERENCES

1. Public Health Agency of Canada. Report from the Canadian Chronic Disease Surveillance System: Hypertension in Canada, 2010. Ottawa: Public Health Agency of Canada, 2010 (Catalogue Number: Cat.: HP32-2/1-2009). (In press)
2. Gaziano TA, Bitton A, Anand S, Weinstein MC. The global cost of nonoptimal blood pressure. J Hypertens 2009;27:1472-7.
3. Weingarten SR, Henning JM, Badamgarav E, et al. Interventions used in disease management programmes for patients with chronic illness – which ones work? Meta-analysis of published reports. BMJ 2002;325:925-8.
4. Walsh JME, McDonald KM, Shojania KG, et al. Quality improvement strategies for hypertension management. A systematic review. Med Care 2006;44:646-57.
5. McKay DW, Godwin M, Chockalingam A. Practical advice for home blood pressure measurement. Can J Cardiol 2007;23:577-80.
6. Mancia G, De Backer G, Dominiczak A, et al. 2007 ESH-ESC Practice Guidelines for the Management of Arterial Hypertension. ESH-ESC Task Force on the Management of Arterial Hypertension. J Hypertens 2007;25:1751-62.
7. Parati G, Pickering TG. Home blood-pressure monitoring: US and European consensus. Lancet 2009;373:876-8.
8. Imai Y, Otsuka K, Kawano Y, et al. Japanese Society of Hypertension (JSH) guidelines for self-monitoring of blood pressure at home. Hypertens Res 2003;26:771-82.
9. Padwal RS, Hemmelgarn BR, Khan NA, et al. The 2009 Canadian Hypertension Education Program recommendations for the management of hypertension: Part 1 – blood pressure measurement, diagnosis and assessment of risk. Can J Cardiol 2009;25:279-86.
10. Ohkubo T, Imai Y, Tsuji I, et al. Home blood pressure measurement has a stronger predictive power for mortality than does screening blood pressure measurement: A population-based observation in Ohasama, Japan. J Hypertens 1998;16:971-5.
11. Stergiou GS, Skeva II, Zourbaki AS, Mountokalakis TD. Self-monitoring of blood pressure at home: How many measurements are needed? J Hypertens 1998;16:725-31.
12. Tsuji I, Imai Y, Nagai K, et al. Proposal of reference values for home blood pressure measurement. Prognostic criteria based on a prospective observation of the general population in Ohasama, Japan. Am J Hypertens 1997;10:409-18.
13. Agarwal R, Andersen MJ, Bishu K, Saha C. Home blood pressure monitoring improves the diagnosis of hypertension in hemodialysis patients. Kidney Int 2006;69:900-6.
14. Bobrie G, Chatellier G, Genes N, et al. Cardiovascular prognosis of "masked hypertension" detected by blood pressure self-measurement in elderly treated hypertensive patients. JAMA 2004;291:1342-9.

15. Cappuccio FP, Kerry SM, Forbes L, Donald A. Blood pressure control by home monitoring: Meta-analysis of randomised trials. BMJ 2004;329:145-50.
16. Logan AG, Dunai A, McIsaac WJ, Irvine MJ, Tisler A. Attitudes of primary care physicians and their patients about home blood pressure monitoring in Ontario. J Hypertens 2008;26:446-52.
17. Statistics Canada. Data User Guide: 2009 Survey on Living with Chronic Diesase in Canada. Ottawa: Statistics Canada, 2009.
18. Statistics Canada. Survey on Living with Chronic Diseases in Canada: Hypertension Component, 2009 Questionnaire. Ottawa: Statistics Canada, 2009.
19. Robbins AS, Chao SY, Fonseca VP. What's the relative risk? A method to directly estimate risk ratios in cohort studies of common outcomes. Ann Epidemiol 2002;12:452-4.
20. Lee J. Odds ratio or relative risk for cross-sectional data? Int J Epidemiol 1994;23:201-3.
21. Rust K, Rao JNK. Variance estimation for complex surveys using replication techniques. Stat Methods Med Res 1996;5:281-310.
22. Thorpe CT, Oddone EZ, Bosworth HB. Patient and social environment factors associated with self blood pressure monitoring by male veterans with hypertension. J Clin Hypertens (Greenwich) 2008;10:692-9.
23. Carter BL, Rogers M, Daly J, Zheng S, James PA. The potency of team-based care interventions for hypertension: A meta-analysis. Arch Intern Med 2009;169:1748-55.
24. Parati G, Omboni S, Albini F, et al. Home blood pressure telemonitoring improves hypertension control in general practice. The TeleBPCare study. J Hypertens 2009;27:198-203.
25. Green BB, Cook AJ, Ralston JD, et al. Effectiveness of home blood pressure monitoring, Web communication, and pharmacist care on hypertension control: A randomized controlled trial. JAMA 2008;299:2857-67.
26. Campbell NR, So L, Amankwah E, Quan H, Maxwell C. Characteristics of hypertensive Canadians not receiving drug therapy. Can J Cardiol 2008;24:485-90.
27. Wilkins K, Campbell N, Joffres M, et al. Blood pressure in Canadian adults. Health Reports 2010;21:1-10.