The effect of a patient education booklet and BP ‘tracker’ on knowledge about hypertension. A randomized controlled trial

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Purpose. Home blood pressure (BP) monitoring is increasingly prevalent. The Canadian Hypertension Education Program (CHEP) developed a Family Practice BP tracking diary for home readings with an educational booklet. We evaluated the effectiveness of these tools compared with the standard approach of a hypertension information leaflet on BP-related knowledge, attitudes and behaviours of hypertensive family practice patients.

Method. Single-blind randomized control trial on patients with raised BP.

Results. Three practices in Ontario, Quebec and Nova Scotia recruited a total of 109 eligible patients. The average age was 66.1 (SD 9.3) years and 58 (54.7%) were male. There was a statistically significant increase in the mean number of correct responses to 20 hypertension knowledge questions of 1.14 from 15.3 (SD 2.2) at baseline to 16.4 (SD 2.2) at 3 months in both groups (n = 72, P < 0.001). Patients frequently did not realize that usually more than one drug plus lifestyles changes were necessary to reduce BP to target or that it might take 6 weeks for some drugs to achieve their full effect. The BP tracking diary and the booklet had positive evaluation from the patients.

Conclusions. Most patients have a good baseline of knowledge about hypertension but there are still important areas that need to be addressed. The booklet and tracker were well received by patients but the simple leaflet was as effective at improving knowledge.

Keywords. Home blood pressure monitoring, hypertension, knowledge translation, self blood pressure monitoring.

Introduction

Hypertension remains a significant health problem and a growing public health challenge in Canada and around the globe. Despite effective therapies and lifestyle interventions, optimal control of blood pressure (BP) remains a challenge for many patients in part due to poor adherence to pharmacological and lifestyle therapies. In recognition of these challenges, the Canadian Hypertension Education Program (CHEP) provides annual evidence-based recommendations and develops dissemination tools to aid health professionals in diagnosing and managing hypertension. The recommendations as well as tools supporting their implementation can be found at the CHEP website (www.hypertension.ca). Part of CHEP’s mandate is to evaluate the impact of these activities.

Effective management of hypertension depends on patient’s understanding of their condition and treatment and adherence to lifestyle and/or pharmacological treatment. The 2006 recommendations emphasize the importance of supporting adherence to treatment by increased patient involvement in their treatment.

Recognizing that patients are increasingly interested in self-management of conditions such as hypertension, patient education and self-monitoring with systematic tracking of results can provide a method for enhancing monitoring and management of BP and other risk factors for cardiovascular disease and stroke.

Effective patient education materials are a feasible and widely transferable first step in promoting these goals. Patient education materials should provide information reflecting the latest hypertension guidelines in a manner accessible to a non-medical population with varying levels of literacy. Used without other educational strategies, educational materials have not found to be effective. Optimally, they should be
accompanied by self-BP monitoring.\cite{6} Sixty-four percent of Canadians with hypertension reported monitoring their BP at home; of these, two-thirds said they had been shown how to measure BP by a health professional (http://www.phac-aspc.gc.ca/cd-mc/sledfsp-epam cefi/pdf/SLCDCFactSheet2009-Hypertension-eng.pdf). Home BP monitoring alone does not necessarily lead to improved BP control\cite{9} and it may be that educational materials need to accompany home BP monitoring.

CHEP has developed a BP tracking diary and booklet for patients who record their pressure at home. The primary purpose of the booklet was to provide relevant education about hypertension, modifiable and non-modifiable risk factors and proper techniques for monitoring BP at home. We hypothesized that improved knowledge and better BP measurement technique would lead to improved adherence to both pharmacological and non-pharmacological therapies and thus lower BP. In a meta-analysis of six trials,\cite{10} the odds of good BP control among patients adherent to antihypertensive medications, compared with those who were non-adherent, was 3.44 [95% confidence interval (95% CI) 1.60–7.37]. The purpose of this study was to investigate the effectiveness and acceptability of the BP tracker diary and the booklet.

**Research question**

What is the effectiveness of combining home BP monitoring diary and an education booklet compared to a four-page leaflet on BP-related knowledge among patients with raised BP in family practice?

**Methods**

**Design**

A single-blind randomized controlled trial of a CHEP booklet and BP tracker diary for patients with raised BP compared with the usual family practice management of providing patients with a standard four-page hypertension educational leaflet.

**Eligibility**

Eligible patients were undergoing monitoring for a possible diagnosis of hypertension according to CHEP guidelines or were uncontrolled hypertensive patients (at least one BP reading of Systolic BP $>$140 mmHg or $>$130 if having diabetes; CHEP). The patient who currently owned or intended to purchase a BP measurement device for home use. Intent to buy a machine was ascertained by the family physician asking the patient. A list of home BP monitors recommended by the Canadian Hypertension Society was available to all eligible patients, regardless of the allocation arm.

**Exclusion criteria.** Cognitive impairment or language barriers (not able to use the English or French version of booklet and tracker).

**Randomization**

Consecutively numbered sealed opaque envelopes were used to allocate eligible patients to the intervention group or control group. Allocation was assigned using a computer-generated random sequence for 40 patients per site in blocks of 8.

**Intervention**

CHEP has produced a patient guide for hypertension management in the form of a four-page leaflet that aligns content and presentation with the provider guidelines. The Patient Hypertension Guidelines booklet and ‘BP Tracker’ self-management tool expanded on a four-page leaflet by incorporating BP tracking, a lifestyle risk factor checklist, a medication diary as well as a more detailed information supporting home monitoring of BP. BP Tracker allowed patients to plot up to two readings per day on a graph paper, for easy assessment of BP status and patterns by both the patient and the physician (Fig. 1). Side effects or symptoms were captured alongside BP readings, as well as lifestyle changes that might affect BP. Users were encouraged to bring the tracker to their physician visits and the chart that included the current target BP. A medication diary was included at the back of the tracker to capture changes in pharmacologic treatment, along with a lifestyle changes planner to document changes in diet, exercise, smoking, alcohol use, stress management or weight.

Patients in the intervention group received the booklet and tracker and were asked by their physician to complete a specified number of self-assessments daily/weekly for 12 weeks. The frequency of these varied according to the circumstances of the patient and physician preference. Patients in the control group received a copy of the CHEP four-page 2006 Public Recommendations for management of BP leaflet. Patients were blind to the allocation as they received educational material and were asked to record home BP readings. The home BP devices were validated at Visit 2.

**Outcome assessment**

**Primary outcome.** A patient knowledge questionnaire was administered on enrolment and again 3 months later.

**Secondary outcomes.** A validated automated device (BpTRU; VSM Medtech Ltd, Coquitlam, BC) was used to measure BP at baseline and a follow-up visit 3 months later. At an initial office visit, home BP devices were compared to mean BpTRU and results recorded, and guidance was provided to patients to ensure proper measurement technique.

**Ethics and trial registration**

Ethics approval was obtained from Hamilton Health Science/Faculty of Health Sciences Research Ethics
Board and McGill University Health Centre and the trial was registered with Current Controlled Trials ISRCTN28843954.

Measuring knowledge, attitudes, behaviours and BP

The measurement instruments to assess attitudes, knowledge and behaviours were selected and adapted from several existing self-assessment tests and questionnaires with the help of experts in this area. As there was no validated tool for assessing both patient knowledge and attitudes to hypertension and BP measurement, we used questions that had been developed from another study for knowledge about hypertension \(^{11}\) and developed questions on BP measurement ourselves. These were then piloted and refined in response to patient feedback. A French version of the questionnaire was also developed and pilot tested.

Sample size—knowledge, attitudes and behaviours

Knowledge
Assuming a two-tailed alpha of 0.05 and a beta of 0.2, with a sample size of 120 (60 controls and 60 intervention), we would be able to detect true underlying differences of \(\geq 0.5\) SD on mean scores in attitudes, knowledge and self-reported behaviours with an 80% chance of excluding the null hypothesis. Our study was not intended or powered to evaluate the impact of the intervention on BP reduction.

Statistical analyses

Differences in demographics and independent variables between groups at baseline were analysed using chi-square tests for categorical variables and t-tests for continuous measures. To assess the effectiveness of the intervention on attitudes, knowledge and self-reported behavioural changes, \(2 \times 2\) analyses of variances were performed examining between- and within-group differences over the two assessment periods treated as a repeated measure. Relevant independent variables and baseline scores were statistically controlled for, when appropriate, to eliminate confounding influences (analyses of covariances).

Other analytical work performed included calculation of the univariate statistics, 95% CIs around differences, reliability of the test measures and correlational analysis. In all analyses, results were accepted as statistically significant if there is <5% possibility of false positive results. All statistical tests were two sided. Data were collected on standard study forms and analysed using STATA v9.2.

Results

Participants
Three practices in Ontario, Quebec and Nova Scotia recruited 109 patients (Fig. 2); 11 short of the target. As the research was undertaken in non-research settings, it was difficult for recruiting physicians to track accurately the number of patients who did not wish to take part in the study. In one practice, recruitment was achieved in all patients approached while in the other two practices, physicians estimated the refusal
rate at ~5%. The average age was 66.1 years (SD 9.3 minimum 28 maximum 83) and 58 (54.7%) were male (Table 1). The intervention group had a higher BP (143.8/83.4 mmHg) than the control group (139.6/80.8 mmHg) at baseline. The intervention group had fewer patients with high cholesterol (33.3% versus 50.9%).

**Knowledge assessment**

The three commonest patient knowledge gaps were not realizing that usually more than one drug plus lifestyles changes were necessary to reduce BP to target, expecting to stop treatment after reaching target and not knowing that it might take 6 weeks for drugs to have their full effect.

The average number of correct responses to 20 questions about hypertension at the beginning of the study in all patients \( n = 95 \) was 15.3 (95% CI 14.8–15.7). The minimum was 9 and the maximum was 19. For the intervention and control groups, the average number of correct answers at baseline was similar, 15.2 and 15.4, respectively.

At the end of the study, the number of correct answers for the all patients had risen to 16.4 (95% CI 15.7–16.7, \( n = 84 \)). There was an overall statistically
significant increase in the mean number of correct responses to 20 hypertension knowledge questions of 1.14 from 15.3 (SD 2.2) at baseline to 16.4 (SD 2.2) at 3 months in both groups \( (n = 72, \ P < 0.001) \) (Table 2). The increase in scores in patients with a first score of <15 (2.29, 95% CI 1.17–3.41, \( n = 24 \)) was statistically significantly higher than those who had scored \( \geq 15 \) in the first test (0.56, 95% CI 0.07–0.24, \( n = 48, \ P = 0.0013 \)). The intervention group \( (n = 38; \text{mean of 1.29 more correct answers between start and finish of programme}) \) improved the same as the control group \( (n = 34; 0.97 \text{more correct answers}) \).

The mean number of correct responses to 10 knowledge questions on BP measurement increased significantly from 6.6 (SD 1.6) at baseline to 6.9 (SD 1.8) at 3 months in both groups \( [F(1,80) = 4.6, \ P < 0.05] \). This increase was due to a significant increase in the intervention group from 6.3 to 7.0 \( (P < 0.05) \).

### Blood pressures

The average of two readings taken at Visit 2 with home BP device gave readings very similar to the BpTRU (correlation systolic/diastolic 0.6/0.64). Patients used 30 different models (14 manufacturers) of home BP monitor. The commonest three were OMRON HEM 711 (15.4%), LifeSource UA-767-PAC (12.8%) and OMRON HEM 773 (7.6%).

There was a statistically significant reduction in BpTRU systolic BP (6.36 mmHg, \( P = 0.03 \)) and diastolic (3.66 mmHg, \( P = 0.03 \)) between the first and 3-month follow-up reading in all patients. Although the reduction was greater in the intervention group, this was not statistically significant at the conventional significance level.

### Patient satisfaction

The patient satisfaction questionnaire for the Blood Pressure Management Booklet and the BP tracker was filled in by 40 (71%) of patients in the intervention group. There was strong support for both the booklet and the tracker although there was a request for more information, as well as a web-based version. In particular, it provided information on normal values of BP to patients (97% agreement) (Table 3).

### Discussion

Despite hypertension being a common problem, the amount of information on attempts to share

#### Table 2

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
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<tbody>
<tr>
<td>Control, ( N ) (%)</td>
<td>Intervention, ( N ) (%)</td>
</tr>
<tr>
<td>53</td>
<td>56</td>
</tr>
<tr>
<td><strong>High BP can usually be cured</strong></td>
<td>16 (30.8)</td>
</tr>
<tr>
<td><strong>Many drugs take up to 6 weeks before showing full effects</strong></td>
<td>21 (39.6)</td>
</tr>
<tr>
<td><strong>Most people with high BP need two or more medications, and lifestyle changes, to lower their BP to the target level</strong></td>
<td>25 (47.2)</td>
</tr>
<tr>
<td><strong>You can tell if you have high BP (without a BP cuff) and will probably feel unwell</strong></td>
<td>30 (56.6)</td>
</tr>
<tr>
<td><strong>High BP becomes more common with aging</strong></td>
<td>41 (77.4)</td>
</tr>
<tr>
<td><strong>Once BP is under control with medications, it is ok to stop taking the medication</strong></td>
<td>49 (94.2)</td>
</tr>
<tr>
<td><strong>In some people, just having their BP measured in the doctor's office can make it go up</strong></td>
<td>50 (94.3)</td>
</tr>
<tr>
<td><strong>Mildly raised BP can be lowered without taking tablets, for example, by stopping smoking, losing weight and exercising</strong></td>
<td>50 (94.3)</td>
</tr>
<tr>
<td><strong>High BP can cause other serious health problems</strong></td>
<td>51 (96.2)</td>
</tr>
<tr>
<td><strong>High BP is a risk factor for heart attacks and strokes</strong></td>
<td>55 (100)</td>
</tr>
</tbody>
</table>

In the general population, the following things can contribute to people having high BP:

- Having too much caffeine
- Using public transport
- High BP running in your family
- Drinking too much alcohol
- Being tall
- Having a stressful lifestyle
- Eating too much salt
- Not taking enough exercise
- Smoking
- Being overweight

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**Discussion**

Despite hypertension being a common problem, the amount of information on attempts to share
knowledge with patients is limited. Some of the evidence seems to have indicated that more information can make things worse. It is important to note that there have only been 16 randomized controlled trials on patient education until 2006. A systematic review of the literature indicates that patient education may lead to a BP reduction (odds ratio 0.66, 95% CI 0.44–1.01). Studies included in this review may have bias due to poor allocation concealment and low follow-up as well as other methodological issues. They relied heavily on patients attending educational sessions.

What our study adds to the current knowledge is that the possible BP reduction associated with information in a booklet is consistent with previous research. There was a substantial increase in awareness with the booklet.

The BP tracker and the booklet had positive evaluation from the patients that supports the effectiveness of its educational effect on patients. The leaflet given to the control group and the task of completing the questionnaire may have reduced the observed difference. It is not standard care to give patients questionnaires and ask them to repeat this at 3 months. The difference between normal care without the questionnaire may be larger.

Methodological limitations

We failed to achieve our target for recruitment, 109 not 120 patients recruited. We had three practices recruiting patients (n = 39, 39 and 31) and one practice found it harder to identify patients who were uncontrolled hypertensives. In addition, there was a significant loss to follow-up for the questionnaire that may have introduced some bias into the results. The study was single blinded, which also may have introduced bias.

The clinics were general primary care office-based sites that were not residency programme sites but do have students or other trainees. They are a mixture of urban, semi-rural and rural practices so results should be generalizable across these settings. However, the robustness of the randomization and concealment of the randomization do add credibility to these results. It also confirms the findings from other researchers that undertaking this sort of evaluation in primary care is feasible but not easy. The differences in BP between the two groups at baseline were not large enough to have a significant impact on the effect of the intervention. The trial lasted for 3 months, which is shorter than the average length of study included in the Cochrane review of 6 months and so sustainability of knowledge and consequently adherence may not be observed in longer term studies.

There is no accepted and tested questionnaire on patient knowledge about hypertension or BP monitoring. This is a drawback for anyone undertaking work in this field. We used questions already used in a previous study. While these have not been validated, they are accepted as a standard for the Canadian Health Survey. We developed questions about knowledge of BP monitoring ourselves and these have not been validated. The response range of correct answers indicates that the tool was not too easy and did measure change especially in those who had scored lower on the first assessment. It is not possible to state the exact importance of these improvements in knowledge in terms of BP reduction. It is also possible that knowing that a second questionnaire was to be given at 3 months was a major factor for improving knowledge.

Recommendations for patients with hypertension

1. Clearly written brief patient information leaflets should be available for all patients.
2. Patients should be informed about the probable need for multiple therapies, the length of time therapy takes to work and the probable need to take medication for life.
3. Patients should be given in writing the target level for home BP.

Conclusions

Most patients have a good baseline of knowledge about hypertension but there are still important areas that need to be addressed. The booklet and tracker...
were well perceived by patients but a simple leaflet can improve knowledge as effectively.

Declaration

Funding: Canadian Hypertension Program.
Ethical approval: Hamilton Health Science/Faculty of Health Sciences Research Ethics Board and McGill University Health Centre and the trial was registered with Current Controlled Trials (ISRCTN28843954).
Conflict of interest: none.

References