



Published in final edited form as:

Cancer Nurs. 2009 ; 32(4): E15–E25. doi:10.1097/NCC.0b013e3181a0238f.

The Self-Regulation Model of Illness Applied to Smoking Behavior in Lung Cancer

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Abstract

Thirteen to 20% of lung cancer patients continue to smoke after diagnosis. Guided by Self-Regulation theory, the purpose of this study was to examine illness perceptions over time in a sample of lung cancer patients.

This prospective one-group descriptive longitudinal design study included participants 18 years or older, with a lung cancer diagnosis within the past 60 days who self-reported smoking within the past 7 days. At baseline patients completed a sociodemographics and tobacco use history questionnaire. The Illness Perception Questionnaire-Revised (IPQ-R) was repeated at 3 time points (baseline, 2–4 weeks, 6 months).

Fifty-two participants provided data for the IPQ-R at baseline, 47 at 2–4 weeks, and 29 at 6 months. Differences between mean scores for each illness representation attribute of the IPQ-R at repeated time points were calculated by within-subject repeated measures analysis of variance and Wilcoxon Signed-Rank Tests. Identity (baseline vs. 2–4 weeks: $p=0.026$; baseline vs. 6 months: $p=0.005$) and acute/chronic timeline ($p=0.018$) mean scores significantly increased over time; personal and treatment control mean scores significantly decreased over time ($p=0.007$ and $p=0.047$, respectively). Understanding the context in which a patient perceives disease and smoking behavior may contribute to developing interventions that influence behavior change.

Keywords

Self-Regulation theory; common-sense model; illness cognitions; smoking behavior; lung cancer; illness representation

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Introduction

Lung cancer is responsible for most cancer deaths in the United States for both men and women¹. For all stages of the disease, the 5 year survival rate of lung cancer is approximately 15%². It is well established that quitting smoking after a diagnosis of lung cancer improves survival, side effects of disease and treatment, and decreases the risk of developing a second smoking-related lung cancer^{3, 4}.

In patients who continue to smoke after diagnosis, tobacco may act as a carcinogenesis promoter in previously initiated cancer sites⁵. Patients who survive lung cancer and continue to smoke risk further compromise of lung function that is diminished due to surgical resection, pulmonary toxicity from chemotherapy, and/or chest irradiation⁵. Results from the Nurses Health Study (n=158,734) indicated that current smokers reported lower health-related quality of life than former and never smokers⁶. Among non-small cell lung cancer patients of all stages (n=206), performance status (PS) (i.e., quality of life measure) was significantly related to patient smoking status. Patients who quit smoking maintained a better PS at 0 to 6 months (OR=7.09, 95% CI=1.99–25.3) and at 0 to 12 months (OR=6.99, 95% CI=1.76–27.7), than those who continued to smoke after diagnosis, when controlling for stage, demographics, treatment, and comorbidities⁷.

Patients who quit smoking prior to and at the time of a lung cancer diagnosis (all stages) have a significantly better prognosis than those who continued to smoke during and subsequent to treatment^{3, 4}. Smoking cessation after initial treatment decreases the risk of developing a second, smoking-associated primary tumor⁸. Among early stage lung cancer patients (n=569), smoking status (current versus former) was a significant predictor of the development of a second, smoking-associated primary lung cancer⁹. Despite known benefits of quitting, 13% to 20% of lung cancer patients continue to smoke after diagnosis^{5, 10–12}.

Head and neck and lung cancer patients that continued smoking after diagnosis had higher nicotine dependence, reported more perceived ‘cons of quitting’, fatalism, and emotional distress; and lower self efficacy, perceptions of risk and perceived ‘pros of quitting’¹³. In female lung cancer patients, younger age, living with another smoker, and depressive symptoms are significantly associated with continued smoking after diagnosis¹⁴. While these findings contribute interesting preliminary data for this population, *conceptual understanding* that exclusively examines characteristics of smoking behavior in lung cancer patients is lacking. Furthermore, an understanding of how a lung cancer diagnosis impacts patient perceptions and behavior such as smoking could be useful in designing future smoking cessation interventions.

Limited research has been conducted to examine the psychosocial and behavioral influences that contribute to continued smoking following a lung cancer diagnosis. Understanding a patient’s perception of illness may improve the day-to-day management of illness and disease¹⁵ as patient beliefs about illness are known to influence health behavior outcomes¹⁶. Illness perceptions over time among smoking lung cancer patients as guided by Self-Regulation theory is the focus of the next section.

Background

Overview of the Self-Regulation Model of Illness

The Self-Regulation Model of Illness (SRMI), initially described in 1980 as the “common sense model of illness representation” by Leventhal and colleagues, provides a framework for understanding how individual symptoms and emotions experienced during a health threat

or diagnosis influence perception of illness and guide subsequent coping behavior 17, 18. The SRMI may be useful to further understanding of why individuals diagnosed with lung cancer continue to smoke. This model has been examined within multiple illnesses and health-related behaviors including coronary heart disease 19, human immunodeficiency syndrome (HIV) medication adherence 20, and diabetes self management 21. Components of the SRMI have been examined among oncology patients 22–25, however, there has been no examination of the SRMI among lung cancer patients who smoke at the time of diagnosis.

The SRMI theory suggests that individuals search to understand their illness or disease threat by developing an understanding of what the illness is, what it means, its causes, its consequences, how long it will last, and whether it can be cured or controlled. This understanding (or illness representation) is not necessarily scientifically or medically validated, but formulated from personal experience (physical symptoms and emotions), social influences, and/or interaction with healthcare providers. Individuals are thought to reduce their health risk or change their health behavior in ways consistent with their own illness representation. The model in Figure 1 suggests that a lung cancer patient's decision to quit or continue to smoke following diagnosis will be influenced by whether it 'makes sense' given the patient's own illness representation. The discussion in the following section will focus on how the theoretical components of the SRMI can be conceptually applied to continued smoking following a lung cancer diagnosis.

SRMI as applied to lung cancer

Illness representation—Following a diagnosis such as lung cancer, the individual analyzes, internalizes, and interprets the meaning of the illness. The individual becomes an active problem solver and simultaneously deals with two phenomena: the perceived reality of the illness and their emotional reaction. Internal and external stimuli such as previous experience with the illness and social and societal influences operate to influence the development of the *illness representation* 17, 18. For example, a newly diagnosed lung cancer patient who is currently smoking may interpret their increased cough and worsening shortness of breath as symptoms of lung cancer. Depending on past experiences with these symptoms and influences from healthcare providers, the media, family and/or friends, an illness representation is formed by the patient with respect to his or her continued smoking after this new diagnosis (see Figure 1). Aside from recognizing the signs and symptoms (*identity*) of the disease, other components of this illness representation are cause, consequence, control, and timeline 17, 18. The patient's perception of lung cancer will influence the interpretation of the *cause* of the disease, linking past or continued smoking with the cause of the disease. The *consequences* of continuing or stopping smoking will be internalized and made part of the smoker's illness representation. Perceived *control* of lung cancer symptoms and disease and whether quitting or continuing smoking will have an effect upon the symptoms and the stage of the lung cancer, become part of the illness representation. In addition, the smoker's ability to change the overall *timeline* or prognosis of the diagnosis, with respect to quitting or continuing smoking, will be an important component of the illness representation.

Illness representations are complex and dynamic. The internal and external stimuli of the individual changes the illness representation over time and further guides actions of the individual in response to the health threat 17, 18. Internal stimuli such as side effects of lung cancer treatment and external stimuli such as public opinion on causes of lung cancer and prognosis will shape the illness representation over the course of the disease. Emotions are also integral to illness representation and develop simultaneously with the cognitive component. Emotional experiences such as fear, anger, depression or anxiety can motivate

the individual to develop an action plan (coping procedure), or can be so overwhelming, resulting in less or no action taken (with respect to the disease)¹⁷. After a patient has had the opportunity to consider the diagnosis, prognosis, and proposed medical treatment, the patient's illness representation may change. Receiving a cancer diagnosis can evoke a range of emotions, contributing to the formation of the illness representation that influences the coping procedures.

Coping procedure—The illness representation drives the individual's coping strategies. A response to the illness representation is instituting a behavior, or *coping procedure*. The individual develops a response plan or procedure to cope with the illness representation, and the selection of a coping procedure is guided by the illness representation concept¹⁸. A smoker may choose to cope with the new diagnosis of lung cancer by either quitting or continuing to smoke. The consequences of quitting smoking may involve physical and psychological factors (both positive and negative) such as decreased shortness of breath²⁶, increased nicotine withdrawal symptomatology²⁷, increased family support¹³, and improved survival^{3, 4}. Although the consequences of continued smoking may result in worsening pulmonary symptoms and possible decreased long-term survival, the patient may continue to smoke to avoid the additional stress of quitting smoking during this already stressful time.

Outcome appraisal—The individual will engage in ongoing *outcome appraisal*, or the analysis of the consequence or efficacy of the coping procedure. The outcome appraisal is the repeated evaluation of the coping procedure (continued or quitting smoking) and may be influenced by such variables as quality of life, clinical response to lung cancer treatment and lung cancer symptomatology, in addition to the consequences of quitting or continuing to smoke. Each variable influences the patient's evaluation of the coping procedure. Information gained during the coping procedure feeds back to the other constructs. If an individual perceives that a coping procedure is ineffective, an alternative coping procedure may be selected. Thus the model is fluid and dynamic, with continuous feedback between each component¹⁸. A patient may use his or her own quality of life assessment as a proxy indicator for outcome appraisal when evaluating their smoking behavior (coping procedure).

Representation of self—The individual's cognitive and emotional processes that form illness representations do not occur in isolation, they are influenced by the *representation of self*. A lung cancer patient's *representation of self* is defined as their self-perception ("Who am I?" or "How do I define myself?") and self-meaning or 'importance of self' ("What value do I place on myself?" or "Why do I matter?"). After a disease threat or illness (i.e., lung cancer), the *representation of self* is redefined within the context of the illness and is influenced by the individual's social interactions (e.g., family, friends, society, and healthcare professionals). Thus, the individual 'looks' at or interprets the illness 'through the eyes of the self'^{17, 18, 28}. There are many sociodemographic and biobehavioral characteristics that are specific to an individual (self), and are known to be associated with continued smoking.

Sociodemographic characteristics and self: Age, education, and income are several known sociodemographic characteristics associated with continued smoking behavior²⁹. Smoking is often initiated in adolescence, and once dependent, continues throughout adulthood³⁰. Level of education is inversely correlated with smoking prevalence, as those with a higher education are least likely to smoke and are most successful in quitting^{29, 31}. There is an inverse relationship between lower socioeconomic status (income) and smoking, those living at or below the poverty line have a higher prevalence of smoking^{29, 31}. These sociodemographic characteristics (age, education, and income), that are specific to an

individual, can further influence and guide the patient's perception of illness and coping procedure (quitting or continuing to smoke).

Biobehavioral characteristics and self: Biobehavioral characteristics such as higher nicotine dependence and less social support are also associated with smokers who are unable to quit^{13, 32}. Nicotine is the psychoactive drug in tobacco that causes acute and chronic dependence³², and nicotine dependence often requires repeated intervention to assist individuals to successfully quit smoking³³. Smokers who have increased dependence on nicotine often require many quit attempts and have higher relapse rates before achieving permanent abstinence²⁷. Most tobacco users express the desire to quit smoking and many make unsuccessful attempts to quit^{27, 33}. The level of nicotine dependence and social support can further influence the illness representation and coping procedure.

Living with other smokers and having family and/or caregiver support to quit smoking can greatly influence the outcome of a patient's success at quitting smoking. Among those diagnosed with cancer (n=74), it has been observed that having a family member at home who smokes increased the likelihood that patients will continue to smoke¹³.

This study was designed to examine the natural course of a smoking behavior once a diagnosis of lung cancer has been made. Its purpose was to describe changes in illness representations over time and answer the following questions: Do the components of illness representations change from baseline to 2–4 weeks and at 6 months among newly diagnosed lung cancer patients who smoke at the time of diagnosis? And, how do lung cancer patients' reasons for smoking or quitting align with Self-Regulation theory constructs?

Methods

Design/sample

This was a prospective one-group descriptive longitudinal design. Eligibility criteria included those participants who were age 18 years or older, had a confirmed diagnosis of lung cancer (non-small cell or small cell) within the past 60 days, and self-reported current smoking within the past seven days. Participants had to be able to understand English and provide informed consent.

Procedure

Recruitment took place within the thoracic oncology outpatient clinics at an urban, academic comprehensive cancer center. At baseline, patients completed a sociodemographic, medical and tobacco use history questionnaire, and the Illness Perception Questionnaire (Revised) (IPQ-R)³⁴. At 2–4 weeks and 6 months following enrollment, the IPQ-R was re-administered. The 2–4 time point was selected to examine illness representation after allowing the patient time to consider the medical information regarding diagnosis, prognosis, and treatment, after the initial medical center visit. Patients also completed the medical and tobacco use history questionnaire again at 6 months post enrollment. Data collection at all time points took place either while waiting for a clinic appointment, through mail correspondence, or during a chemotherapy visit. All data was collected via self-administered, written questionnaires. At 6 months, patients who self-reported as a non-smoker provided a saliva cotinine sample for biochemical verification. Verbal and written instructions for the questionnaires were given to each patient. As part of usual care, all patients in these clinics were routinely asked their smoking status and advised to quit smoking at the time of each visit. Appropriate pharmacotherapy was recommended, according to the U.S. Public Health Service Guideline recommendations³³. This study was

approved by and in compliance with the institution's Human Subjects Cancer Review Board.

Study Measures

A sociodemographic (age, gender, insurance, education, race, marital status, and household income), tobacco use history (cigarettes per day (CPD), years smoked, previous quit attempts, and living with another smoker), and medical history (pathology, stage, previous cancer treatment at study entry, and date of diagnosis) questionnaires were administered. Tobacco use history questions were obtained from other standardized questionnaires^{35, 36}. The IPQ-R is a quantitative measure of illness representation, containing five scales that assess each component of illness representation. It is intended to be used in a variety of diseases, inserting the specific disease or health threat where appropriate³⁴. The identity scale includes 14 symptoms that the patient is asked to state if present. This provides a simple measure of the number of symptoms perceived by the patient to be associated with the illness. A higher score indicates a greater number of symptoms attributable to the disease³⁴. The remaining scales of the IPQ-R include acute/chronic timeline (6 items), cyclical timeline (4 items), consequences (6 items), personal control (6 items), treatment control (5 items), illness coherence (5 items), and emotional representation (6 items), and are rated by the patient on a five-point Likert-type scale ranging from "strongly disagree" to "strongly agree"³⁴.

Higher scores on the timeline scales, acute/chronic and cyclical, indicate a strong belief that the illness is chronic or cyclical in nature. A stronger belief that the illness has negative consequences is represented by a higher score on the consequence scale. Higher scores on the personal and treatment control scales suggest a strong belief in personal and treatment control of the disease. A greater personal understanding of the disease is represented by a higher score on the illness coherence scale and a higher score on the emotional representation scale suggests that the illness has a greater emotional meaning³⁴. Estimates of Cronbach's alpha coefficients for the IPQ-R range from 0.79–0.89³⁴.

During baseline data collection, each patient was asked, "What is the primary reason you have not quit smoking?" At the study completion, each patient was asked: 1) "What is the primary reason you have not quit smoking?" Or, 2) "What was the primary reason you were successful in quitting smoking?" These open-ended questions were investigator designed.

Smoking Status

Smokers were defined as self-reported users of cigarettes in the past 7 days. Non-smokers (i.e., quitters) were defined as those who self-report no use of cigarettes in the past 7 days³⁷ AND a saliva cotinine concentration <14ng/mL³⁸. Cotinine is a reliable and valid measure of tobacco smoke exposure³⁹. Jarvis and others³⁸ reported a 96% sensitivity rate and a 99% specificity rate when using 14ng/mL as a cutoff level in discriminating tobacco users from non-users. Biochemical verification of self-reported smoking status is recommended as additional confirmation that self-reporting is accurate. The window for precise biochemical verification of smoking status by cotinine is within 7 days⁴⁰. Saliva samples were collected with Salivettes® (Sarstedt, Newton, NC). The samples were processed at the outpatient clinic, stored frozen at –80 degrees Celsius until analyses were conducted. Cotinine was extracted from the saliva using a technique described by Hariharan et al., (1991). Next, saliva cotinine levels were quantified by a high-performance reversed-phase ion exchange liquid chromatographic technique.

Statistical Analyses

Descriptive statistics (means, standard deviations, percents) were calculated on all sociodemographic, medical history, tobacco use, and illness representation data. Missing data on the IPQ-R were imputed with the mean score for the corresponding question. Only 0.6% (6 cases) of the data had to be imputed. Internal consistency was assessed by estimating Cronbach's alpha coefficient on each IPQ-R attribute except identity 41. Differences between mean scores for each attribute of the IPQ-R at repeated time points were calculated by within-subject repeated measures analysis of variance (ANOVA). Tukey-Kramer post-hoc tests were conducted to indicate pairs of data that had significantly different means. Histograms and quantile-quantile (Q-Q) plots were constructed and examined to determine if the residuals met the assumption of normality, and compound symmetry was assessed with Mauchly's Test of Sphericity. For data that violated the assumption of normality, Wilcoxon Signed-Rank Tests for non-parametric data were calculated 42. Data were analyzed using SPSS 14.0 (SPSS Inc, Chicago, IL) and SAS version 9.1 (SAS Institute Inc., Cary, NC). Open-ended responses were independently reviewed by 2 nurse experts and percent agreement of selected patient response categories was reported. Typology of smoking relapse 43 and the Horn-Waingrow smoking typology 44 served as the framework for selection of the open-ended patient response categories.

Results

Fifty-two participants provided data for the IPQ-R at baseline, 47 at the 2–4 week time point, and 29 at 6 months. Five participants did not provide data at the 2–4 week time point because they were not able to be contacted. Of the participants who did not provide data at 6 months (n=23), 21.7% (5) were lost to follow up, 73.9% (17) were deceased, and 4.4% (1) withdrew. Fifty percent of the sample was female and most were married (61.5%) and were Non-Hispanic white (84.6%) (see Table 1). Twenty-seven percent of the sample had Medicaid and 5.8% had no insurance; 42.9% reported an annual household income of < \$25,000. (see Table 1 for other sociodemographic characteristics.) There was no statistical difference in sociodemographic characteristics or medical history between patients who provided data at all time points and those who provided data only at baseline or baseline and the 2–4 week time point.

The majority of the sample was diagnosed with non-small cell lung cancer (78.8%) and were in the late stages of disease (68.6%) (see Table 2). Forty percent (n=31) of the sample had already begun cancer treatment (chemotherapy, radiation therapy, and/or surgery) at baseline. At study entry, the mean time since diagnosis (date of pathology) was 26.1 days. The sample reported smoking 16 cigarettes per day on average and the average number of years smoked were 36.8. The average number of quit attempts was 5.1. A higher number of previous quit attempts were reported at 6 months than at baseline. (See Table 2 for other tobacco and medical history data.) At 6 months 27 out of 29 patients (93.1%) reported receiving some treatment for lung cancer (chemotherapy, radiation therapy, and/or surgery) and the remaining two patients had surgery or received radiation prior to study entry. Twenty-four patients (89.7%) received chemotherapy as a component of their lung cancer treatment. The majority of patients (51.7%, n=15) received chemotherapy plus radiation therapy for their prescribed lung cancer treatment (data not presented in Table 2).

Smoking Status

Twenty-nine patients completed data collection at 6 months. Twenty-two patients were self-reported smokers and seven patients self-reported quitting smoking. Of these, five (17.2%) were biochemically confirmed to be abstinent by saliva cotinine. The 2 misclassified patients reported no use of nicotine replacement therapy. Most patients (76.7%) made at

least one attempt to quit smoking in the previous 6 months, and smokers reported a mean of 2.9 quit attempts in the past 6 months (data not present in table). The lung cancer staging of the 5 non-smokers included 4 early stage (one IB, one IIIA, two limited stage) and 1 late stage (IIIB).

Illness Perception at Baseline, 2–4 Weeks and 6 Months

The results of the IPQ-R at baseline and second time point are summarized in Table 3. The acute/chronic timeline attribute mean scores indicated that patients believed their disease was more chronic than acute. The cyclical timeline scores showed that patients had a stronger belief in the cyclical nature of their lung cancer. Patients held strong beliefs about the personal and treatment controllability of lung cancer. The reported mean emotional representation attribute was high at both time points. There were no significant differences detected between IPQ-R baseline group means of those who provided data at 6 months and those who did not provide data at 6 months.

IPQ-R descriptive results for patients who provided data for all of the time points (baseline, second time point, and 6 months) and results of the within-subjects repeated measures ANOVAs and Wilcoxon Signed-Rank Tests can be found in Table 4. All data had a normal distribution, except for the identity attribute. The identity data (at all 3 time points) had a mixed distribution. There appeared to be a binary response, where many patients reported having either zero or 14 symptoms, with a more normal distribution of data in between. The identity mean scores were significantly higher at the second time point ($p=0.03$) and 6 month time point ($p=0.01$) as compared to baseline mean scores. Significant differences between mean scores of the person control attribute were detected, with the 6 month mean score significantly lower than the sample's baseline mean score. The acute/chronic timeline mean scores were significantly different; the 6 month mean score indicated a more chronic belief by patients as compared to their mean scores at baseline and the second time point. The sample's 6 month treatment control attribute mean score was significantly lower than the mean score at baseline.

The internal consistency coefficients for the acute/chronic timeline, personal control, illness coherence and emotional representation attributes at all 3 time points ranged from 0.80–0.91. The internal consistency coefficients for the cyclical timeline ranged from 0.60–0.73 over the 3 time points. Treatment control ranged from 0.56–0.81 and consequence ranged from 0.61–0.82.

Illness Perception Questionnaire at 6 months

Descriptive results of the IPQ-R at 6 months by smoking status are summarized in Figure 2. Smokers reported higher mean identity, chronic and cyclical timeline, and emotional representation scores and quitters reported higher mean treatment control scores. The personal consequences and illness coherence mean scores were about the same for both groups. Four of the 5 non-smokers were female, 2 had surgery and chemotherapy, 2 had radiation therapy and chemotherapy, and 1 had surgery, radiation therapy, and chemotherapy.

Reason for Smoking or Quitting

At baseline, patients were asked, "What is the primary reason you have not quit smoking?", at 6 months smokers were asked, "What is the primary reason you have not quit smoking?" and non-smokers were asked, "What is the primary reason you were successful in quitting smoking?" There was a 91.7% agreement by expert reviewers on selected patient response categories. Patient responses were organized according to corresponding SRMI constructs (see Table 5). For example, nicotine dependence and family support related responses were

categorized under the SRMI construct 'self'. 'Quality of life' type statements (e.g., enjoyment, fear, nervousness) were categorized under outcome appraisal. Statements that corresponded with 'attempting to quit' or 'not wanting to quit' were categorized as illness representation.

Discussion

This is the first paper to integrate smoking behavior characteristics of lung cancer patients within the context of Self-Regulation theory, and the first to describe changes in illness representations over time, among lung cancer patients who smoke. The SRMI provided a framework to help guide our understanding of the complexity of illness representation formation as it applies to lung cancer patients who smoke. The components of illness representation, identity, acute/chronic timeline, and personal and treatment control, were found to significantly change over time. Nicotine dependence was the most frequently cited reason for smoking at study entry and at 6 months.

Changes in illness representations over time have been characterized in head and neck cancer and coronary artery bypass graft surgery patients. In these patients, illness representation findings have been useful in predicting patient quality of life, psychological distress, and return to work following a medical procedure⁴⁵⁻⁴⁷. Changes in symptom representations as a result of psychoeducational interventions have been identified among ovarian cancer patients²⁵. Illness representation information from lung cancer patients that smoke could be useful in developing specific smoking cessation interventions. Understanding the context in which a patient perceives disease and smoking behavior can translate to developing specific smoking cessation interventions that contribute to successful quitting. For instance, smokers report worse quality of life than non-smokers^{48, 49}. If a lung cancer patient quits smoking at any point after the diagnosis, this may improve quality of life.

In this study, a significant increase in the identity attribute over time was consistent with a patient experiencing increased disease and treatment-related symptomatology. Lung cancer patients identified their symptoms to be related to their disease. The majority of patients in this study continued to smoke, which may also have contributed to increased symptoms. Interestingly, non-smokers at 6 months reported less symptoms of their lung cancer than smokers (although not able to be statistically compared).

A strong belief in the personal and treatment controllability of lung cancer was exhibited by patients at baseline. This is appropriate for patients who were actively undergoing lung cancer treatment or just had lung cancer surgery. Both attributes significantly decreased over time and could have been attributed to patient realization of the serious nature and poor prognosis of the disease. Unsuccessful attempts to quit smoking may also have decreased patient's beliefs in the personal and treatment controllability of the disease. Furthermore, smokers reported lower personal and treatment controllability at 6 months than non-smokers (not able to statistically compare).

The significantly increased belief among patients over time that lung cancer was a chronic disease (timeline acute/chronic) suggested that at diagnosis, patients may not have understood the nature of living with a chronic disease, and over 6 months, patients had an increased understanding of the chronicity of their disease. Chronic disease refers to "living with a disease for lifetime" versus having a relative quick disease cure. Although not statistically compared, smokers reported a chronic disease belief that was stronger than non-smokers. Continued smoking behavior may have accentuated patients' beliefs in the chronicity of their lung cancer. The increased trend (although not significant) of the cyclical

nature of lung cancer was consistent with patients who had recently completed or were receiving chemotherapy. In general, chemotherapy treatment for lung cancer is given for 1–3 days during a 21 day cycle, and the symptoms experienced by the patient also follow the same cyclical pattern⁵⁰.

The patient's consistent, strong belief that lung cancer produced negative consequences was expected, given the known toxicity of lung cancer treatment and overall poor prognosis of the disease. Illness coherence scores (understanding of illness) were relatively stable over time, perhaps suggesting that patients could benefit from further education. The decreased trend (although not significant) of the emotional representation attribute reflected a decreased emotional response to lung cancer among patients, perhaps suggesting that at 6 months, the 'shock' of the cancer diagnosis had 'worn off' and patients were more accepting of their diagnosis and/or treatment.

Reliability estimates for acute/chronic timeline, personal control, illness coherence, and emotional representation attributes all demonstrated good reliability and comparable to other reports of internal consistency scores³⁴. The cyclical timeline, treatment control and consequences internal consistency scores were lower than those previously reported³⁴.

Study limitations

A sizable portion of this sample was deceased at the 6 month time point which reduced the investigators' ability to examine illness perception among study participants. The 6 month study endpoint was chosen because it is a reasonable amount of time to have completed initial lung cancer treatment and not too long to exclude patients with advanced stage. In addition, due to fewer participants completing the study, comparison of illness perception among early and late stage lung cancer patients was unable to be completed. Illness perception may have been influenced by type of cancer treatment the patient received (i.e., chemotherapy plus radiation may cause more symptoms than a single modality of treatment). A patient's perception of symptoms may have been influenced by treatment or disease related symptoms rather than explicating the role of tobacco use behavior.

The study included current *smokers* and their natural course of behavior following a lung cancer diagnosis. Never and former smokers and recent quitters may have very different smoking behavior and illness representation characteristics.

Implications for future research

Interventions to aid the lung cancer patient in coping with lung cancer treatment-related symptoms in addition to the emotional distress that living with a lung cancer diagnosis causes, all while quitting smoking, is essential. Illness representation and 'representation of self' may be the most interesting attributes of the SRMI to examine in future research with smoking behavior among lung cancer patients. Understanding the context in which a patient perceives disease and smoking behavior may contribute to influencing behavior change. These characteristics deserve consideration as interventions are designed. The emotional stress and treatment-related side effects that accompany therapy must be addressed as lung cancer patients attempt to stop smoking.

Further research investigating the influence of illness representations on the lung cancer patient's decision to quit or continue to smoke is needed. In addition, interventions that are tailored to a patient's illness representation should be developed and tested. Early stage lung cancer patients who continue to smoke after a diagnosis represent a group who may benefit substantially from these types of studies. Well controlled multisite trials that increase patient accrual should be considered.

Conclusion

Smoking cessation after a diagnosis of lung cancer is an important health-related behavior change. Characteristics that contribute to continued smoking among lung cancer patients are not well understood. In order for oncology nurses and physicians to deliver the most effective smoking cessation interventions to lung cancer patients, more empirical research is warranted. The model proposed in this paper was constructed to illustrate the components that may underlay smoking behavior after a diagnosis of lung cancer. The model's constructs deserve further consideration in the development of future smoking cessation interventions.

Acknowledgments

This study was funded by NIH/NINR F 31 NR008978 (Browning) and the Walther Cancer Institute, Indianapolis, IN predoctoral fellowship (Browning).

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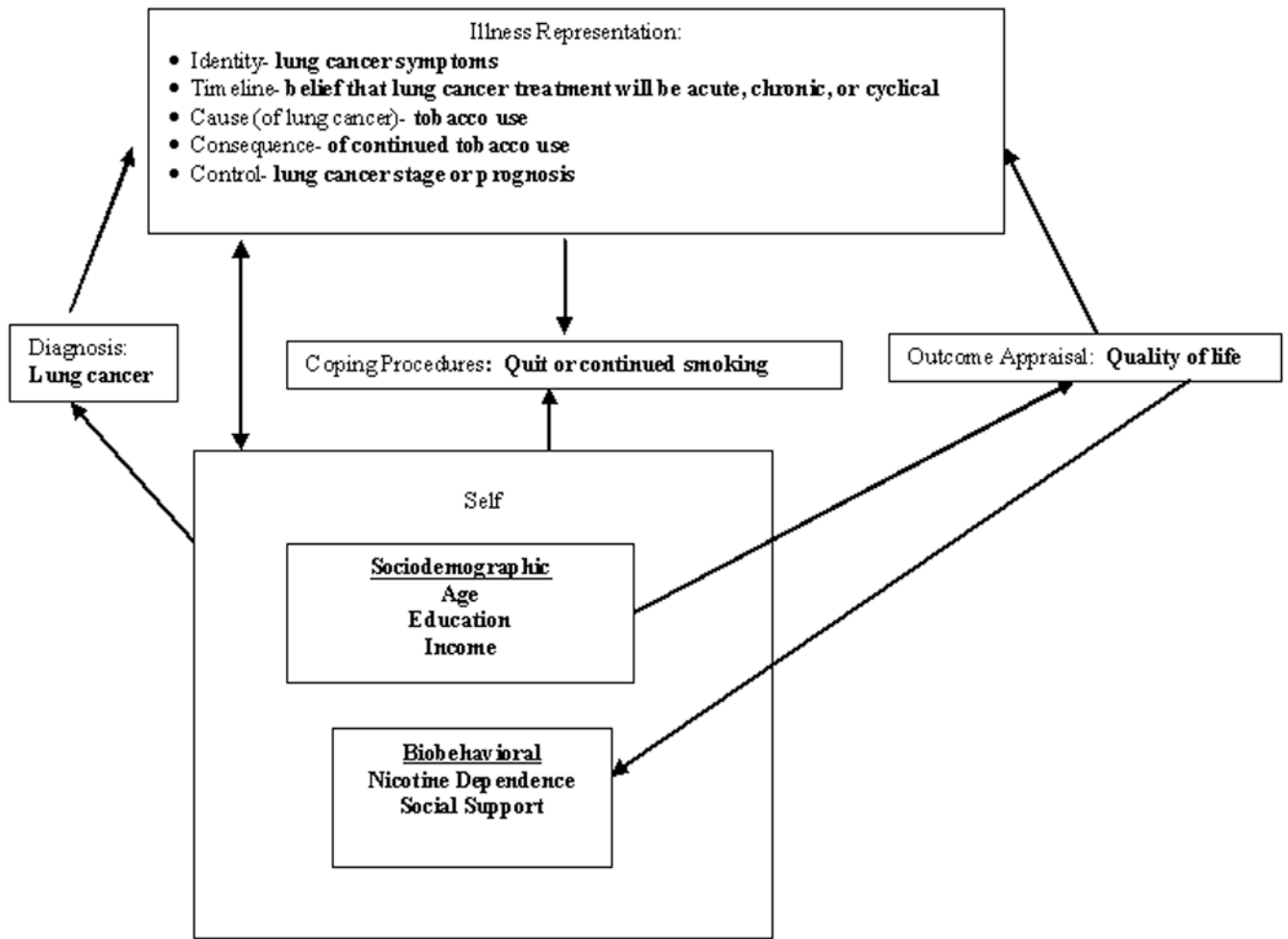


Figure 1. Self-regulation model applied to tobacco use in smokers recently diagnosed with lung cancer

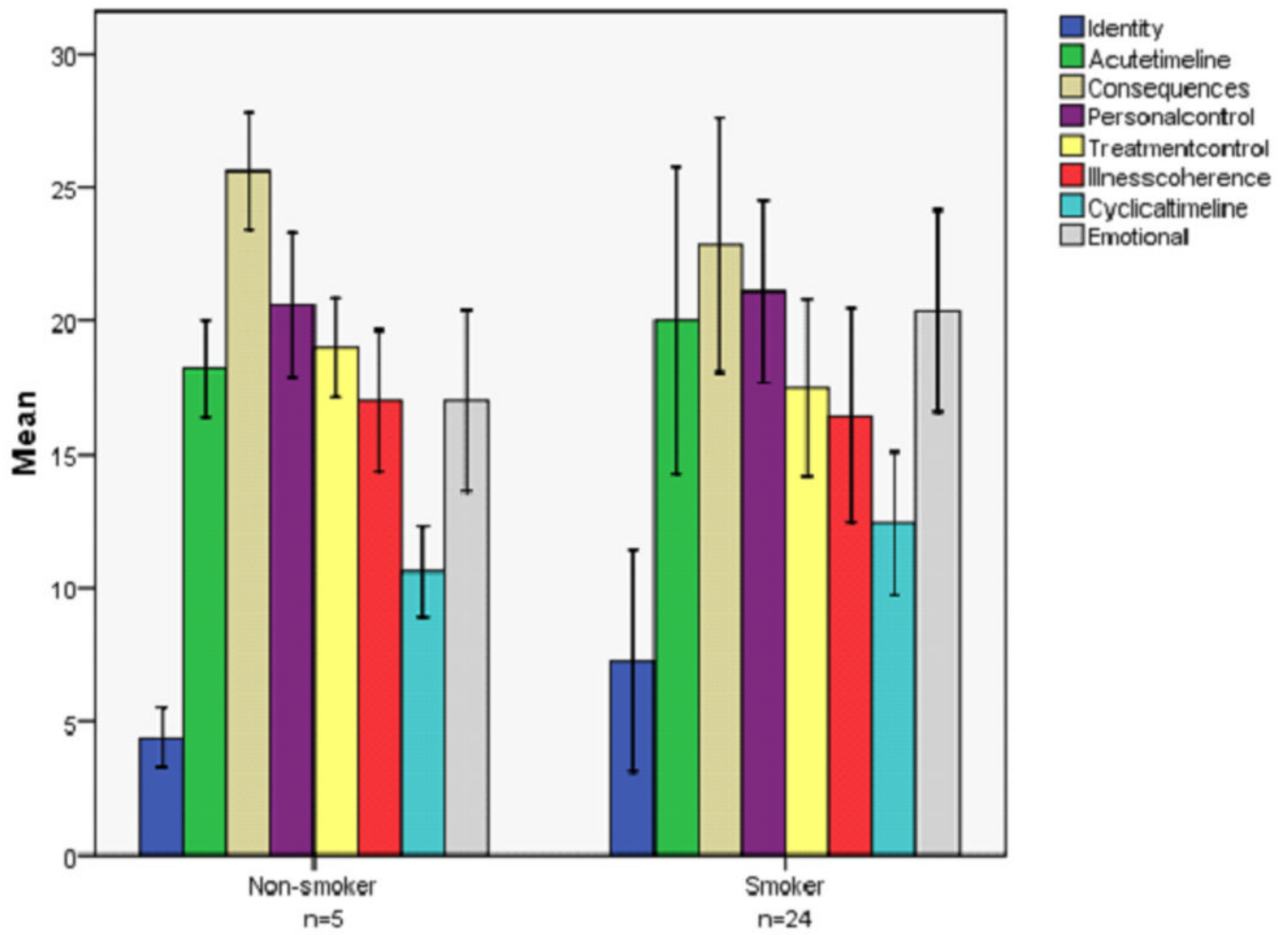


Figure 2. Six month mean scores (SD) of the IPQ-R attributes by smoking status as 6 months

Table 1

Sociodemographic characteristics for entire sample

Variables	n	%	mean (SD)	range
Age	52		56.6 (10.1)	25–80
Gender (n=52)				
Male	26	50.0		
Female	26	50.0		
Insurance (n=52)				
Private/Medicare	35	67.3		
Medicaid	14	26.9		
No insurance	3	5.8		
Education (n=51)				
Some HS	11	21.6		
HS graduate	13	25.4		
GED	6	11.8		
Post HS education	17	33.4		
College graduate	4	7.8		
Race (n=52)				
Non Hispanic black	7	13.5		
Non Hispanic white	44	84.6		
Other	1	1.9		
Marital Status (n=52)				
Married/Living with partner	32	61.5		
Widowed	4	7.7		
Divorced	11	21.2		
Never married	5	9.6		
Household Income (n=49)				
<\$25K	21	42.9		
\$25K-\$50K	10	20.4		
>\$50K	9	18.4		
Refused	5	10.2		
Don't know	4	8.2		

Table 2

Smoking history and lung cancer characteristics at baseline categorized by the entire sample and participants who provided data at 6 months

Variables	Entire Sample			Participants Who Provided Data at 6 Months				
	n	%	mean (SD)	range	n	%	mean (SD)	range
CPD	51		16.0 (11.01)	0-40	29		14.2 (10.57)	0-40
Years smoked	51		36.8 (11.24)	8-65	29		35.2 (11.95)	8-60
Previous quit attempts	50		5.1 (14.52)	0-100	28		7.3 (19.52)	0-100
Living with a smoker (n=51, n=28)	27	52.9			15	53.6		
Pathology (n=52, n=29)					7			
Small cell	11	21.2			22	24.1		
Non-small cell	41	78.8				75.9		
Stage (n=52, n=29)								
Early (I-IIIa, limited)	16	31.3			12	41.4		
Late (IIIB, IV, extensive)	35	68.7			17	58.6		
Cancer treatment at baseline (n=52)								
No treatment	31	59.6						
Surgery	6	11.5						
Radiation (XRT)	6	11.5						
Chemotherapy	4	7.7						
Chemotherapy + XRT	5	9.7						
Time since diagnosis (days)	52		26.1 (14.20)	3-58	28		27.0 (14.13)	4-58

Table 3
 Mean scores (SD) and range of the IPQ-R attributes at baseline and second time point for entire sample*

IPQ-R Attributes	Possible Range	Baseline			Second Time Point**		
		n	mean (SD)	range	n	mean (SD)	range
Identity	(0-14)	52	5.4 (3.83)	0-12	47	6.6 (4.34)	0-14
Timeline (acute/chronic)	(0-30)	52	17.8 (5.61)	3-29	47	18.2 (5.02)	10-30
Timeline (cyclical)	(0-20)	52	11.6 (2.28)	6-18	47	12.0 (2.59)	7-18
Personal control	(0-30)	52	22.4 (4.00)	12-30	47	21.4 (4.16)	6-30
Treatment control	(0-25)	52	18.8 (2.88)	13-25	47	18.7 (2.36)	13-24
Consequence	(0-30)	52	23.7 (3.60)	14-30	47	23.6 (4.67)	9-30
Illness coherence	(0-25)	52	16.3 (4.23)	6-24	47	17.3 (4.39)	6-25
Emotional representation	(0-30)	52	21.5 (4.53)	10-30	47	20.5 (4.44)	13-29

* No significant differences between time points

** 2-4 weeks

Table 4

Results* of the IPQ-R attributes over 3 time points** (n=29)

IPQ-R Attributes	Possible Range	Baseline		Second Time Point		6 Months	
		mean (SD)	range	mean (SD)	range	mean (SD)	Range
Identity***, d	(0-14)	4.7 (3.55)	0-12	6.2 (4.29)	0-14	6.6 (3.94)	0-12
Timeline (acute/chronic) ^a	(0-30)	17.8 (4.59)	10-29	17.2 (4.67)	10-27	19.8 (5.50)	8-30
Timeline (cyclical)	(0-20)	11.2 (2.35)	6-16	11.8 (2.63)	7-18	11.9 (2.64)	7-16
Personal control ^b	(0-30)	22.7 (3.51)	12-28	21.8 (3.18)	15-28	20.4 (3.89)	12-26
Treatment control ^c	(0-25)	19.2 (2.47)	13-24	19.0 (1.88)	15-24	17.8 (3.06)	9-23
Consequence	(0-30)	23.7 (3.17)	15-30	22.6 (5.03)	9-30	23.1 (4.54)	10-29
Illness coherence	(0-25)	15.9 (4.70)	6-24	16.9 (4.46)	6-23	16.9 (3.87)	9-23
Emotional representation	(0-30)	21.0 (5.01)	10-30	19.6 (3.92)	14-27	19.6 (4.03)	12-29

* Differences between means calculated by within-subjects repeated measures ANOVA except for identity attribute

** baseline, 2-4 weeks, 6 months

*** Differences between means calculated by Wilcoxon Signed-Rank Tests

^aF=4.310, df=(2,28), p=0.018

^bF=5.495, df=(2,28), p=0.007

^cF=3.239, df=(2,28), p=0.047

^dBaseline vs. second time point: s=59, p=0.026; baseline vs. 6 months: s=75.5, p=0.005

Table 5

Baseline* and 6 month** reasons for smoking by SRMI construct***

SRMI Construct	Patient Reasons for Not Quitting Smoking at Baseline		Patient Reasons for Quitting and Continuing Smoking at 6 months	
	n	%	Reasons for Quitting	Reasons for Continuing Smoking
Illness representation	9	25.9	lung cancer surgery, hospitalization for lung cancer treatment, started chemotherapy, cancer	don't want to, not ready, cutting down or trying to quit, starting medication soon
Outcome Appraisal (quality of life)	3	27.8	makes cancer treatment harder, to feel better	nervous or anxiety, stress
Self	11	46.3	family is supportive of quitting	addiction or habit, no will power or can't quit, depression, family smokes
	10			
	1			
	3			
Total	54			

* n=48

** n=23

*** Categories were not mutually exclusive