

# Impact of Chronic Cough on Quality of Life

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**Background:** Cough is the most common complaint for which adult patients seek medical care in the United States; however, the reason(s) for this is unknown.

**Objectives:** To determine whether chronic cough was associated with adverse psychosocial or physical effects on the quality of life and whether the elimination of chronic cough with specific therapy improved these adverse effects.

**Methods:** The study design was a prospective before-and-after intervention trial with patients serving as their own controls. Study subjects were a convenience sample of 39 consecutive and unselected adult patients referred for evaluation and management of a chronic, persistently troublesome cough. Baseline data were available for 39 patients and follow-up for 28 patients (22 women and 6 men). At baseline, demographic, Adverse Cough Outcome Survey (ACOS), and Sickness Impact Profile (SIP) data were collected and patients were managed according to a validated, systematic protocol. Following specific therapy for cough, ACOS and SIP instruments were readministered.

**Results:** The ages, sex, duration, and spectra and frequencies of the causes of cough were similar to multiple other studies. At baseline, patients reported a mean  $\pm$  SD of  $8.6 \pm 4.8$  types of adverse occurrences related to cough. There were significant correlations between multiple ACOS items and total, physical, and psychosocial SIP scores. Psychosocial score correlated with total number of symptoms ( $P < .02$ ). After cough disappeared with treatment, ACOS complaints decreased to a mean  $\pm$  SD of  $1.9 \pm 3.2$  ( $P < .0001$ ) as did total (mean  $\pm$  SD,  $4.8 \pm 4.5$  to  $1.8 \pm 2.2$ ) ( $P = .004$ ), psychosocial (mean  $\pm$  SD,  $4.2 \pm 6.8$  to  $0.8 \pm 2.3$ ) ( $P = .004$ ), and physical (mean  $\pm$  SD,  $2.2 \pm 2.9$  to  $0.9 \pm 1.8$ ) ( $P = .05$ ) SIP scores. Multiple linear regression analysis showed that 54% of variability of the psychosocial SIP score was explained by 4 ACOS items while none of the physical score was explained.

**Conclusions:** Chronic cough was associated with deterioration in patients' quality of life. The health-related dysfunction was most likely psychosocial. The ACOS and SIP appear to be valid tools in assessing the impact of chronic cough.

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**W**HILE COUGH is an important defense mechanism that helps clear excessive secretions and foreign material from the airways, it is the most common symptom for which adult patients seek medical attention from primary care physicians in the United States.<sup>1</sup> Additionally, referrals of patients with persistently troublesome chronic cough have been shown to account for up to 38% of a pulmonologist's outpatient practice.<sup>2</sup> Since cough is a frequent complaint, it is not surprising that the treatment of this problem is responsible for a substantial proportion of health care dollars. For example, the expenditure for over-the-counter cough suppressant drugs designed to modify rather than eliminate cough is approximately \$1 billion per year.<sup>3</sup> This figure clearly underestimates the total cost of treating cough since it does not include the cost of prescription drugs.

To determine why patients with chronic cough seek medical attention so frequently and spend so much money on cough medications, we prospectively sought to determine whether chronic cough was associated with adverse psychosocial or physical effects on

the quality of life and to determine whether the elimination of chronic cough with specific therapy improved these adverse effects.

## RESULTS

### CHARACTERISTICS OF THE STUDY SUBJECTS

During an 8-month period, 39 patients (32 women and 7 men) were enrolled in our study. Their average ( $\pm$  SD) age was  $54 \pm 12$  years. They had complained of cough for an average ( $\pm$  SD) of  $56 \pm 63$  months (range, 2-192 months).

After treatment, data were available for 28 of the 39 patients. In each, cough disappeared with specific therapy. The causes of cough shown in **Figure 1** are similar to other prospective studies<sup>2,7-10</sup> dealing with groups of patients with chronic cough. The group of 28 was composed of 6 men and 22 women, whose average ( $\pm$  SD) age was  $52 \pm 12$  years. The average ( $\pm$  SD) duration of their cough was  $42 \pm 54$  months (range, 2-180 months).

After treatment, data were not available for 11 of the original 39 patients: 8 were excluded because they could not be contacted

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## PATIENTS AND METHODS

The design of the study was a prospective before-and-after intervention trial with patients serving as their own controls. The study group consisted of a convenience sample of consecutive and unselected patients referred to one of us (R.S.I.) in the Lung and Allergy Center of the University of Massachusetts Medical Center in Worcester for evaluation and management of a chronic, persistently troublesome cough. Chronic cough is defined as being of 3 weeks or longer in duration.<sup>2</sup>

At baseline and before beginning treatment, demographic data were collected and patients were evaluated with a previously published and validated systematic, anatomical, diagnostic protocol<sup>2</sup> to determine the cause of cough, and 2 self-administered instruments—the Sickness Impact Profile (SIP)<sup>4</sup> and the Adverse Cough Outcome Survey (ACOS)—developed by us and based on a review of the literature on complications of coughing and prior interviews with patients presenting with chronic cough. The ACOS was developed in part to help us better understand why 23% of our patients with chronic cough, who had been advised by their physician that they would have to learn to live with their cough,<sup>2</sup> referred themselves to our cough clinic. Immediately following baseline data collection, specific therapy for the suspected causes of chronic cough was begun according to our previously described management protocol.<sup>2</sup> Specific therapy was defined as therapy directed at the presumed cause or operant pathophysiological mechanism responsible for cough. Physician evaluation and management clinic visits were scheduled monthly until resolution of cough. When the patients reported that their cough resolved, the data collection was repeated and the final diagnosis of the cause of cough was determined by observing which specific treatment(s) eliminated cough as a complaint.

The SIP is a scaled measure of health-related dysfunction based on the individual's perception of the effects of his/her sickness on his/her usual daily activities. The SIP is a paper-and-pencil instrument containing 136 items grouped into

12 categories. These categories are further aggregated into a psychosocial dimension, a physical dimension, and total SIP score. The physical dimension describes behaviors related to ambulation, mobility, and body care and movement. The psychosocial dimension describes behaviors related to social interaction, communication and alertness, and emotional behaviors.

The ACOS is a fixed-alternative, yes/no, paper-and-pencil questionnaire designed to determine the reasons why patients with chronic cough sought medical attention. Patients were asked to reply yes/no to 29 potential, psychosocial, and/or physical adverse occurrences. These adverse occurrences had been previously published by us<sup>5</sup> and others<sup>6</sup> as complications of cough. The ACOS questionnaire can be found in its entirety in **Table 1**.

### HYPOTHESIS

The major hypothesis of this study was that chronic cough has the greatest impact on patients' lives by affecting their social interactions and sense of well-being rather than physical complications. By associating responses on the ACOS with those on the SIP, we sought to determine which complications of chronic cough were most responsible for patients' health-related dysfunction and whether patients who seek medical attention for chronic cough do so primarily for psychosocial or physical reasons. Correlation and regression analyses were used to quantify the strength of the associations. The ACOS was intentionally constructed to have similar numbers of physical and psychosocial complications of cough in the score.

### STATISTICAL ANALYSIS

Differences between groups were compared with the Student paired *t* test and  $\chi^2$  analysis. The .05 level of significance (type I error rate) was used throughout. Spearman correlation was used to correlate variables. Using SPSS statistical software (SPSS Inc, Chicago, Ill), stepwise linear regression analysis was performed with a significance of  $P < .05$  to enter the equation.

despite numerous attempts or they refused to complete the follow-up questionnaires, 2 developed serious comorbid illnesses that precluded continuation in the study and the assessment of the impact of cough on quality of life, and 1 was refractory to treatment with no change in her cough.

### BASELINE DATA FROM ACOS AND SIP

The spectrum and frequency of reasons why the 39 patients with chronic cough sought medical care are listed in decreasing order of frequency in **Table 2**. Subjects reported an average ( $\pm$  SD) of  $8.5 \pm 4.5$  adverse occurrences.

The effects of cough on the usual daily activities of the 39 patients as measured by SIP scores are shown in **Figure 2**. As a point of reference, individuals who have no health-related dysfunctions will have scores close to zero. Asterisks have been inserted to draw attention to those elevated dysfunctional scores in the categories of ambulation, social interaction, sleep and rest, work, home management, and recreation and pastimes; the scores in these categories approached those previously presented by us<sup>11</sup> for a group of disabled patients with chronic obstructive

pulmonary disease who participated in our outpatient pulmonary rehabilitation program.

### BASELINE INTERRELATIONSHIPS BETWEEN ACOS ITEMS, DURATION OF COUGH, AND SIP SCORES

While no adverse occurrence was significantly associated with any of the 12 SIP categories, there were significant correlations between multiple items in the ACOS and total SIP scores, and physical and psychosocial aggregate SIP scores. These are summarized in **Table 3**. Total SIP score was also significantly correlated with duration of cough ( $r = -0.51$ ;  $P = .001$ ); psychosocial dimension score was also significantly correlated with total number of symptoms ( $r = 0.44$ ;  $P < .02$ ) and duration of cough ( $r = -0.45$ ;  $P = .004$ ).

In an attempt to determine which adverse cough occurrences best explained our patients' health-related dysfunction, a multiple stepwise linear regression analysis was performed. Those factors significantly ( $P < .05$ ) explaining the variability in SIP scores were as follows: 28% of the total SIP score was explained by exhaustion; 25% of the psy-

**Table 1. Adverse Cough Outcome Survey**

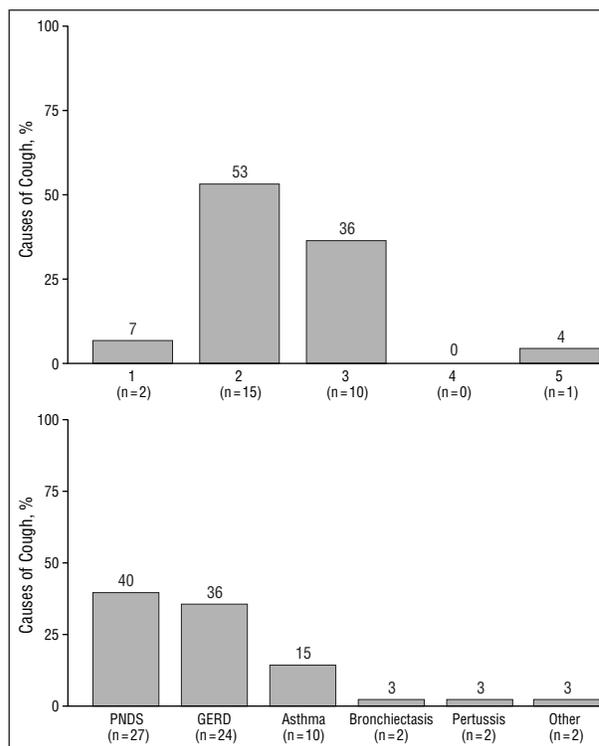
Please check the columns Yes or No for the following reasons why you are seeking medical attention to determine the cause of your cough.

My spouse can't tolerate it anymore.	Yes ___	No ___
I have prolonged absences from work or school.	Yes ___	No ___
I have lost my job.	Yes ___	No ___
I have lost my appetite.	Yes ___	No ___
I am sick to my stomach and vomit.	Yes ___	No ___
I cough frequently, and it makes me retch (dry heaves).	Yes ___	No ___
I have a fear that I might have AIDS [acquired immunodeficiency syndrome] or tuberculosis.	Yes ___	No ___
I have headaches.	Yes ___	No ___
I am concerned that I have cancer.	Yes ___	No ___
I am dizzy.	Yes ___	No ___
I wet my pants.	Yes ___	No ___
I soil my pants.	Yes ___	No ___
I sweat excessively.	Yes ___	No ___
I am hoarse.	Yes ___	No ___
It hurts when I breathe.	Yes ___	No ___
I broke a rib.	Yes ___	No ___
I cannot sleep at night.	Yes ___	No ___
I have difficulty speaking on the telephone.	Yes ___	No ___
I can no longer sing, for instance in church.	Yes ___	No ___
I have stopped going to the movies.	Yes ___	No ___
I have had to change my lifestyle.	Yes ___	No ___
I ache all over.	Yes ___	No ___
I am exhausted.	Yes ___	No ___
I am embarrassed.	Yes ___	No ___
I am upset by people thinking that I have something wrong with me.	Yes ___	No ___
I want to be reassured that I do not have anything seriously the matter with me.	Yes ___	No ___
I am self-conscious.	Yes ___	No ___
I am concerned that I have something seriously the matter with me.	Yes ___	No ___
I am concerned that something is wrong.	Yes ___	No ___

chosocial dimension score was explained by exhaustion; and 40% of the physical dimension score was explained by 3 adverse occurrences (the need for reassurance that nothing was seriously the matter [18%], stopped going to the movies [11%], and spouse unable to tolerate the cough [11%]).

#### CHANGES IN ACOS ITEMS AND SIP SCORES WITH ELIMINATION OF CHRONIC COUGH

In the 28 patients in whom before-and-after treatment data were available,  $\chi^2$  analysis revealed a significant reduction in adverse cough occurrences. With successful treatment, the average ( $\pm$  SD) number of complaints decreased from  $8.6 \pm 4.8$  to  $1.9 \pm 3.2$  ( $P < .0001$ ). Sixteen of the 29 adverse occurrences had significantly decreased (**Table 4**). Associated with the decreases in adverse cough occurrences was a significant decrease in the patients' self-perceived health-related dysfunction. The *t* test analysis revealed that total SIP and aggregate psychosocial and physical dimension scores had significantly decreased (**Figure 3**). There was no significant correlation between adverse cough occurrences or any SIP score and specific diagnosis or number of causes of cough.



**Figure 1.** Top, Chronic cough was due to a single condition in 2 patients (7%) and multiple disorders in 26 patients (93%). Bottom, The spectrum and frequency of the causes of chronic cough in the patients. PNDS indicates postnasal drip syndrome; GERD, gastroesophageal reflux disease. Numbers indicate total causes of cough; patients could have more than 1. The other disorders were chronic bronchitis from cigarette smoking and chronic pneumonia.

Multiple stepwise linear regression and correlation analyses were performed using before-and-after treatment data in the 28 patients in whom cough was eliminated to more specifically characterize the health-related dysfunction associated with chronic cough. It was determined that: (1) 54% of the variability of the psychosocial dimension score was significantly explained by concern of cancer (28%), exhaustion (14%), fear of acquired immunodeficiency syndrome or tuberculosis (6%), and hoarseness (6%); (2) 35% of the variability of the total SIP score was significantly explained by exhaustion (24%) and hoarseness (11%); and (3) none of the variability of the physical dimension score was significantly explained by any specific complaint.

There was a significant correlation between the number of adverse occurrences experienced by patients and 6 of the 12 SIP categories: body care and movement ( $r = 0.31$ ;  $P = .03$ ); home management ( $r = 0.33$ ;  $P = .02$ ); social interaction ( $r = 0.46$ ;  $P = .001$ ); alertness behavior ( $r = 0.45$ ;  $P = .002$ ); communication ( $r = 0.38$ ;  $P = .009$ ); and recreation and pastimes ( $r = 0.31$ ;  $P = .04$ ). Three categories relate to psychosocial and 1 to physical dysfunction.

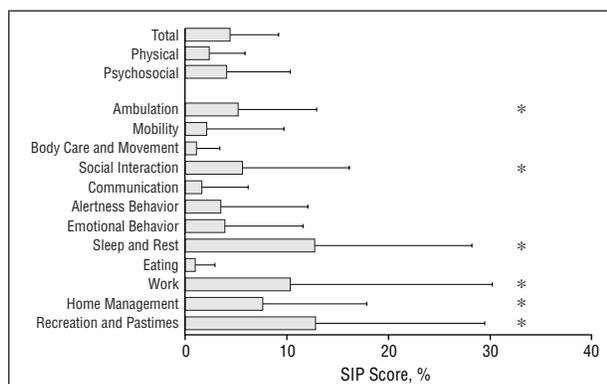
#### COMMENT

To determine prospectively whether chronic cough adversely affected the quality of our patients' lives and why, we characterized the complications of cough in our patients and their quality of life before and after chronic cough was successfully treated. To our knowledge, this has not been previously done. To characterize the complications of cough, we de-

**Table 2. Spectrum and Frequency of Reasons Why Patients With Chronic Cough Sought Medical Care\***

Adverse Occurrence	Frequency, %
Needs reassurance nothing is serious	77
Concerned something is wrong	72
Frequent retching	56
Exhaustion	54
Others think something is wrong with me	53
Embarrassment	49
Self-consciousness	46
Difficulty speaking on the telephone	39
Hoarseness	39
Had to change lifestyle	36
Cannot sleep at night	34
Can no longer sing in church	31
Spouse cannot tolerate cough	30
Wetting pants	30
Concerned something is seriously wrong	28
Dizziness	21
Excessive sweating	21
Achiness	21
Hurts to breathe	16
Stopped going to movies	16
Headaches	14
Fear of AIDS or TB	13
Concern of cancer	11
Absences from school or work	11
Lost appetite	11
Sick to stomach or vomiting	11
Soiling of pants	8
Broken ribs	8
Lost job	5

\*N = 39. The relative frequencies for the 28 patients used in the major analyses of this study were similar. AIDS indicates acquired immunodeficiency syndrome; TB, tuberculosis.



**Figure 2.** Sickness Impact Profile (SIP) scores at baseline in patients with chronic cough. Data for usual daily activities are plotted as mean  $\pm$  SD. Asterisks indicate scores similar to those observed in patients with severe, disabling chronic obstructive pulmonary disease (see the "Results" section of the text for further discussion). The scores related to ambulation, mobility, and body care and movement make up the physical dimension score. The scores related to social interaction, communication, alertness behavior, and emotional behavior make up the psychosocial dimension score.

veloped and used a cough-specific adverse outcome instrument (ACOS) that reflected physical and psychosocial complications previously published. To assess the effects of cough on quality of life, we used the SIP, a reliable and well-validated non-illness-specific measure of health status in general. From our study, 5 important findings emerged.

**Table 3. Correlations Between Adverse Occurrences and Aggregate Sickness Impact Profile (SIP) Scores\***

SIP Scores, Adverse Occurrence	r	P
Total		
Exhaustion	0.5762	<.001
Lifestyle change	0.5394	<.001
Cannot sing in church	0.3112	.05
Hoarseness	0.4335	.006
Aching all over	0.3593	<.03
Physical dimension		
Exhaustion	0.5479	<.001
Others think something is wrong	-0.3562†	<.03
Lifestyle change	0.3447	.03
Psychosocial dimension		
Exhaustion	0.5821	<.001
Inability to sleep	0.4320	.007
Lifestyle change	0.4240	.007
Aching all over	0.3917	<.02
Hoarseness	0.3887	.01
Soiling of pants	0.3497	.03
Not going to movies	0.3379	<.04

\*N = 39.

†The negative correlation coefficient indicates inverse rather than direct association. For example, others think something is wrong was correlated with a decrease in the physical dimension score.

First, chronic cough was significantly associated with meaningful adverse psychosocial and physical effects on quality of life. Compared with individuals with no health-related dysfunction, baseline SIP scores revealed that cough was associated with dysfunction in our patients' usual daily activities (Figure 2), particularly in the categories of ambulation, social interaction, sleep and rest, work, home management, and recreation and pastimes. There were multiple significant correlations between multiple ACOS items and total, physical dimension, and psychosocial dimension SIP scores. Furthermore, multiple stepwise linear regression analysis just using before treatment data suggested that a substantial proportion of our patients' health-related dysfunction was explained by cough inducing (1) exhaustion, (2) the need for reassurance that nothing was seriously the matter with them, (3) the inability to go to the movies, and (4) spouses not being able to tolerate the cough.

Second, successful treatment of chronic cough was associated with resolution of our patients' deterioration in quality of life. Compared with baseline data, SIP scores simultaneously and significantly decreased toward normal (Figure 3) as ACOS items significantly decreased from an average of 8.6 to 1.9 ( $P < .0001$ ). Multiple stepwise linear regression analysis performed using before-and-after treatment data showed that a substantial proportion of our patients' health-related dysfunction was explained by cough inducing concern of cancer, exhaustion, fear of acquired immunodeficiency syndrome or tuberculosis, and hoarseness.

Third, the health-related dysfunction induced by chronic cough was more likely to be psychosocial than physical in nature. Using before-and-after treatment data, ACOS items were more likely to be significantly correlated with SIP categories reflecting psychosocial rather than physical dysfunction. Moreover, multiple stepwise linear regression analysis using before-and-after treatment data showed that 54% of the variability of the psychosocial di-

**Table 4. Spectrum and Frequency of Adverse Occurrences Before and After Treatment in Patients Whose Cough Was Eliminated\***

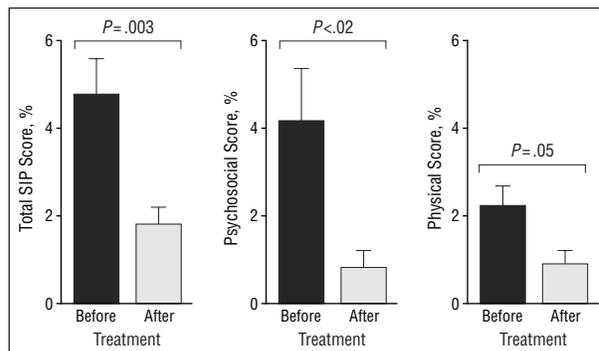
Adverse Occurrence	Frequency, %		P
	Before Treatment	After Treatment	
Needs reassurance nothing is serious	75	19	<.001
Concerned something is wrong	68	11	<.001
Frequent retching	57	8	<.001
Exhaustion	61	15	<.001
Others think something is wrong with me	46	19	.03
Embarrassment	46	11	<.004
Self-consciousness	46	14	.01
Difficulty speaking on the telephone	43	22	.10
Hoarseness	46	15	.01
Had to change lifestyle	36	11	.03
Cannot sleep at night	43	15	.02
Can no longer sing in church	29	8	<.05
Spouse cannot tolerate cough	27	8	.08
Wetting pants	32	7	.02
Concerned something is seriously wrong	68	11	<.001
Dizziness	18	0	.02
Excessive sweating	29	7	.04
Achiness	21	0	.01
Hurts to breath	18	15	.76
Stopped going to movies	18	4	.09
Headaches	15	4	.16
Fear of AIDS or TB	11	0	.08
Concern of cancer	14	4	.17
Absences from school or work	11	19	.40
Lost appetite	11	0	.08
Sick to stomach or vomiting	7	7	.97
Soiling of pants	7	0	.16
Broken ribs	7	0	.16
Lost job	4	4	.97

\*N = 28. AIDS indicates acquired immunodeficiency syndrome; TB, tuberculosis.

mension score was significantly explained by 4 ACOS complaints while none of the variability of the physical dimension score was explained by any specific ACOS complaint.

Fourth, the ACOS and SIP appeared to be valid tools in assessing the impact of chronic cough. Since ACOS and SIP scores were at their highest when patients initially sought our help for chronic cough and since ACOS and SIP scores were at their lowest when cough had disappeared, this study has provided logical and empirical data supporting the validity of the use of both of these instruments in the setting of chronic cough and its treatment. Studies are in progress to determine the psychometric properties of the ACOS questionnaire. Further validation work will be aimed at producing a brief questionnaire sufficiently comprehensive and sensitive to change to be hopefully used as a treatment outcome measure for chronic cough.

Finally, our results suggest that the health-related dysfunction observed in the patients in this study may be generalizable to other adult patients who seek medical attention complaining of chronic cough. The ages, sex, duration, and spectra and frequencies of the causes of cough in our patients were similar to the results in other prospective studies.<sup>2,7-10</sup> Also, there was no significant correlation between adverse cough occurrences or any SIP score and specific diagnosis or number of causes of cough. Future studies will be needed to confirm or refute the generalizability issue.



**Figure 3. Sickness Impact Profile (SIP) scores before and after successful treatment of chronic cough. Total SIP and psychosocial and physical dimension aggregate scores significantly decreased with elimination of chronic cough. Data for 28 patients are plotted as mean ± SE.**

On the basis of our results, it is inappropriate to minimize a patient's complaint of chronic cough and/or advise him/her to "live with it" since chronic cough is associated with adverse effects on his/her quality of life and it can be successfully treated in most patients who adhere to treatment.<sup>7</sup> While previous medical publications have emphasized the physical consequences of cough,<sup>6</sup> our data indicate that patients are most troubled by the psychosocial complications. Our patients on average could easily identify a minimum of 8 reasons of how cough adversely affected their lifestyle and health. Therefore, in taking a medical history from a patient with chronic cough, physicians should specifically note psychosocial as well as physical complications. Failure to address the patient's concern about embarrassment, sense of exhaustion, and impact on social interactions may lead to dissatisfied patients likely to seek referral to other physicians.

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