

## Quality of Life in Hypertensive Clinic Patients Following Hurricane Katrina

Erin Stanley, MPH<sup>1,\*</sup> Paul Muntner, PhD, MHS,<sup>†‡§</sup> Richard N. Re, MD,<sup>||</sup> Edward D. Frohlich, MD,<sup>||</sup>  
Elizabeth Holt, PhD, MPH,<sup>¶</sup> Marie A. Krousel-Wood, MD, MSPH<sup>§¶#</sup>

\*Louisiana Office of Public Health, New Orleans, LA<sup>1</sup>

<sup>†</sup>Department of Epidemiology, University of Alabama at Birmingham School of Public Health, Birmingham, AL

<sup>‡</sup>Department of Medicine, University of Alabama at Birmingham School of Medicine, Birmingham, AL

<sup>§</sup>Department of Epidemiology, Tulane University School of Public Health and Tropical Medicine, New Orleans, LA

<sup>||</sup>Section of Hypertension, Department of Cardiology, Ochsner Clinic Foundation, New Orleans, LA

<sup>¶</sup>Center for Health Research, Ochsner Clinic Foundation, New Orleans, LA

<sup>#</sup>Department of Family and Community Medicine, Tulane University School of Medicine, New Orleans, LA

---

### ABSTRACT

**Background:** The purpose of this study was to assess quality of life among hypertensive patients in the year following Hurricane Katrina.

**Methods:** Hypertensive patients (n = 211) in a multispecialty group practice in New Orleans completed validated surveys during the year after Hurricane Katrina. We assessed patients' demographics, quality of life (Medical Outcomes Study 36), hurricane coping self-efficacy, property damage, stress, and changes in distance from and visits with family and friends.

**Results:** The mean age of participants was 63.5 years, 45.0% were men, 70.6% were white, 89.5% had graduated from high school, and 68.3% were married. Mean quality of life scores (standard deviation) were physical functioning 64.6 (30.0), role physical 60.0 (42.8), bodily pain 59.9 (24.3), general health 60.4 (20.5), vitality 53.6 (26.5), social functioning 74.5 (28.1), role emotional 67.8 (41.1), and mental 72.3 (22.0). After adjustment for age, gender, and race, lower coping self-efficacy, more damage to their residence, higher levels of stress after the

storm, increased distance from family and friends, and decreased visits with family and friends were associated with lower quality of life. Personal and financial losses were identified as the most common cause of postdisaster stress, reported by 29.6% of participants.

**Conclusions:** Storm-related factors were associated with lower quality of life in adult patients with hypertension after Hurricane Katrina. Providers managing hypertensive patients in disaster-prone areas may want to consider these factors in identifying patients at risk for lower quality of life following catastrophes.

---

### INTRODUCTION

On August 29, 2005, Hurricane Katrina decimated New Orleans and its surrounding parishes and was classified as the worst natural disaster to affect the United States. More than 500,000 people were evacuated, and the declared disaster area spanned 90,000 square miles.<sup>1</sup> The destruction caused by this hurricane and the ensuing levee failure remained unchanged longer than after previous hurricanes.

Many people lost homes and all their possessions, communities were destroyed, and financial issues escalated, any of which could negatively affect quality of life and health status. Patients place high priority on improving how they feel,<sup>2</sup> and patient perceptions of poor quality of life may be a significant barrier to treatment and control of chronic illnesses such as hypertension.<sup>3,4</sup> Failure to adequately treat and control hypertension could lead to cardiovascular events. Ferdinand<sup>5</sup> noted an unforeseen complication of the Hurricane Katrina disaster: increased morbidity and mortality related to uncontrolled hypertension. Understanding changes in quality of life after a disaster may have important implications for managing hypertension in other disaster-prone areas. The purpose of this analysis was twofold: to assess quality of life after Hurricane Katrina in a population with hypertension

---

Address correspondence to  
Marie Krousel-Wood, MD, MSPH  
Center for Health Research  
Ochsner Clinic Foundation  
1514 Jefferson Highway  
New Orleans, LA 70121  
Tel: (504) 842-3680  
Fax: (504) 842-3648  
Email: mawood@ochsner.org

**Keywords:** Disasters, Hurricane Katrina, hypertension, quality of life, Short Form 36

The authors have no financial or proprietary interest in the subject matter of this article.

<sup>1</sup>Analysis completed while working at the Center for Health Research, Ochsner Clinic Foundation, New Orleans, LA.

and to identify disaster-related factors associated with worse quality of life in the storm's aftermath.

## METHODS

### Study Population and Study Design

We conducted a cross-sectional survey of community-dwelling patients who were patients of the Hypertension Section of the Department of Cardiology in a large multispecialty group practice in New Orleans following Hurricane Katrina.<sup>6</sup> The Institutional Review Board determined that the study was exempt. Inclusion criteria were age >18 years, a diagnosis of hypertension, and a current prescription for antihypertensive medication. We asked patients meeting inclusion criteria and registering for routine appointments with their physician between November 2005 and August 2006 to complete a self-administered core questionnaire that consisted of questions regarding demographics, quality of life, and damage to their residence. Between January and August 2006, a supplemental survey was administered along with the core survey and included questions about stress after the hurricane, changes in distance from and visits with family and friends, and the Hurricane Coping Self-Efficacy scale.<sup>7</sup> A total of 233 surveys collected from patients met the inclusion criteria; 22 patients were excluded because they did not complete all quality of life scales. Participants who did not complete the quality of life scales compared to participants who did complete the scales were more likely to be men (68.2% vs 45.0%, respectively;  $P < .05$ ) and non-white (50.0% vs 29.4%, respectively,  $P < .05$ ). A total of 111 patients completed the supplemental survey. Participants who completed the supplemental survey were younger than those who did not (61.7 years vs 65.5 years, respectively;  $P = .04$ ); otherwise, the groups were similar with respect to gender, race, and educational status.

*Quality of Life.* The Medical Outcomes Study, a 36-item short-form survey instrument (MOS-36), was used to assess quality of life. The MOS-36 consists of questions with Likert responses grouped and scored within 8 scales: physical functioning; social functioning; role functioning, physical items; role functioning, mental items; mental health; energy and fatigue items; pain items; and general health perceptions. This tool has been used in multiple research and clinical settings, and its validity, reliability, and utility are well established.<sup>3,8-14</sup> For participants who answered at least 50% of the scale's items, we calculated the scales of the MOS-36 as the average of all items completed and transformed to a score from 0 (worst health, poorest functional status) to 100 (perfect health, highest functional status) following standard methods.

*Patients' Experiences with Hurricane Katrina and Hurricane Coping Self-Efficacy Scale.* The 10-item Hurricane Coping Self-Efficacy tool<sup>7</sup> was used to assess patients' ability to perform day-to-day tasks and cope with psychological stresses in the post-hurricane period. Responses to questions on the Hurricane Coping Self-Efficacy tool were scored on a 7-point Likert scale, with 1 being not at all capable, 4 being moderately capable, and 7 being totally capable. Possible scores ranged from 10 to 70, with higher scores indicating a greater perceived ability to cope in the aftermath of a hurricane. Although there are no standard cut-points for this scale, we used a cut-point of 70 (ie, a score of 7, totally capable, for all 10 questions) for the analysis of coping with the aftermath of Hurricane Katrina. The validity and reliability of the coping scale have been demonstrated.<sup>7</sup> In addition, participants were asked about the degree of damage to their residence through the following question: 'How much damage did you have to your residence?' Response options were no damage, able to be inhabited with some repairs (ie, damaged minimally), damaged or burned (hardly able to be inhabited; ie, damaged moderately), and completely damaged or burned.<sup>15</sup> Supplemental questions (Table 1) included items about change in distance from and visits with family members or friends<sup>16</sup> and causes of stress after the storm. For the questions about changes in visits with and distance from family and friends, the response options were categorized into increased distance from family or friends (yes or no) and decreased visits with family or friends (yes or no).

### Statistical Analyses

We calculated demographic characteristics of the study population as means and proportions and quality of life scale as means and standard deviations for the 8 scale scores. A multivariable linear regression model—including age, gender, and race—calculated differences in the coping and quality of life scores associated with storm-related factors, including patients' coping ability (not fully capable vs fully capable of coping), the presence of stress after the storm (yes vs no), damage to residence (none vs any), increase in the distance from family and friends (yes vs no), and a decrease in the number of visits with family and friends (yes vs no). Causes of stress after the storm were calculated as proportions. All statistical analyses were performed using SAS version 9.1 (SAS Institute, Cary, NC).

## RESULTS

Characteristics of study participants are presented in Table 2. The mean age of participants was

**Table 1. Supplemental Questions**

A. Family- and friend-related questions (adapted from reference 16)	
As a result of Hurricane Katrina, did the distance from <u>family</u>	
1. Increase	
2. Decrease	
3. Remain the same	
As a result of Hurricane Katrina, did the distance from <u>friends</u>	
1. Increase	
2. Decrease	
3. Remain the same	
After Hurricane Katrina, did the number of visits with <u>family</u>	
1. Increase	
2. Decrease	
3. Remain the same	
After Hurricane Katrina, did the number of visits with <u>friends</u>	
1. Increase	
2. Decrease	
3. Remain the same	
B. Stress-related question	
What has caused the most stress for you since Hurricane Katrina?	
Response Options:	
Family/Work/Health/Personal and Financial Losses/ Housing and Food/No Stress	

63.5 years, 45.0% were men, 70.6% were white, 89.5% had graduated from high school, and 68.3% were married. Mean quality of life scores ranged from a low of 53.6 for vitality to a high of 74.5 for social functioning. After age, gender, and race adjustment, participants reporting any damage to their residence versus no damage had lower coping scores and quality of life. Those not fully capable of coping had lower quality of life compared to those who were fully capable. Participants who reported an increase in the distance from and a decrease in the number of visits with family and friends had lower quality of life in almost all of the scales compared to those who reported no increase in the distance from and no decrease in the number of visits with family and friends (Table 3).

Patient-reported causes of stress after Hurricane Katrina are presented in the Figure. The most common causes of stress after the hurricane were personal and financial losses, which were reported by 29.6% of participants. Additionally, 21.3% of participants reported health being a cause of stress after the hurricane.

**DISCUSSION**

In the year following Hurricane Katrina, hypertensive patients attending a specialty clinic in New

**Table 2. Characteristics of the Study Participants**

Variable	N = 211
<b>Age</b> , mean years (SD)	63.5 (13.5)
<b>Gender</b> , % male	45.0
<b>Race</b> , % White	70.6
<b>Education</b> , % ≥high school	89.5
<b>Marital Status</b> , % married	68.3
<b>Physical Functioning</b> , mean (SD)	64.6 (30.0)
<b>Role Physical</b> , mean (SD)	60.0 (42.8)
<b>Bodily Pain</b> , mean (SD)	59.9 (24.3)
<b>General Health</b> , mean (SD)	60.4 (20.5)
<b>Vitality</b> , mean (SD)	53.6 (26.5)
<b>Social Functioning</b> , mean (SD)	74.5 (28.1)
<b>Role Emotional</b> , mean (SD)	67.8 (41.1)
<b>Mental</b> , mean (SD)	72.3 (22.0)
<b>Coping</b> , mean (SD)	54.5 (13.9)

SD = standard deviation.

Orleans reported low quality of life. Factors associated with lower quality of life included lesser ability to cope with the effects of the storm, more damage to their residence, the presence of stress in their life, increased distance from family and friends, and decreased visits with family and friends. Also, the most prevalent causes of stress reported by disaster victims were financial and personal losses.

Other studies have documented reduced quality of life in patients and healthcare providers following Hurricane Katrina. Quality of life scores were lower among New Orleans residents with diabetes compared to scores of a baseline population of people with diabetes in Olmstead County, MN.<sup>17</sup> Other studies have documented low quality of life scores among Hurricane Katrina evacuees<sup>18</sup> and among older nurses who worked in Katrina-affected areas.<sup>19</sup> Our results add to these findings by providing data on storm-related factors associated with quality of life in older patients with hypertension seen in medical clinics following the storm.

Whether survey respondents had any damage to their residences because of the storm was associated with their quality of life. Physical functioning, general health, vitality, and social, emotional, and mental scale scores were significantly lower for hypertensive participants who reported damage to their residences compared to their counterparts who reported no damage. A study assessing quality of life in elderly earthquake survivors in Taiwan found that damage to a person’s residence was associated with lower quality of life. Survivors who reported that their residence was fully collapsed versus those whose residence did not collapse at all had statistically significant lower physical capacity, psychological, social relationships, and environment scores.<sup>20</sup>

Table 3. Mean Differences in Coping and Quality of Life for Hypertension Clinic Patients Following Hurricane Katrina Adjusted for Age, Race, and Gender

	Damage to Residence: Damage (n = 159) vs No damage (n = 46)	Coping: Not fully capable (n = 90) vs Fully capable (n = 18)		Stress After Hurricane Katrina: Stress (n = 87) vs No stress (n = 21)		Distance From Family: Increased (n = 32) vs Not increased (n = 77)		Visits With Family: Decreased (n = 32) vs Not decreased (n = 78)		Distance From Friends: Increased (n = 43) vs Not increased (n = 66)		Visits With Friends: Decreased (n = 50) vs Not decreased (n = 51)	
Coping Score	-11.8 <sup>‡</sup>	N/A	-7.1*	-9.6 <sup>†</sup>	-9.9 <sup>‡</sup>	-10.1 <sup>‡</sup>	-11.2 <sup>‡</sup>						
Physical Functioning	-12.0*	-15.4*	-17.5*	6.9	0.27	-3.4	-4.9						
Role Physical	-6.9	-20.5	-36.4 <sup>‡</sup>	7.5	5.3	-2.6	0.7						
Bodily Pain	-4.4	-9.7	-19.5 <sup>‡</sup>	1.6	-2.3	4.4	5.5						
General Health	-8.1*	-11.9*	-8.1	4.7	3.1	-1.4	-2.0						
Vitality	-12.1 <sup>†</sup>	-20.5 <sup>†</sup>	-19.5 <sup>†</sup>	-0.6	-1.6	-5.3	-8.7						
Social	-11.3*	-18.6*	-19.0 <sup>†</sup>	-4.1	-11.4	-6.0	-11.7						
Emotional	-15.0*	-27.0*	-30.3 <sup>†</sup>	-2.8	-8.6	-7.4	-9.3						
Mental	-9.5*	-14.7 <sup>†</sup>	-13.8 <sup>†</sup>	-9.9*	-9.1*	-9.4*	-10.6*						

\*  $P < .05$ .†  $P < .01$ .‡  $P \leq .001$ .

N/A, not applicable.

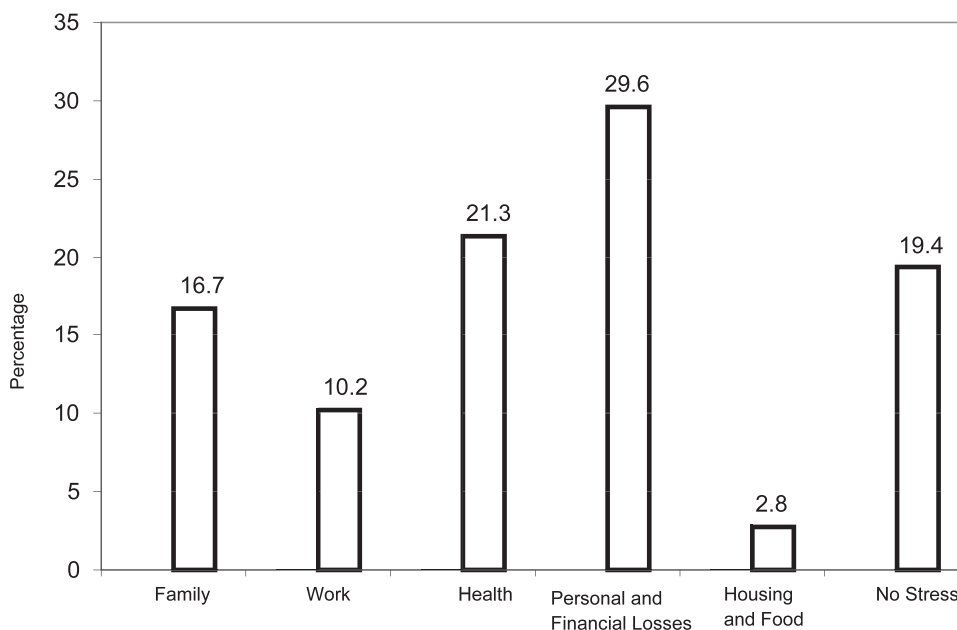
The first column in the table (nonshaded) represents core survey questions, and the shaded area represents supplemental questions.

In the current study, increases in distance from family and friends and decreases in visits with family and friends—signaling potential social activity decline—were each associated with significantly lower mean scores on the mental health and coping scales. A trend existed for lower mean scores for the vitality, social, and emotional scales, but the trends did not achieve statistical significance. A Taiwanese study reported similar findings 3 years after Taiwan experienced a major earthquake. In separate regression analyses, social activity decline was found to be a statistically significant negative predictor of physical functioning, bodily pain, social functioning, and mental health.<sup>21</sup>

Poor quality of life may have important implications in the management of patients with chronic diseases such as hypertension. In prior publications, Holt et al described poor quality of life as an important factor contributing to low antihypertensive medication adherence,<sup>3</sup> and Krousel-Wood et al reported worse blood pressure control and cardiovascular events.<sup>4</sup> Ried and colleagues<sup>22</sup> found that health-related quality of life was associated with a subjective well-being measure in patients with hypertension and coronary heart disease: 1-year mortality rates and the incidence of nonfatal stroke were higher among individuals reporting poor/fair subjective well-being compared with their peers with good subjective well-being. It is possible that quality of life assessments may be useful in identifying patients who are at increased risk for adverse health outcomes.

Evidence suggests that stress contributes to cardiovascular disease. For example, survivors of the Hanshin-Awaji earthquake experienced increases in blood pressure, myocardial infarction, and stroke.<sup>23-25</sup> In postdisaster situations where personal, financial, and social losses and causes of stress may escalate and adversely affect quality of life, special attention to disease management and medication adherence counseling should be considered. Bremner<sup>26</sup> reviewed a number of studies relating antihypertensive medication and quality of life. Although he found no unanimity in the definition of health-related quality of life, self-reported health status seemed to be a powerful predictor of morbidity and mortality.<sup>26</sup>

Results of the current study should be interpreted with the following limitations in mind. The sample size was relatively small, and participation rates were not captured. Data on the socioeconomic and clinical make-up of those who attended the clinic before and after Hurricane Katrina were unavailable; thus, we could not determine whether the sample was representative of the entire clinic population. The survey included mostly insured patients returning for a clinic visit in a healthcare facility that suffered minimal structural damage and may underrepresent disadvantaged and



**Figure. Causes of stress reported by disaster victims after Hurricane Katrina.**

seriously ill patients who were unable to return to New Orleans. Quality of life scores could be different in patients unable or unwilling to participate in this study. The cross-sectional nature of the study and the lack of detailed information on clinical outcomes prevent conclusions regarding any causal relationship to poor quality of life.

With these limitations in mind, the study also has several strengths. A structured questionnaire with validated scales assessed quality of life and storm-related factors in clinic patients in the year following this large-scale disaster. Additionally, several domains assessing participants' experiences related to Hurricane Katrina were captured.

## CONCLUSIONS

Lower coping self-efficacy, greater damage to one's residence, higher levels of stress, increased distance from family and friends, and decreased visits with family and friends were associated with lower quality of life in adults with hypertension attending medical clinics after Hurricane Katrina. Our findings are important because previous research has shown that poor quality of life may negatively influence medication adherence, blood pressure control, and ultimately health outcomes in hypertensive patients. Consideration of quality of life in the postdisaster setting may be useful in identifying patients at risk for adverse cardiovascular events and in managing this chronic disease.

## REFERENCES

1. Hurricane Katrina Advisory Group. Overview of Baseline Survey Results: Hurricane Katrina Advisory Group. August 29, 2006. [http://www.hurricanekatrina.med.harvard.edu/pdf/baseline\\_report%208-25-06.pdf](http://www.hurricanekatrina.med.harvard.edu/pdf/baseline_report%208-25-06.pdf). Accessed 3 February 2011.

2. Testa MA. Methods and applications of quality-of-life measurement during antihypertensive therapy. *Curr Hypertens Rep.* 2000;2(6):530-537.
3. Holt EW, Muntner P, Joyce CJ, Webber L, Krousel-Wood MA. Health-related quality of life and antihypertensive medication adherence among older adults. *Age Ageing.* 2010;39(4):481-487.
4. Krousel-Wood M, Thomas S, Muntner P, Morisky D. Medication adherence: a key factor in achieving blood pressure control and good clinical outcomes in hypertensive patients. *Curr Opin Cardiol.* 2004;19(4):357-362.
5. Ferdinand KC. The Hurricane Katrina disaster: focus on the hypertensive patient. *J Clin Hypertens (Greenwich).* 2005;7(11):679-680.
6. Krousel-Wood MA, Islam T, Muntner P, et al. Medication adherence in older clinic patients with hypertension after Hurricane Katrina: implications for clinical practice and disaster management. *Am J Med Sci.* 2008;336(2):99-104.
7. Benight CC, Ironson G, Durham RL. Psychometric properties of a hurricane coping self-efficacy measure. *J Trauma Stress.* 1999;12(2):379-386.
8. Bardage C, Isacson DG. Hypertension and health-related quality of life. An epidemiological study in Sweden. *J Clin Epidemiol.* 2001;54(2):172-181.
9. Erickson SR, Williams BC, Gruppen LD. Perceived symptoms and health-related quality of life reported by uncomplicated hypertensive patients compared to normal controls. *J Hum Hypertens.* 2001;15(8):539-548.
10. Krousel-Wood MA, Re RN. Health status assessment in a hypertension section of an internal medicine clinic. *Am J Med Sci.* 1994;308(4):211-217.
11. Lawrence WF, Fryback DG, Martin PA, Klein R, Klein BE. Health status and hypertension: a population-based study. *J Clin Epidemiol.* 1996;49(11):1239-1245.

12. McHorney CA, Ware JE Jr, Rogers W, Raczek AE, Lu JF. The validity and relative precision of MOS short- and long-form health status scales and Dartmouth COOP charts. Results from the Medical Outcomes Study. *Med Care*. 1992;30(5 Suppl):MS253-MS265.
13. Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care*. 1992;30(6):473-483.
14. Ware JE, Snow KK, Kosinski M, Gandek B. *SF-36 Health Survey Manual and Interpretation Guide*. Boston: The Health Institute, New England Medical Center; 1993.
15. Inui A, Kitaoka H, Majima M, et al. Effect of the Kobe earthquake on stress and glycemic control in patients with diabetes mellitus. *Arch Intern Med*. 1998;158(3):274-278.
16. Bland SH, Farinara E, Krogh V, Jossa F, Scottoni A, Trevisan M. Long term relations between earthquake experiences and coronary heart disease risk factors. *Am J Epidemiol*. 2000;151(11):1086-1090.
17. Khoo TK, Smith SA. After Katrina: quality of life among New Orleans residents with diabetes. *Mayo Clin Proc*. 2008;83(5):601.
18. LaJoie AS, Sprang G, McKinney WP. Long-term effects of Hurricane Katrina on the psychological well-being of evacuees. *Disasters*. 2010;34(4):1031-1044.
19. James NT, Miller CW, Nugent K, Welch C, Cabanna M, Vincent S. The impact of Hurricane Katrina upon older adult nurses: an assessment of quality of life and psychological distress in the aftermath. *J Miss State Med Assoc*. 2007;48(10):299-307.
20. Lin MR, Huang W, Huang C, Hwang HF, Tsai LW, Chiu YN. The impact of the Chi-Chi earthquake on quality of life among elderly survivors in Taiwan—a before and after study. *Qual Life Res*. 2002;11(4):379-388.
21. Wu HC, Chou P, Chou FH, et al. Survey of quality of life and related risk factors for a Taiwanese village population 3 years post-earthquake. *Aust N Z J Psychiatry*. 2006;40(4):355-361.
22. Ried LD, Tueth MJ, Handberg E, Nyanteh H. Validating a self-report measure of global subjective well-being to predict adverse clinical outcomes. *Qual Life Res*. 2006;15(4):675-686.
23. Kario K, Matsuo T, Shimada K, Pickering TG. Factors associated with the occurrence and magnitude of earthquake-induced increases in blood pressure. *Am J Med*. 2001;111(5):379-384.
24. Kario K, McEwen BS, Pickering TG. Disasters and the heart: a review of the effects of earthquake-induced stress on cardiovascular disease. *Hypertens Res*. 2003;26(5):355-367.
25. Saito K, Kim JI, Maekawa K, Ikeda Y, Yokoyama M. The great Hanshin-Awaji earthquake aggravates blood pressure control in treated hypertensive patients. *Am J Hypertens*. 1997;10(2):217-221.
26. Bremner AD. Antihypertensive medication and quality of life—silent treatment of a silent killer? *Cardiovasc Drugs Ther*. 2002;16(4):353-364.

*This article meets the Accreditation Council for Graduate Medical Education competencies for Patient Care, Medical Knowledge, and Systems-Based Practice.*