Photographic art in exam rooms may reduce white coat hypertension

Michael B Harper, Stacy Kanayama-Trivedi, Gloria Caldito, David Montgomery, EJ Mayeaux Jr, Lourdes M DelRosso

Department of Family Medicine, Louisiana State University Health Sciences Center (LSUHSC), Shreveport, Louisiana, USA

Correspondence to
Michael B Harper, Family Medicine at LSUHSC, Chairman, Family Medicine, 1501 Kings Highway, Shreveport, LA 71130, USA; mharpe@lsuhsc.edu

Accepted 9 March 2015
Published Online First 10 April 2015

ABSTRACT

Introduction Blood pressure (BP) elevation in medical office settings in patients who are normotensive in nonmedical settings is an effect known as 'white coat hypertension'. This phenomenon is thought to be due to situational anxiety caused by the experience of visiting a doctor and the anxiety-inducing nature of the medical office. Our study was designed to determine if carefully selected photographic art could counter the anxiety that causes white coat hypertension and lead to lower BP recordings in some patients.

Methods 117 adults, non-pregnant patients from the Louisiana State University Health Sciences Center Family Medicine Resident Clinic participated in this study. After the triage nurse measured the BP, the patients were randomly placed in either an exam room with standard medical posters (control room) or in an exam room with photographic art (photo room). The BP was measured in the exam room. After the medical visit, the patients switched rooms and the BP was measured a third time. The patients were asked to fill out a questionnaire to identify room preference.

Results On average, the BP obtained in the control rooms was higher than that obtained in the photo rooms. There was a statistically significant difference between the mean arterial pressure, systolic BP and diastolic BP between the control room and the photo room.

Conclusions Landscape photographic art may have the beneficial effect of reducing BP in medical office examination rooms.

INTRODUCTION

Hypertension (HTN) is a known risk factor for cardiovascular diseases. Fluctuations in blood pressure (BP) can make the diagnosis and management challenging.[1 2] The term 'white coat hypertension' has been used to describe those patients who have hypertensive BP readings in the medical office setting, but normal BP in non-clinical settings. A precise definition of white coat hypertension is not widely accepted, and the prevalence of this condition varies with the degree of BP difference required for diagnosis.[3] White coat effect is defined as the change in BP that occurs in response to a clinic visit. It has been shown that the white coat effect is present in most patients who are diagnosed with HTN, and increases with age.[4] White coat effect reduces the reliability of clinical BP and complicates the diagnosis and management of HTN, but the clinical significance of white coat hypertension remains uncertain.[5]

The cause of white coat hypertension has not been fully studied. It has been postulated to be caused by a conditioned response and anxiety experienced upon visiting a doctor and the nature of the medical office but not to an anxiety trait (a general tendency to be anxious).[2]

The appearance of the examination rooms tends to be similar across medical offices.[3] Many offices display medical information in the examination rooms. The researchers sought to test the hypothesis that replacing medical posters with photographic art could decrease white coat hypertension.

METHODS

All posters and other medical literature were removed from six of the exam rooms of the Louisiana State University Health Sciences Center Family Medicine Resident Clinic. Photographic art was provided by Fletcher Thorne-Thomsen, an internationally known photographer with broad experience in placing his work in hospitals and clinics (figure 1A, B). Two large photographs of natural landscapes or other natural scenes, chosen by Mr Thorne-Thomsen with input from the lead author and the head nurse of the family medical centre, were mounted in these rooms (photo rooms). The other six exam rooms in the clinic remained unchanged with medical information posters designed for medical offices to raise awareness about common diseases; these rooms functioned as controls (control rooms).

Second-year and third-year medical students were instructed on proper methods of measuring BP with a manual sphygmomanometer in accordance with the recommendations in JNC7. In total, 117 adult, non-pregnant patients who were waiting for a routine appointment in the family medicine centre were asked to take part in this study; all agreed to participate. The triage nurse measured their BP. The patient was randomly placed in either a control room or a photo room. After being in the room approximately 10 min, their BP was measured by a medical student. After the medical visit, the patients switched rooms. After 10 min, the same medical student measured their BP a third time. At the end of the encounter, the patients were asked to fill out a questionnaire to identify room preference and record comments.

A Wilcoxon signed-rank test was used to determine significant differences between the patient's control and photo room BP levels (systolic, diastolic and mean arterial pressure (MAP)) unadjusted for effects of other factors. Factors significantly correlated with the difference between control and photo rooms BP levels were determined with either the Spearman's rank correlation coefficient (for numeric factors such as baseline BP and age) or the

To cite: Harper MB, Kanayama-Trivedi S, Caldito G, *et al*. *Med Humanit* 2015;**41**:86–88.

Figure 1 Samples of photographic art used in photo rooms (the photos used in the rooms were in colour).

Wilcoxon rank-sum test (for categorical factors such as gender, known HTN, smoking status, first room assignment, preferred room and doctor who treated patient). The general linear regression model was used to estimate the difference between control and photo room BP (systolic, diastolic and MAP) adjusted for the baseline value and other factors observed to be significantly associated with the difference. The one-sample t test was used to test the average estimated adjusted difference for significance.

Because of the observed non-normality of the differences between control and photo BP levels (systolic, diastolic and MAP), non-parametric statistical methods such as the Wilcoxon signed-rank test and rank-sum test were used to analyse the differences.

A power analysis, performed prior to beginning the study, determined that 100 subjects would be needed to detect a statistically significant difference between control and photo room BP.

RESULTS

Summary statistics for patient demographics and results are shown in table 1. The majority of the patients were women (72.6%), had prior HTN diagnosis (70.9%) and had preference for the photo room (63.7%). Median age was 52 years, ranging from 17 to 77.

Results of significance tests on unadjusted differences between BP readings at the control and photo rooms are shown in table 2. Average differences for MAP and systolic and diastolic BP were all positive and significant at either the 5% or 1% level. Thus, on average, the BP obtained in the control room was significantly higher than that obtained in the photo room.

Table 1 Summary of statistics for patient demographics and results

	Number (%) or median	Mean±SD	Range
(a) Demographics (n=117)			
Female	85 (72.5)		
Prior history of HTN	83 (70.9)		
Smoker	34 (29.1)		
Age (years)	52	49.3±15.5	17–77
Weight (lbs)	198	200.4±48.8	110–356
(b) Results			
Preferred room			
Photo	58 (63.7)		
Control	33 (36.3)		
Baseline MAP	107	105.2±12.3	80–139.5
Control room MAP	105	106.7±12.1	79.5–149
Photo room MAP	105	105.8±13.8	78–177
Baseline systolic BP	133	131.2±17.6	100–178
Control room systolic BP	130	132.2±17.3	96–190
Photo room systolic BP	130	131.0±19.3	96–215
Baseline diastolic BP	78	79.2±10.6	53–107
Control room diastolic BP	80	81.2±10.2	58–116
Photo room diastolic BP	80	80.5±11.1	56–140

BP, blood pressure; MAP, mean arterial pressure.

No factors were observed to be significantly associated with control and photo room differences for systolic, diastolic and MAP. Thus, control and photo room differences were adjusted only for baseline BP values.

Average estimates of the differences between control and photo room BP levels (systolic, diastolic or MAP), adjusted for the baseline values and results of significance tests on the average adjusted differences, are shown in table 3. Average estimated differences between control and photo room BP levels (systolic, diastolic and MAP), adjusted for baseline values, are all positive and significant at the 1% level.

The patient survey comments reveal a greater preference for the rooms with photographic art. Of the 117 patients, 58 preferred the photo room and 33 preferred the control room. The remainder of patients did not express a preference. Qualitative comments revealed that only 15 patients were indifferent to the room decorations and 102 patients had an opinion about the art or medical information displayed in the room. There were 32 comments documented from the patients that preferred the photo room. The majority stated that the room was ‘calming’, ‘relaxing’, ‘peaceful’, ‘soothing’ or ‘nice’. Of the patients who preferred the control room, 16 wrote comments, which included ‘educational’, ‘professional’ or ‘felt like a doctor’s office’.

Table 2 Statistics and significance tests on unadjusted differences between control and photo BP levels

Difference in BP level	Median, mean±SD, range	p Value†
(control–photo) MAP	2.0, 1.0±5.8, −32.5 to 12.0	0.004**
(control–photo) Systolic BP	2.0, 1.2±8.5, −28 to 26	0.02*
(control–photo) Diastolic BP	2.0, 0.7±7.0, −40 to 20	0.03*

*Significant at 5% level (0.01<p<0.05).
**Significant at 1% level (p<0.01).
†For testing null hypothesis of no difference between control and photo room BP.
BP, blood pressure; MAP, mean arterial pressure.

Table 3 Statistics and significance tests on estimated differences between control and photo BP levels adjusted for baseline values

Estimated difference in BP level adjusted for baseline value	Median, mean±SD, range	p Value*
(control–photo) MAP	0.8, 1.0±1.0, −1.8 to 3.0	<0.01**
(control–photo) Systolic BP	1.0, 1.2±1.4, −2.6 to 3.8	<0.01**
(control–photo) Diastolic BP	0.7, 0.7±0.1, 0.5 to 1.0	<0.01**

*For testing null hypothesis of no adjusted difference between control and photo room BP.
**Significant at 1% level (p<0.01).
BP, blood pressure; MAP, mean arterial pressure.

DISCUSSION

Art has long been thought to have health benefits but only recently have scientific studies confirmed some of these effects. Studies have demonstrated the relaxing effect of nature images in stress, anger and fear; the opposite has also been shown: images of buildings and parking lots may worsen stress in some patients. Visual stimulation, especially natural scenery, has been shown to increase pain threshold.[6] Surgical patients exposed to natural landscapes have demonstrated shorter hospital stay, less pain medication requirement and less anxiety than patients exposed to abstract art or blank panels.[7] Prior studies have confirmed the patient's predilection for landscapes and natural scenes. A possible explanation is the combination of blues and greens being calming and pleasurable.[8] Art in the hospital setting has also demonstrated positive effects on family members and staff, promoting distraction, reflection and familial interactions.[9]

Studies have demonstrated that emotions and stressors are important contributors to HTN, via efferent innervation from the amygdala (processing centre of emotions) to the medullary baroreceptive neurons.[10] Different levels of amygdala activation in response to emotions have been found among individuals, hence some may have an exaggerated response that may provoke a hypertensive reaction.[11]

Our current study demonstrates a statistically significant difference in BP reading in patients exposed to landscape photographic art in the exam room compared with patients examined in regular rooms with medical information-related decorations. The lowered BP findings in patients exposed to photo rooms may be secondary to decreased anxiety level, relaxation or distraction. Art in waiting rooms, as well as exam rooms, may also produce an effect in the clinician, in the patient–clinician engagement and in the overall experience. The impression of the medical setting may contribute to building trust, respect and ultimately influence the perceived quality of care. Further research in this area is needed as well as further research in the identification of the most suitable style of art recommended for waiting rooms and exam rooms.

Although ambulatory and home BP measurements are more accurate and predictive of target organ damage, BP measurements obtained in physicians' offices continue to be the standard. Improving the reliability of BP measurements in the clinical setting can be expected to result in more accurate diagnosis, classification and management of HTN. It has been suggested that the most reliable method would be BP taken by an automatic device while the patient is alone in the physician's office.[2]

Some limitations of our study include limited number of subjects, homogeneous patient population recruited from a single institution, female predominance and no prior diagnosis of white coat HTN.

The results of this study suggest that the use of photographic art in the exam room may produce a calming effect in selected patients that may be associated with lower BP readings. The clinical significance of this effect needs to be further investigated.

CONCLUSION

Unadjusted or adjusted for baseline values, control room BP levels (systolic BP, diastolic BP and MAP) were significantly higher than those obtained in the photo room. No factors were significantly associated with control and photo room BP differences. Natural landscape and other non-threatening photographic art may have the beneficial effect of reducing BP.

Acknowledgements We thank Fletcher Thorne-Thomsen, who helped select and made available the photographic art for this research project.

Contributors All authors meet the authorship criteria for the manuscript.

Competing interests None.

Patient consent Obtained.

Ethics approval Institutional Review Board of Louisiana State University Health Sciences Center-Shreveport.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

1 Angeli F, Verdecchia P, Gattobigio R, *et al*. White-coat hypertension in adults. *Blood Press Monit* 2005;10:301–5.
2 Ogedegbe G, Pickering T, Clemow L, *et al*. The misdiagnosis of hypertension, the role of patient anxiety. *Arch Intern Med* 2008;168:2459–65.
3 Pickering T, Coats A, Mallion J, *et al*. Task force: white-coat hypertension. *Blood Press Monit* 1999;4:333–41.
4 Pickering TG, Swartz AR, Gerin W. What is the white-coat effect and how should it be measured? *Blood Press Monit* 2002;7:293–300.
5 Verdecchia P, Angeli F, Gattobigio R, *et al*. The clinical significance of white-coat and masked hypertension. *Blood Press Monit* 2007;12:387–9.
6 Tse MM, Ng JK, Chung JW, *et al*. The effect of visual stimuli on pain threshold and tolerance. *J Clin Nurs* 2002;11:462–9.
7 Malenbaum S, Keefe FJ, Williams AC, *et al*. Pain in its environmental context: implications for designing environments to enhance pain control. *Pain* 2008; 134:241–4.
8 Lankston L, Cusack P, Fremantle C, *et al*. Visual art in hospitals: case studies and review of the evidence. *J R Soc Med* 2010;103:490–9.
9 Suter E, Baylin D. Choosing art as a complement to healing. *Appl Nurs Res* 2007;20:32–8.
10 Saha S. Role of the central nucleus of the amygdala in the control of blood pressure: descending pathways to medullary cardiovascular nuclei. *Clin Exp Pharmacol Physiol* 2005;32:450–6.
11 Gianaros PJ, Sheu LK, Matthews KA, *et al*. Individual differences in stressor-evoked blood pressure reactivity vary with activation, volume, and functional connectivity of the amygdala. *J Neurosci* 2008;28:990–9.

Photographic art in exam rooms may reduce white coat hypertension

Michael B Harper, Stacy Kanayama-Trivedi, Gloria Caldito, David Montgomery, EJ Mayeaux, Jr and Lourdes M DelRosso

Med Humanities 2015 41: 86-88 originally published online April 10, 2015
doi: 10.1136/medhum-2014-010609

Notes