

Predictors of Persistent Palpitations and Continued Medical Utilization

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Background. The aim of this study was to determine the predictors of persistent palpitations and continued medical utilization in a sample of medical patients referred for ambulatory electrocardiographic monitoring.

Methods. A prospective telephone follow-up was conducted with patients who had undergone ambulatory electrocardiographic monitoring 3 months earlier. At inception, patients completed in-person interviews and self-report questionnaires, assessing somatization, hypochondriacal attitudes, bodily amplification (high degree of sensitivity to bodily sensations), and two types of life stress (minor daily irritants and major life changes). At follow-up, patients completed a structured interview about their clinical course, palpitations, and utilization of medical care during the interval.

Results. At 3-month follow-up, 55 of the inception cohort of 67 patients were interviewed again. The mean severity of palpitations for the entire sample declined significantly, but 46 (83.6%) patients continued to experience their presenting symptoms. Stepwise multiple linear regression revealed that the interaction of bodily amplification and daily life stress at inception uniquely

explained 10.0% of the variance in palpitation severity at follow-up. A four-step model composed of these two interaction terms and age and education level accounted for 21.4% of the variance in palpitations. The medical utilization findings are complementary in that the interaction of amplification and daily irritants at baseline predicted the number of unscheduled medical visits over the subsequent 3 months. The total number of ventricular premature contractions occurring during ambulatory monitoring was *not* a significant predictor of palpitations.

Conclusions. Palpitations are more persistent in persons who are both highly sensitive to bodily sensations *and* who experience a greater number of minor daily irritants. The existence of either predictor alone is not sufficient to perpetrate this functional somatic symptom; it requires the combination of these predictors.

Key words. Palpitation; somatoform disorders; stress, psychological; health services; health services misuse; electrocardiography, ambulatory. (*J Fam Pract* 1996; 42:465-472)

Although palpitations are a very common complaint, surprisingly little is known about their origin, natural history, and longitudinal course. Palpitations are among the 10 most common symptoms in primary care practice, occurring in 16% of general medical outpatients,¹ and the com-

plaint is common in cardiology practice as well.² These patients often remain diagnostic enigmas, despite extensive and expensive diagnostic evaluation.³

Currently available research suggests that patients with palpitations remain symptomatic, distressed, and impaired over prolonged periods. Weber and Kapoor,³ for example, prospectively followed 190 patients presenting with palpitations to a medical outpatient clinic at an academic medical center. At 1-year follow-up, 75% of these patients had recurrent symptoms, 19% reported decreased work performance, and 33% reported role impairment at home. Almost one half (45%) were judged to have a psychiatric basis for their symptoms. High rates of chro-

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nicity, disability, and psychiatric disorder were also reported by Mayou,⁴ who studied 94 patients with chest pain or palpitations referred to a cardiac clinic. At baseline, 50% of the patients with palpitations received a psychiatric diagnosis. Three years later, those without cardiac disease had refractory symptoms, disability, dissatisfaction with their medical care, and 12.9% believed they had cardiac disease. Knudson⁵ reviewed the records of 109 primary care patients complaining of palpitations and of a comparison group without palpitations. Palpitation patients did not have a higher incidence of cardiac morbidity or mortality. A strong positive relationship was found between a history of psychiatric disorder and the chronicity of palpitations: those with a psychiatric history had a 50% greater risk of recurrent palpitations.

In a previous longitudinal study of consecutive outpatients referred for Holter electrocardiographic monitoring to evaluate palpitations,⁶ we found considerable chronicity at 6-month follow-up. More than three fourths (83.7%) of these patients reported recurrent palpitations, and over one half (57.4%) continued to experience palpitations in the month preceding the follow-up interval. Self-reported amplification of benign bodily sensations (hereafter in this paper termed "amplification"), assessed at inception, was a significant predictor of persistent palpitations at 6-month follow-up. Although statistically significant, they were only modest predictors (total $R^2=.17$).

There is very little literature on the specific factors that precipitate, perpetuate, or mitigate acute somatization. Stressful life events are known to be accompanied by functional somatic symptoms and physician visits, and this increase in medical utilization is greater than that attributable to an increase in actual medical morbidity.⁷⁻⁹ Evidence suggests that such distress prompts medical visits by causing people to assess their health status less favorably,¹⁰ to focus on benign bodily symptoms they might otherwise ignore,^{11,12} and to seek medical attention for disguised psychological distress.¹³ The specific precipitating life stresses cited most often are the death of a relative¹⁴⁻¹⁶ and marital and family crises.^{17,18}

Similarly, the literature on stress, somatization, and medical care utilization in patients with functional cardiovascular complaints consists of only a few scattered and uneven reports. In one study, for example, emergency department patients with noncardiac chest pain were found to have more stressful life events in the preceding year than did matched controls.¹⁹ In another, 50% to 60% of patients undergoing exercise tolerance testing for chest pain had neither cardiac nor psychiatric disorders, but many of them were thought to be somatizing psychosocial stress.²⁰ A review of cardiology clinic referrals for chest pain and palpitations noted that fewer than one half had a cardiac diagnosis, concluding that more of the

symptoms in this residual group resulted from psychosocial causes than from psychiatric disorder.⁴ Very little is known specifically about the somatizing process in patients with palpitations or about the particular life events that precipitate their visit to the physician. Observers of patients with functional cardiovascular complaints have emphasized the importance of events that cause them to interpret symptoms as indicative of serious disease.^{21,22} A family history of heart disease and a recent cardiac diagnosis in an acquaintance also have been noted.^{4,22}

In the present study, we describe the longitudinal course and persistence of palpitations in medical outpatients. In particular, we examine the influence of life stress and amplification of bodily sensations on the chronicity of palpitations and on the ongoing use of medical services. An interaction model is proposed, in which persistent somatizing results from the combination of a predisposing trait (amplification) and a precipitant (life stress).

Methods

Setting and Subjects

This study was conducted in the ambulatory electrocardiography (Holter) laboratory at the Massachusetts General Hospital. The study sample consisted of consecutive outpatients referred to the laboratory for the evaluation of palpitations. The inclusion criteria were English literacy and fluency and availability for a follow-up interview. Patients were excluded if they had significant organic brain disease or communication deficits, or if they were referred to the laboratory from the emergency department or walk-in clinic. The latter exclusion criterion is based on the generally low rate of compliance with medical follow-up and absence of a primary care physician among these patients. Patients are referred to the Holter laboratory from a variety of sources: approximately 60% from the hospital's general medical clinics or primary care internists; approximately 25% from the cardiac clinic or staff cardiologists; and the remainder in approximately equal numbers from other medical specialists and neighborhood health centers.

Over a 7-month interval, 153 consecutive patients underwent ambulatory (Holter) monitoring for palpitations. Fifty-two of these patients were ineligible, most commonly because they were referred from the emergency department or walk-in clinic. Five could not be contacted, and 29 declined to participate. Thus, 67 of the eligible patients (66.3%) completed the resulting battery at baseline. Of these subjects, 55 (82.1%) completed the follow-up battery approximately 3 months later (mean, 105 days; standard deviation [SD], 15.1; range, 86 to 153).

Design and Procedures

A consecutive sample of medical outpatients complaining of palpitations was gathered at the time they underwent 24-hour ambulatory monitoring. Patients were contacted soon after referral to the Holter laboratory. Those consenting to the study came to the hospital before their electrocardiography appointments to complete the research battery, which took slightly less than 2 hours. The research battery consisted of self-report questionnaires, structured interviews, and a computer-administered cognitive recall test. Patients were compensated for undergoing the interview.

The Holter electrocardiogram was recorded in the standard fashion with a dual-channel recorder (Del Mar Avionics Electrocardiometer, model 453A), with five leads placed in a modified CM lead convention. Patients received specially designed diaries for recording symptoms during monitoring, were given a clock to determine the exact onset of all symptoms, and were taught how to mark the ECG recording precisely at the time of each symptom. Recordings were scanned and analyzed with a Holter analysis unit (Del Mar Avionics, model 750), interpreted by a cardiologist, and analyzed in conjunction with the symptom diary.

Questionnaires were circulated to the patients' referring physicians, eliciting their impressions of diagnosis and cause and their ratings of each patient's cardiac and medical morbidity. They were completed before the physician received the Holter laboratory report. Three months after the inception interview, all patients were recontacted by telephone. They completed a structured clinical interview and several of the original questionnaires, covering the interval between inception and follow-up. This took approximately 15 minutes.

Predictor Variables

SOMATIZATION

Somatization was measured with the Somatic Symptom Inventory. This instrument consists of 26 symptoms common to the somatization subscale of the Hopkins Symptom Checklist-90^{23,24} and the hypochondriasis subscale of the Minnesota Multiphasic Personality Inventory, on which responses are scored on a 5-point ordinal scale. In previous work, the Somatic Symptom Inventory had a test-retest reliability of 0.86 (Pearson's product moment correlation) over a mean interval of 26 days and an intrascale consistency of 0.95 (Cronbach's α).^{25,26}

HYPOCHONDRIASIS

Hypochondriacal symptoms were assessed with the Whiteley Index,²⁷ which is composed of 14 items assessing hypochondriacal attitudes and beliefs. It contains three factors: disease conviction (the unfounded belief one has a serious disease), disease fear, and bodily preoccupation. It has excellent test-retest and intrascale reliability, as well as discriminant and convergent validity.^{28,29} In our prior work, this scale had an intrascale consistency of 0.85 (Cronbach's α) and a test-retest reliability of 0.84 (Pearson's product moment correlation coefficient) over a mean interval of 26 days.

SOMATOSENSORY AMPLIFICATION

The Somatosensory Amplification Scale (SSAS) is a 10-item questionnaire developed in previous work.³⁰ It assesses the self-reported sensitivity to a range of normal physiological states and uncomfortable bodily sensations that are minor and not regarded generally as symptomatic of serious disease (eg, "hunger contractions," "feeling your pulse throbbing in your ear," "insect bites"). The SSAS has excellent test-retest reliability and internal consistency.³⁰ It is significantly associated with hypochondriacal symptoms,³⁰ somatization,³⁰ and alexithymia,³¹ and also predicts the persistence of hypochondriacal symptoms in transiently hypochondriacal patients,³² and the incidence of environmental illness and chemical sensitivity among plastics workers.³³

LIFE STRESS

Major stressful negative life events were assessed with the Life Experiences Survey.³⁴ This self-report questionnaire contains 52 important life events, such as marriage, job change, and major financial change. The respondent indicates whether the event has occurred in the past year and, if so, rates its perceived impact on a 7-point scale from extremely positive to extremely negative. This scale is widely used and has been demonstrated to have test-retest reliability and convergent validity.³⁵

Everyday life stresses that pose recurring or continuing demands or conflicts were measured with the Daily Hassles Scale.³⁶ This 117-item scale measures the frequency and severity of minor daily irritants that require adaptation, eg, interpersonal friction or transportation problems. The cumulative severity, ie, the sum of each item multiplied by its severity rating, was used in the statistical analyses.³⁶ Factor analysis generates eight stable subscales, including work, household financial responsibilities, health, and time pressures. This scale is widely used, and normative data are available for a number of different groups.³⁶ Daily Hassles scores show significant

stability over 9 months, and concurrent, convergent, and construct validity has been demonstrated by the significant correlation of scores with emotional distress, life adjustment, and self-reported overall health.³⁶

CARDIAC ECTOPY

The total number of ventricular premature contractions (VPCs) during 24 hours of monitoring was used as an aggregate measure of arrhythmic activity. Because VPCs were not normally distributed in this population, these data were transformed using the natural $\log+1$.³⁷

Criterion Variables

MEDICAL AND CARDIAC SYMPTOMS

A 1-month history of cardiorespiratory symptoms was assessed with a 12-item questionnaire, the Cardiac Symptom Questionnaire (CSQ), which is scored on an ordinal scale from 1 (not at all) to 5 (a great deal). It includes six descriptors of palpitations (racing, stopping, skipping a beat, pounding, fluttering, or jumping) and additional cardiorespiratory symptoms. Only the six items referring to palpitations were analyzed; these are referred to as CSQ-38. The same questionnaire was incorporated into the Holter diaries to record symptoms during monitoring. Patients were also asked directly about the presence or absence of palpitations at the 3-month follow-up. A clinical history of known cardiac disease, treatment, and current medications was obtained by means of directly questioning the patient.

MEDICAL CARE UTILIZATION

In the follow-up interview, patients were asked how many scheduled visits they had made to medical physicians and mental health providers and to emergency departments and walk-in clinics in the preceding 3 months. These questions have been used in earlier research³⁸ and have face validity.

Covariates

Sociodemographic characteristics, including age, gender, educational level, employment, and marital status, were obtained by direct inquiry. Since type of employment could not be reliably categorized, educational level, which was highly correlated with a composite measure of socioeconomic status, was used to estimate socioeconomic status.

Data Analysis

Descriptive statistics for the predictor variables and the CSQ-38 were calculated at inception and at 3 months, and were compared using paired *t* tests. The number of negative life events, independent of severity ratings, was used for the Life Experiences Survey. For inferential tests, subjects were classified as having no negative events, one or two negative events, or three or more negative events. This stratification was based on the distribution of these variables and has been used in prior studies. Intercorrelation matrices were also calculated for this set of inception variables.

Multiple stepwise linear regression correlation was used to predict the extent of palpitations at follow-up.³⁹ This method permitted forced entry of two covariates, ie, age and educational level, followed by a set of possible predictors measured at baseline: Whiteley Index, SSAS, Daily Hassles Scale, and sex. Several interaction terms were constructed and were also available for entry: the SSAS×Daily Hassles Scale, the SSAS×Whiteley Index, and the SSAS×Negative Life Events. Possible predictors were entered in the model if they met the conservative "F to enter" criterion of 0.05. This method permitted testing the effects of both of the individual variables (life stress and amplification) and the interaction terms after the effects of age and educational level had been partialled out.

Stepwise regression was also employed to test the association of predictor variables at inception with medical care utilization during the follow-up period. As with the previous regression analyses, age and educational level were forced into the model as covariates, followed by the same predictors described above.

Results

Complete follow-up data were obtained on 20 men and 35 women. The mean age was 49.6 (± 16.3). Fifty-four were white and 1 was Hispanic. Fifteen (27.3%) of the patients were single, 29 (52.7%) were married, and 11 (20.0%) were divorced, widowed, or separated. Six patients (10.9%) were in Social Class I (highest), 18 (32.7%) in II, 14 (25.5%) in III, 11 (20.0%) in IV, and 6 patients (10.9%) were in Social Class V (lowest). When the 12 patients lost to follow-up were compared with this sample, they differed with respect to sex: proportionately more men were lost to follow-up than women (33.3% vs 9.3%; Pearson $\chi^2 [1]=6.05, P=.01$) but not in age, marital status, or social position.

Of the 55 subjects who were followed up at 3 months, 46 (83.6%) still experienced presenting symptom at 3 months. Twenty-one subjects (38.2%) reported ex-

Table 1. Descriptive Statistics for Patients with Palpitations at Inception and 3-Month Follow-up

Variable	Scale (score range)	Inception (N=55) Mean (SD)	3 months (N=55) Mean (SD)
Somatization*	Somatic Symptom Inventory (1-5)	2.04 (0.72)	1.81 (0.67)
Hypochondriasis*	Whiteley Index (1-5)	1.92 (0.08)	1.74 (0.71)
Amplification†	Somatosensory Amplification Scale (1-5)	2.65 (0.70)	—
Daily hassles†	Daily Hassles Scale (0-351)	25.96 (29.9)	—
Negative life events†	Life Experiences Survey (1-52)	3.16 (3.2)	—
Cardiac ectopy†	Total VPCs/24 hours (Log+1)	2.98 (2.88)	—
Palpitations*	CSQ-38 (1-5)	2.32 (0.82)	1.81 (0.74)

*P<.001 compared with other variables.

†Not readministered at 3 months.

VPCs denotes ventricular premature contractions; CSQ-38, Cardiac Symptom Questionnaire items referring to palpitations. Amplification refers to self-reported amplification of benign bodily sensations.

perceiving palpitations at least once per day. Table 1 shows that somatization, hypochondriacal symptoms, and palpitations all declined significantly over this period. The intercorrelations among the predictors were moderate in magnitude, ranging from .41 to .48. Amplification and daily hassles had a statistically significant, moderate intercorrelation at baseline ($r=.41, P<.01$). Women tended to have higher CSQ-38 scores than men. The correlations of predictor variables with CSQ-38 ranged from $-.08$ (VPCs/24 hours) to $.33$ (Daily Hassles Scale). The correlations between the sociodemographic descriptors and palpitations were low. VPCs were not significantly correlated with palpitations, hypochondriasis, amplification, or daily life hassles.

Stepwise multiple linear regression analysis was then carried out (Table 2). On steps 1 and 2, age and educational level were forced into the model as covariates to take into account any possible role that sociodemographic characteristics might play. They accounted for a non-significant 1.0% and 0.8% of the variance in palpitation severity as measured by the CSQ-38 at follow-up. On step 3, the interaction of amplification $SSAS \times$ Daily Hassles Scale entered, followed by the interaction of $SSAS \times$ Negative Life Events on step 4. The full model explained 21.4% of the variance in palpitations as measured by the CSQ-38 at follow-up ($F[4,43]=2.94, P<.031$). None of the other variables met criteria for

Table 2. Amplification* and Stress as Predictors of Palpitations at 3-Month Follow-up (n=48)

Multiple Regression	Predictor	% of Increase in Variance Explained by Predictor	P Value†
Step 1	Age	1.0	NS
Step 2	Educational level	0.8	NS
Step 3	Amplification \times Daily hassles	10.0	<.01
Step 4	Amplification \times Negative events	9.6	<.05

*Amplification refers to self-reported amplification of benign bodily sensations.

†Two-tailed P values.

NOTE: Seven cases were excluded because of missing data.

NS denotes not significant.

entry. The pattern of intercorrelations between the two interaction terms and CSQ-38 is such that $SSAS \times$ Negative Life Events functions as a *suppressor* variable,³⁸ ie, it suppresses the portion of the variance in the $SSAS \times$ Daily Hassles interaction term that is unrelated to the CSQ-38, thus increasing the variance explained in CSQ-38. The Figure presents a graph of the interaction effect of the $SSAS \times$ Daily Hassles Scale on the CSQ-38. Daily hassles and amplification are conditional on each other with respect to their relationship to CSQ-38. The Figure indicates that at lower levels of amplification and

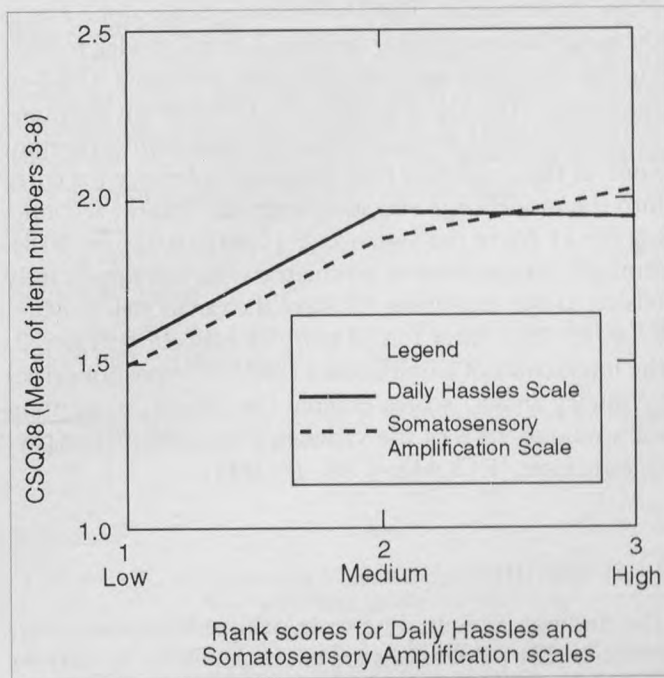


Figure. Interaction of baseline Somatosensory Amplification and Daily Hassles scales with the six items related to palpitations on the Cardiac Symptom Questionnaire (CSQ-38) at 3 months.

Table 3. Amplification* and Stress as Predictors of Emergency and Medical Walk-in Visits from Inception to 3 Months (n=48)

Multiple Regression	Predictor	% of Increase in Variance Explained by Predictor	P Value†
Step 1	Age	1.2	NS
Step 2	Educational level	1.4	NS
Step 3	Hypochondriasis scale	8.4	NS
Step 4	Amplification × Daily hassles	23.4	<.001
Step 5	Daily hassles	13.2	<.01

*Amplification refers to self-reported amplification of benign bodily sensations.

†Two-tailed P value.

NOTE: Seven cases were excluded because of missing data.

NS denotes not significant.

hassles, hassles are responsible for more of their combined effect on palpitations than at higher levels of amplification and hassles, at which amplification is relatively more important.

The predictors of medical care utilization were then examined using multiple stepwise linear regression (Table 3). For each regression model, age and educational level were first forced into the model as covariates. The number of emergency and walk-in visits at 3 months was predicted by the Whiteley Index and the interaction of SSAS and the Daily Hassles Scale. The Daily Hassles Scale alone enters the model as a suppressor variable. The full model, including the covariates age and education, explained 47.6% of the variance ($F [5,42]=7.623, P<.001$). When the number of scheduled medical visits was used as the criterion, none of the predictors met minimum tolerance for entry into the model. Age was statistically significant, accounting for 11.6% of the variance ($F [1,46]=6.01, P<.018$). Similarly, the number of psychiatric visits was significantly related to age, explaining 13.5% of the variance ($F [1,46]=7.15, P<.01$). After forced entry of education in step 2, the interaction of amplification (SSAS)×hypochondriasis (Whiteley Index) scores entered the model, accounting for a unique 9.8% of the variance in the number of psychiatric visits ($F [3,44]=5.05, P<.004$).

Discussion

The findings presented here are compatible with the hypothesis that palpitations are more persistent in persons who are both highly sensitive to bodily sensations and who experience a greater number of minor daily stressors and irritants. The existence of either predictor alone, ie,

either an amplifying somatic style or a stressful daily life, is not sufficient to perpetrate this functional somatic symptom; it is their combination that is salient. Their *interaction* explains a significant proportion of the variance in palpitations above and beyond the effect of each variable alone. The findings regarding medical utilization are compatible with those on symptom chronicity. The interaction of amplification and hassles at baseline predicted the number of unscheduled, emergency, and walk-in visits over the subsequent 3 months. This finding, if replicated, suggests screening strategies that might help reduce unnecessary medical utilization. The results of this study suggest that there may be two necessary components to chronic somatization: (1) a predisposing, enduring, traitlike amplifying somatic style in which a full range of bodily sensations tends to be experienced as unusually noxious, and (2) precipitating current stressors, in particular, minor irritants recurring daily, as assessed by the Daily Hassles Scale. The literature on the SSAS suggests that this score describes a prominent traitlike characteristic and that it is quite stable over months and even years.^{6,26,33} Thus, amplification could be viewed as a predisposition to a somatizing response to stress. Persons who amplify are continually barraged by uncomfortable bodily sensations and might thereby be primed to feel acutely symptomatic under stressful circumstances.

The nature of the stresses, as measured by the Daily Hassles Scale, is complex. The scale's 117 items include both discrete specific events (such as troublesome neighbors, problems with co-workers, financial difficulties, and family responsibilities) and items that are more likely to tap the subjective experience of distress (eg, fear of rejection, trouble relaxing, feeling conflicted over what to do). The Life Events Survey, in contrast, inquires into relatively infrequent but discrete and objective major life events, such as a death in the family, a divorce, or a change of job. The relationship between these two forms of stress is not clear. The Daily Hassles Scale may be more reflective of a distressed state of mind, whereas the Life Experiences Survey may assess more objective events. The distinction between these two forms of stress has also emerged in a study of headache patients, in which minor daily irritants, as opposed to major life events, were more frequent and more severe in chronic headache patients and were reliable predictors of headache persistence.⁴⁰

Cardiac ectopy, as estimated by the total number of VPCs occurring in 24 hours, did not explain a significant fraction of the variance in palpitations. This lack of a relationship between palpitations and arrhythmias, although striking, has been reported previously.⁴¹ It should also be noted that the total number of VPCs may not be a wholly satisfactory quantitative measure of arrhythmias.

This study contains a number of limitations. First,

the relatively small sample size raises the possibility of Type II error and limits external validity; although multiple linear regression analysis can be applied to samples of this size, it is most suitable for larger samples. Second, a number of biases make us cautious in generalizing these findings to all primary care patients with a complaint of palpitations. We studied only patients who were referred for ambulatory monitoring, which may be an unrepresentative subsample of all medical outpatients with palpitations. It is possible, for example, that patients referred for monitoring are under more stress or somatize less often, or pose a greater differential diagnostic dilemma. Although two thirds of the patients in our study were referred for monitoring by primary care physicians, one third came from specialists. The vast majority of the latter, however, receive their primary care at our hospital and returned to their primary physicians after the cardiac consultation. There is also a sampling bias, since our hospital serves a predominantly white, middle-class population, and does not have a large proportion of minority group members. In addition, there are two sources of selection bias: 52 of 153 (34.0%) patients met exclusion criteria, primarily because they were referred from the emergency department, and 12 of the 67 patients (17.9%) in the inception cohort were lost to follow-up. The patients who dropped out differed from those who were retained only with respect to sex. Although these selection biases were not powerful, they underscore the need to conduct studies such as this one in different patient populations and different settings.

Additionally, possible confounders, such as noncardiac medical comorbidity, were not assessed. Future work should attempt to measure such confounders, but we have no evidence that these were major factors in this study. Another issue is that the precise nature of daily hassles is unclear; reporting this sort of stress may reflect a response bias toward reporting generalized dysphoria and emotional distress. In addition, the 3-month follow-up interval may be too short a period from which to estimate long-term patterns of medical care utilization. These limitations point to factors that should be included in future studies. Finally, both of our independent variables, amplification and stress, may be epiphenomena of a single underlying cause, such as psychiatric disorder; ie, psychiatric disorder may cause patients to report both undue bodily sensitivity and stressful everyday lives *and* more persistent and chronic palpitations.

These findings have several clinical implications. First, they provide guidance for clinicians in identifying patients with both an amplifying bodily style and high levels of daily stress. These patients with palpitations are more likely to be symptomatic and also may be more inclined to seek medical care. An amplifier is a patient who

reports a wide range of bodily discomfort and is troubled by uncomfortable sensations that are not generally symptomatic of disease, such as insect bites, loud noises, and normal physiology. The findings also suggest that the sorts of stress that may be most important in perpetuating and maintaining functional somatic symptoms (eg, palpitations) are minor, repetitive, daily irritants, comparable to traffic jams, inconsiderate neighbors, and "red tape," rather than major life events, such as divorce or loss of employment.

If the primary care physician can identify a subgroup of patients with palpitations at the time of initial presentation who are at greater risk for prolonged somatizing, chronic illness behavior, and continued medical utilization, intervention steps can be initiated. It can be helpful for patients to learn what sorts of stress may be exacerbating their symptoms, in particular, the importance of minor daily irritants as opposed to major life-change events. It can also be helpful to point out to some patients that they are highly sensitive to bodily discomfort that others may perceive as less intense and are better able to dismiss or ignore. This notion of amplification can assist patients in understanding the origin of functional somatic symptoms. The physician can explain that their nervous systems are highly sensitive, causing them to be bothered by benign symptoms and normal physiology. The notion of amplification furnishes the patient with a model of dysfunction rather than disease. This is important because somatizing patients need an explanation for their symptoms beyond simply being told that all their diagnostic tests are unrevealing.

Further study is needed of patients with single functional somatic symptoms such as palpitations. In the meantime, however, physicians need to realize that these symptoms often become chronic and disabling and that they prompt continued medical utilization.

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