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Health beliefs associated with poor disease self-management in smokers with asthma and/or COPD: a pilot study

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ABSTRACT

Background: Compared to nonsmokers, smokers with chronic disease are less likely to adhere to self-management recommendations for the management of their chronic conditions. Although the literature notes poor adherence trends in smokers, actual influences of adherence in these patients require further study. This study examines the health beliefs that influence self-management behaviors in smokers with chronic lung disease. **Methods:** This prospective, cross-sectional study surveyed patients ($n = 83$) seen in the pulmonary outpatient clinics of the University Medical Center of New Orleans between November 2015 and February 2016. Eligible patients included those between 40–64 years old diagnosed with asthma and/or chronic obstructive pulmonary disease (COPD). Primary measures included perceived beliefs related to the susceptibility to asthma and/or COPD becoming worse, perceived barriers to adherence, and perceived benefits to adherence. Patient characteristics under study included smoking status, race, gender, and diagnosis. Descriptive and chi-square analyses were performed to characterize the sample. Student's t and regression analyses were conducted to examine the relationships between perceptions, smoking status, race, gender, and diagnosis. **Results:** Compared to nonsmokers, smokers perceived their asthma and/or COPD becoming worse ($p = 0.0023$). Smokers also perceived more barriers ($p < 0.0001$), and fewer benefits to adherence than nonsmokers ($p = 0.0021$). **Conclusion:** The health beliefs of smokers may influence their self-management behaviors. Results of this study can inform the development of services that target smokers in order to improve adherence to self-management behaviors and health outcomes.

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Introduction

Poor adherence to disease self-management recommendations directly impacts the health outcomes of patients with chronic disease. The World Health Organization (WHO) defines adherence as the “extent to which a person’s behavior corresponds with agreed recommendations from a health care provider” [1]. Across medical disciplines, poor adherence is a significant cause of health disparities based on risk factors ranging from income and educational attainment to drug and tobacco use [2–5]. Smoking, in particular, is the leading cause of all chronic conditions (CDC 2014). Although when compared to nonsmokers, smokers with chronic disease less often follow provider recommendations for disease management and

are more likely to suffer poor disease-related outcomes [3,5–7].

Patients can prevent the symptoms of asthma and slow the progression of COPD by taking proactive measures to reduce their risk. Patients with asthma and/or COPD are asked to participate in self-care programs that include a number of physician-recommended therapies such as reducing tobacco use, taking medications as prescribed, carrying medications to treat acute symptoms, receiving yearly preventive pneumonia and influenza vaccinations, and attending recommended follow-up visits [8,9]. However, similar to smokers with other chronic conditions, smokers with asthma and/or COPD less often follow provider recommendations for self-management [6,10]. Our

previous analysis revealed that compared to non-smokers, smokers with asthma and/or COPD less often filled their asthma-related medications, took medications as prescribed, or received yearly flu and pneumonia vaccinations [6]. Therefore, in addition to increased morbidity caused by active smoking, smoking is also associated with poor self-care practices in those diagnosed with asthma and/or COPD. Although differences between smokers and nonsmokers with asthma and/or COPD exist [6,10], reasons for the disparity between these groups have not been addressed. The purpose of this study was to examine the health beliefs that influence self-management behaviors in smokers with asthma and/or COPD.

Methods

Setting and recruitment

In this cross-sectional study, researchers surveyed patients ($n=83$) attending medical appointments in the outpatient pulmonary clinics at the University Medical Center of New Orleans (UMCNO), Louisiana. Using a one-page instrument, recruiters screened patients for eligibility in clinic waiting rooms. Eligible participants included those patients between the ages of 40 and 64 years old and diagnosed with asthma and/or COPD (i.e. asthma-only, COPD-only, or a combined asthma/COPD diagnosis). Patients were excluded if they were not able to complete the screener without assistance from study staff or a family member. Eligible patients were invited to complete the study survey in the waiting room prior to the start of their clinic appointments. The Louisiana State University Health Sciences Center and Tulane University School of Medicine (Approval #9138) Institutional Review Boards (IRB) approved this study.

Theoretical foundation

According to WHO, a patient's beliefs around treatment and illness will drive their decision to act on a given health behavior (2013). Across health behavior literature, the Health Belief Model (HBM) is employed as an explanatory model to understand how individual patient level factors influence health outcomes [11,12]. This study employed several components of the HBM (i.e. perceived susceptibility, perceived barriers, and perceived benefits) to probe why differences in adherence exist between smokers and nonsmokers. The construct *perceived susceptibility* assessed smokers' perceived risk of their asthma and/or COPD

becoming worse compared to nonsmokers. It is understood that if the individual is able to perceive the risks associated with a given condition they may be more likely to seek health-improving behaviors in order to prevent the condition or reduce its progression [11,12]. However, if the risks of illness are poorly perceived, individuals may less often participate in health improving or preventive behaviors [11,12]. An individual's likelihood of participating in a health-promoting behavior also involves the decisional balance between the patient's *perceived benefits* and *perceived barriers* towards the given behavior [12]. Similarly, the HBM constructs, *perceived benefits*, and *perceived barriers* assessed the beliefs possessed by smokers that may influence or hinder their ability to adhere to self-management recommendations.

Instrumentation

The paper-based survey collected demographic information (i.e. race, ethnicity, age, gender, household income), smoking history, diagnosis (i.e. asthma, COPD, or combined asthma/COPD), self-management behaviors, and perceptions related to the management of their asthma and/or COPD. Survey items included those from previously validated instruments including the Louisiana Tobacco Control Initiative Patient Survey [13], the Medical Outcomes Survey [14], the Adherence Estimator [15], and the Champion Health Belief Scale (CHBS) [16]. Items from the Louisiana TCI survey allowed researchers to characterize the tobacco history of the study sample. Items adapted from the MOS allowed for the assessment of multiple measures of adherence for asthma and/or COPD management including but not limited to medication taking, medication filling, carrying medical supplies, yearly flu, and pneumonia vaccinations, and attending medical appointments. The Adherence Estimator and CHBS are two scales developed for purposes of understanding health beliefs and barriers to care, respectively. Additional details on psychometric properties of the survey are published previously [6].

We adapted items from the Adherence Estimator and CHBS in order to assess the perceived susceptibility of asthma and/or COPD becoming worse, perceived barriers to self-care, and perceived benefits of self-care. First, four items measured perceived susceptibility including the patient's outlook regarding the future of their asthma and/or COPD. Second, six items measured perceived barriers to self-management and potential burdens such as side effects, financial problems, access to care, and disagreement with the

provider. Finally, four items measured perceived benefits to self-care including the ability of the treatment plan to improve health, the patient-provider relationship, and the perception that medications were working to improve health. All items used a 5-point scale scoring, with 5 being “Strongly Agree” and 1 being “Strongly Disagree” to each statement.

Data collection and analysis

Study staff approached patients in clinic waiting areas, screened patients for eligibility, obtained consent from those eligible, and administered the survey between November 2015 and February 2016. This was an anonymous survey and no patient identifiers were collected during the course of this study. Data was stored in an aggregated format and analyzed using SAS 9.4. Descriptive and chi-square analyses characterized the study sample. Mean scores were constructed for individual items measuring perceived susceptibility, barriers, and benefits. Student's *t*-tests were performed to compare differences in individual item and summary score means between smokers and nonsmokers. Individual items were also grouped and summary scores were constructed in order to compare overall construct scores between smokers and nonsmokers. More specifically, to attain summary scores for an individual construct, we summed item responses (rated 1–5) for each participant and constructed means of these scores for smokers and nonsmokers. Using a student's *t*-test, we performed an additional analysis to understand how reducing or cutting down on smoking was associated with a perception summary score. Finally, we also compared mean summary scores, to examine differences in smokers by race, gender, and diagnosis.

Results

Characteristics of smokers

Demographic and medical characteristics of the sample are published previously. However, briefly, the study sample was largely African American (46.3%), Female (53.6), and diagnosed with COPD-only (36.9%). The sample was also largely composed of current smokers (62.65%), who were identified as those participants who indicated they have smoked at least 100 cigarettes in their lifetime and continue to smoke. Individuals who self-identified as former smokers and never smokers were combined into one measure, nonsmokers ($n = 31$). This method of

Table 1. Smoking status by participant race, gender, and diagnosis, percent (*N*).

	Smokers ($n = 52$)	Nonsmokers ($n = 31$)
Race/Ethnicity ($n = 81$)		
Black/African American	67.6 (25)	32.4 (12)
White/Caucasian	59.5 (22)	40.5 (15)
Other*	71.4 (5)	28.6 (2)
Gender ($n = 83$)		
Male	74.4 (29)	25.6 (10)
Female	52.3 (23)	47.7 (21)
Diagnosis ($n = 83$)		
Asthma-only	46.4 (13)	53.6 (15)
COPD-only	92.3 (24)	7.7 (2)
Asthma and COPD	51.7 (15)	48.3 (14)

Note: Participants classified as “Other” included Native Hawaiian/Other Pacific Islander ($n = 2$), American Indian, or Alaskan Native ($n = 3$), those identifying as Hispanic ($n = 2$).

classifying smoking status has been performed and supported in previous literature [5,17].

Current smokers included 67.6% of enrolled African American/Black respondents, 59.5% of Caucasian/White, and 71.4% of respondents of “Other races” (Table 1). Male respondents were also more likely to report current tobacco use (74.4%) than female respondents (52.3%). The majority of the respondents reporting a COPD-only diagnosis were current smokers (92.3%) compared to asthma-only (46.4%), or asthma/COPD (51.7%) diagnosed participants.

Smokers in the sample were asked about their smoking history and methods used to make quit attempts within the past 12 months. Over half of smokers reported smoking “everyday” (51.9%) compared to smoking only on “some days”, (48.1%). At the time of the survey, smokers reported consuming Mean = 9.06 (SD = 6.66) cigarettes per day, although the smoking duration of the sample was Mean = 33.05 years (SD = 10.05). Of the smokers who reported making quit attempts ($n = 41$), 29.3% reported the use of a cessation class or clinic, 19.5% reported the use of quit line, 43.9% reported the use of a medication, and 95.1% reported they had tried to quit on their own.

Perceived susceptibility

In Table 2, mean scores for individual items measuring perceived susceptibility are described for smokers and nonsmokers. Higher scores (on a scale, 1 through 5) indicate more negative responses towards the given statement. Smokers were more likely to “worry about asthma or COPD becoming worse” ($p = 0.0006$), perceive that “there is a good possibility [their] asthma or COPD will get worse” ($p = 0.05456$), and perceive that their “chances becoming sick because of asthma or COPD are high” ($p = 0.0088$). Smokers also had an

Table 2. Mean score of individual items measuring perceived susceptibility, barriers, and benefits by smoking status, mean (SD).

	Smokers (n = 52)	Nonsmokers (n = 31)	p
Perceived susceptibility			
I worry a lot about my asthma or COPD becoming worse.	4.4 (1.2)	3.3 (1.6)	0.0006
There is a good possibility that my asthma or COPD will get worse.	4.2 (1.1)	3.5 (1.7)	0.0546
My chances of becoming sick because of my asthma or COPD are high.	4.5 (1.0)	3.7 (1.6)	0.0088
My lifestyle makes it more likely that I will get sicker because of my asthma and/or COPD.	3.3 (1.8)	2.6 (1.8)	0.0711
Perceived barriers			
I worry that my prescription medication will do more harm than good.	3.1 (1.6)	2.2 (1.7)	0.0183
I feel financially burdened by my out of pocket expenses for my prescription medication.	3.7 (1.6)	1.7 (1.3)	<0.0001
My doctor gave me instructions that are hard to understand or follow.	1.3 (0.6)	1.4 (0.9)	0.6611
I do not agree with my doctor about my health.	3.1 (1.7)	1.6 (1.1)	<0.0001
Doing everything my doctors asks me to do is time consuming.	1.7 (1.0)	2.2 (1.4)	0.1081
Family and/or work obligations stop me from taking care of my health at times.	3.4 (1.7)	2.1 (1.3)	0.0005
Perceived benefits			
I am convinced of the importance of my prescription medication.	3.3 (1.7)	4.0 (0.8)	0.0138
I have a lot to gain by following my treatment plan.	3.5 (1.6)	4.7 (0.8)	0.0042
When I follow my physician's recommendations I experience less problems with my asthma/COPD.	3.7 (1.5)	4.1 (1.3)	0.2172
Following my treatment plan prevents future problems for me.	3.5 (1.6)	3.8 (1.4)	0.3211

Note: Means based on scores for each item, scored 1–5, with 5 being “agree completely” and 1 being “disagree completely”; T-test performed to compare means for individual items between smoker and nonsmoker respondents.

overall higher mean summary score for perceived susceptibility, (Mean = 16.329, SD = 3.6) compared to nonsmokers, (Mean = 13.06, SD = 4.9), $p = 0.0023$ (Figure 1).

Perceived barriers

Compared to nonsmokers, smokers were more likely to “worry about prescription medication doing more harm than good” ($p = 0.0183$) but less likely to agree with their doctors about their health ($p < 0.0001$) (Table 2). Smokers also identified financial burdens ($p < 0.0001$) and family and work obligations ($p = 0.0005$) as barriers to self-care. When testing the overall construct, smokers had a significantly higher perceived barriers summary scores than nonsmokers ($p < 0.0001$) (Figure 1).

Perceived benefits

Smokers perceived fewer benefits to self-care than nonsmokers. Compared to nonsmokers, smokers were less convinced of the importance of prescription medications (0.0138) and did not perceive having a lot to gain by following the treatment plan ($p = 0.0042$) (Table 2). When evaluating the overall construct, nonsmokers had significantly higher summary scores ($p = 0.0021$) indicating more positive perceptions towards the benefits of self-care compared to smokers (Figure 1).

Additional analyses

We performed an analysis of smokers comparing those who indicated smoking “everyday” to those who

smoked only “some days” to determine if differences in perception existed for these groups. Smokers who indicated smoking everyday had significantly higher perceived benefit scores compared to respondents who indicated smoking only some days, ($p = 0.0433$). No associations were found for perceived susceptibility or perceived barriers.

We also examined differences in respondent perception summary score by smoking status and individual patient characteristics (i.e. race, gender, and diagnosis). For analyses including race, Black and Other races were combined. Based on the summary score, White smokers perceived significantly more barriers than “Black and Other” smokers Mean = 18.45, [SD = 3.63], Mean = 14.27 [SD = 4.74], respectively, ($p = 0.01$). To further explore this result, we examined individual items by race and found that White smokers were more likely to perceive that “medications will do more harm than good” ($p < 0.0001$), disagree with their doctor about their health ($p < 0.0001$), and feel that the following instructions from the doctor were time consuming ($p = 0.007$). No associations were found between perceptions and smoking status by gender or diagnosis.

Discussion

The HBM provided a theoretical framework that allowed researchers to probe individual perceptions related to self-care for smokers with asthma and/or COPD. Individual perceptions are the set of beliefs that may be associated with patient factors such as age, race and ethnicity, gender, and knowledge of a given disease process [11,12]. For purposes of this study, we examined smoking status as a key

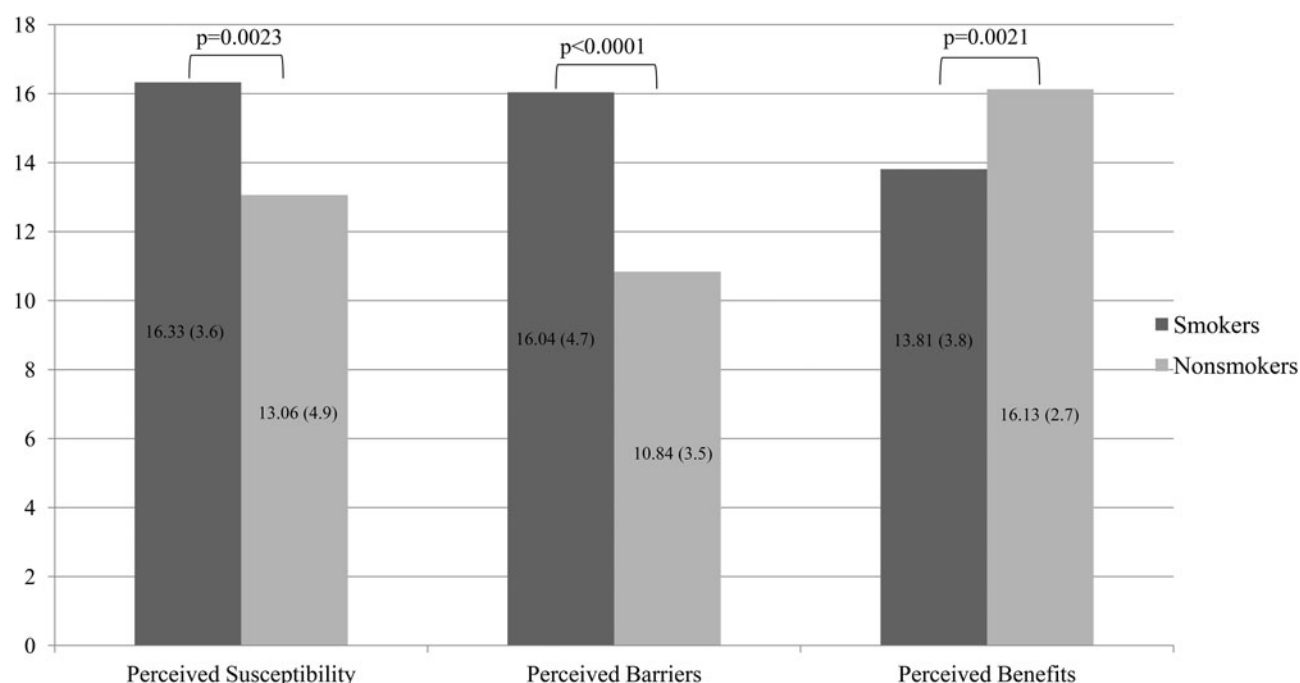


Figure 1. Summary scores for perceived susceptibility, barriers, and benefits by smoking status, mean (SD). *Note:* T-test conducted on mean total scores for each construct across all respondents. Higher perceived susceptibility and perceived barriers summary scores indicate a poorer perception or outlook. A higher perceived benefits score reflects a more positive perception or outlook. Unequal variances (Satterwaite), convenience sample, not randomly selected from a larger population.

patient-level factor associated with varying levels of adherence.

Perceived susceptibility

Compared to nonsmokers, smokers were more likely to perceive that their asthma and/or COPD would become worse. These findings differ from previous literature on smoker perceptions [18]. Previously, smokers have been described as “unrealistic optimists” [18,19] and “defensive optimists” [20] who are unable to perceive the increased health-related risks associated with their tobacco use. In one study, patients were less likely to perceive the risks posed by smoking and believed that even with a diagnosis of lung cancer, they would likely be cured [18,19]. Although in our study, patients were probed on aspects of their asthma and COPD rather than on tobacco use, these studies still provide insight into the disposition and attitude of smokers towards health. In our sample, smokers perceived that their health could become worse. This may, in part, be due to the number of patients in the sample with COPD, who perhaps compared to those, understand the progressive nature of their condition. Also, as evidenced by the number of smokers in our sample who indicated making a quit attempt in the past 12 months, it is possible that respondents who smoke

understand the risks associated with their behavior and are making strides to reduce tobacco use. Although they continue to smoke, these patients may understand that their lifestyle increases their chances of becoming sicker.

Balancing perceived barriers and benefits of adherence

According to the Health Belief Model, perceived benefits and barriers should be balanced as related to an individual’s likelihood of participating in a given behavior [12]. Overall, smokers perceived more barriers and fewer benefits to self-care than nonsmokers. Items referring to the patient-provider relationship were measured under both constructs. Smokers were more likely to disagree with their physicians and were not convinced of the importance of their medication or treatment plan. In past studies, patients found to be in disagreement with their physicians were less likely to adhere to their medications [21,22]. Patients were more likely to follow physician recommendations when their concerns, goals, and preferences were being considered [21,22]. Furthermore, smokers may be more likely to take risks and rebut recommended treatment than nonsmokers. In one study researchers evaluated decision-making as related to personality differences in smokers and nonsmokers. It was

concluded that smokers were more impulsive, sensation seeking, and less agreeable than nonsmokers [20]. Therefore, smokers may be less inclined to agree with their provider about their health and less inclined to follow their provider's instructions compared to nonsmokers.

Smokers also indicated feeling burdened by out of pocket expenses. Smokers may feel burdened by additional costs if more drugs or more costly drugs are prescribed for care. If smokers suffer with uncontrolled asthma or COPD, more expensive, higher dosed therapies may be required for treatment. Although most patients of UMCNO receive Medicaid, Medicare, or free care, out of pocket costs may occur if drugs are not covered by their prescription plans. Smokers may also feel more burdened if their tobacco-related spending reduces their ability to purchase basic living needs such as medications [23].

Smokers in our sample were more likely to perceive that "family and work obligations stopped them from taking care of their own health". This finding may be indicative of overall higher rates of self-reported stress in smoker populations [24–26]. A study by the Pew Research Center revealed that nonsmokers were more likely to be content and happy; perceive excellent or good personal health; and were more satisfied with their family, job and standard of living than smokers [27]. Nonsmokers also have been found to report less stress, anxiety, and depressive symptoms than smokers [25,26,28]. Within our sample, additional stress related to family and work responsibilities may have also prompted smokers to continue cigarette use for coping. Hajek et al. [24] examined changes in stress levels in smokers after being hospitalized for myocardial infarction. Although patients reported that smoking helped them deal with stress, those who quit or cut down reported overall lower stress levels over the course of a year.

Perceptions of everyday and someday smokers

Additional analyses were conducted to determine whether differences in perceptions existed for *some day* versus *everyday* smokers. Someday smokers included those respondents who continue to smoke but do not smoke everyday, perhaps in an effort to reduce their cigarette use. This analysis revealed that compared to some day smokers, everyday smokers were less likely to perceive the benefits of adherence. This finding indicates that some day smokers may understand the importance of managing their health and may, therefore, begin reducing tobacco use. Also,

active smoking is associated with a reduced therapeutic response to inhaled corticosteroids (ICS), which are used to treat asthma and COPD [29,30]. If some day smokers have reduced their tobacco use, they may perceive that medications are working better to improve asthma and/or COPD, and therefore, have more positive perceptions towards their medication and provider care plan.

Perceptions in smokers by race and ethnicity

Barriers to adherence in smokers were also significantly different by respondent race/ethnicity. White smokers perceived significantly more barriers than smokers of "Black and Other" races. In other studies examining low income and/or Medicaid populations, patients, regardless of race or ethnic group, experienced similar barriers to care such as trouble affording medication and travel to appointments [31,32]. White smokers in our sample, however, perceived more barriers towards items relating to the patient-provider relationship. In past studies, Whites are described as being more outspoken and proactive in their health decision-making than other groups including African Americans/Blacks who have been described as preferring and participating in more paternalistic care encounters [33,34]. Whites may, therefore, be more likely actively engage, yet also scrutinize health care recommendations if they do not truly agree with their provider.

Limitations

This study was limited by its convenience sampling methods and cross-sectional design. We understand that this limits our ability to generalize results to the larger population and infer causality. The study's small sample size also limited our ability to make associations such as those examining perceptions and smoking status by diagnosis. In addition, all data collected for this study was based on patient self-report, including clinical diagnosis, smoking status, health behaviors, and adherence. Although we understand the limitations related to this method, self-report has been used previously as a validated method to collect adherence related data [35]. Lastly, this study employed three constructs of the Health Belief Model. By examining additional constructs, such as *self-efficacy*, researchers could have identified whether smokers actually possess the ability and skills needed to manage asthma and/or COPD on their own (e.g.

the ability to use inhalers correctly, the ability to order medication refills, etc.).

Conclusion

Smokers with chronic disease are described as poor adherers to provider recommendations, however, little was known about the actual influences of adherence in this group. In this study, we not only addressed differences in adherence between smokers and non-smokers, but we also sought to explain why these differences exist. The Health Belief Model (HBM) provided a theoretical framework that allowed researchers to probe individual level influences of adherence in smokers and nonsmokers. Results of this study may not only advance clinical practice but also help clinicians and researchers develop new services to reduce barriers and improve care for smokers with chronic disease. Future research should include 1. A comprehensive examination of adherence using additional constructs of the HBM as well as, 2. An exploration of beliefs and perceptions possessed by smokers diagnosed with other chronic conditions.

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Disclosure statement

The authors report no conflicts of interest related to this research and manuscript.

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