3-4-2008

Nicotine Replacement Therapy and Brief Motivational Interview for Emergency Department Smokers with Asthma

Rebecca McNutt

Nicotine Replacement Therapy and Brief Motivational Interview for
Emergency Department Smokers with Asthma

A Thesis Submitted to the
Yale University School of Medicine
in Partial Fulfillment of the Requirements for the
Degree of Doctor of Medicine

By
Rebecca McNutt
2007

Table of Contents

Introduction

Acute asthma exacerbation commonly leads to a visit to the emergency department. One study reports 2,000,000 emergency visits per year for acute asthma exacerbations. (45) Many of the patients who present with this complaint are also smokers; recent research indicates percentages in the 17-25% range. (6,46) Furthermore, they often have little or no follow-up care and often rely only on the emergency department for their health care needs. Therefore, the burden falls on the staff in the emergency department to treat the patient's immediate problem of the acute exacerbation, and also to provide ways to help the patient with long term secondary prevention of asthma.

Research has been done that indicates that smoking worsens the course of asthma. Smoking increases airway reactivity to irritants and causing an acceleration in the rate of pulmonary dysfunction that is irreversible. (8,9) When compared to asthma patients that do not smoke, smoking asthmatics have more respiratory symptoms as well as more severe asthma as evidenced by lower forced expiratory volume in the first second to forced vital capacity (FEV(1)/FVC) ratio, lower lung diffusion ratio, and more radiological evidence of lung damage. This evidence includes both airway and lung parenchymal damage visible on high resolution computed tomography (CT) scan. (10) In direct comparison with former-smokers and never-smokers, asthmatic active smokers have much higher severity scores. (11) Another theory of smoking asthmatics is that they may have a different phenotype than their nonsmoking counterparts. These differences include the type of airway cells present and the mediators involved, as well as a lack of

response to inhaled corticosteroids.   The increased severity of asthma symptoms in smokers may be attributed to this resistance to corticosteroids, as this is part of the routine treatment for asthma.(12) Furthermore, mere exposure to environmental smoke by nonsmoking asthmatics causes more severe asthma as evidenced by more frequent emergency department visits and more frequent use of asthma controlling medications. (13,14) One recent study has also determined that smoking cessation improves lung function as well as causing improvement in measurement of sputum neutrophil count following only six weeks of smoking cessation. (15) This study looked at the short term outcomes of smoking cessation on acute asthma. Specifically, the effect on a patient's asthma as measured by return visits, medication use, and peak flow measurements.

Several factors make this project a viable research study to investigate the possible effects of more active intervention for smoking cessation in asthmatics who present to the emergency department with an acute exacerbation. One of these is the well documented fact that smoking is a major cause of illness, disability, and emergency department visits. From 1995-1999 alone, smoking accounted for over 440,000 premature deaths. In addition, for the 22 billion packs of cigarettes sold in 1999, $3.45 per pack was spent on medical care that was attributed to smoking and an additional $3.73 per pack was the result of lost productivity. (1) Although approximately 25 % of the population smokes, a reported 48% of the emergency department patient population are smokers. (2,3) Furthermore, patients who present to the emergency department for a smoking-related illness score significantly higher on the Fagerstrom Test for Nicotine Dependence than do patients presenting for non-smoking-related illness. (4,5)

In emergency department patients, smoking seems to worsen many different illnesses.   In one study, only 42% of the asthmatics presenting with an acute exacerbation did not smoke, or had never smoked. (6) Furthermore, respiratory illnesses are not the only ones in which smoking makes an impact.   Another common diagnosis in the emergency department is acute myocardial infarction (AMI). Smoking is considered to be one of the most important preventable causes of AMI. (7)

Despite the fact that such a high percentage of emergency department patients are smokers and that many of their illnesses are worsened by their smoking, counseling on smoking cessation and/or smoking cessation therapy are not part of standard emergency care. (2) Efficacious application of nicotine replacement therapy (NRT) requires the concurrent use of counseling. (28) This project will study a targeted group of emergency department patients to determine if counseling coupled with free NRT therapy is an effective method of promoting smoking cessation in the asthmatics presenting with an acute exacerbation.

Another concept important for the completion of this project is the fact that the emergency department is an appropriate site to initiate smoking cessation. The emergency department population is unique because of the fact that a large proportion of the patients do not have access to primary or preventative medical care. Patients seen in the emergency department for care of their asthma are not there for maintenance, but rather for "crisis oriented care". These patients also tend to be of lower socioeconomic status and have less medical knowledge than their counterparts in the primary care setting. (29)

Although the emergency department is a challenging environment in which to offer preventative health, there is an evolving role as more and more patients begin to use the emergency department as their sole source of medical care. The current standard of care requires asking all patients about smoking status. In one study, 56% percent of patients were verbally screened for smoking. However, only 56% of those conversations with patients involved advice to begin smoking cessation. 16% involved assessing readiness to quit and an even smaller percentage, 13%, involved a referral to help with smoking cessation. (30) Another study indicates that only 20-34% of emergency physicians engage in smoking cessation counseling with their patients in the emergency department. (31) The lack of preventive care offered, does not seem to be due to a lack of interest on the part of the patients. In one study, 96% of the patient population in the emergency department expressed interest in some type of preventive health care, including help with smoking cessation. (32) Another study presented evidence that, not only are certain emergency department patients interested in counseling and advice on smoking cessation, but they were also willing to spend an extra 15 minutes in the emergency department to obtain the counseling. (33)

In a study that looked at factors contributing to the success of smoking cessation in hospitalized patients, being in the hospital itself was an independent predictor of success (34). This data supports the idea of a "teachable moment", where patients are directly aware of the negative consequences of their smoking habits. Other studies show that smokers respond well to counseling in the hospital environment. (35,36)

It is accepted that nicotine replacement therapy is effective. NRT has been available for many years and found to be an effective treatment for smoking

cessation.(16) Although all forms of NRT have been shown to be equally effective(17), recent work indicates that a combination of nicotine delivery systems may be more effective than any monotherapy. In certain situations, combination NRT has greater efficacy in successful smoking cessation as well as relief of withdrawal symptoms.(18) U.S. Public Health Service guidelines for clinical practice encourage the use of the nicotine patch along with a self-administered form of nicotine replacement. (19)

There have been several recent studies looking at the efficacy of programs that offer free NRT as a way to promote smoking cessation. Although NRT in its different forms and doses is widely available without a doctor's prescription, cost of therapy has been a barrier to many patients using NRT. In one study in which a quitline was used to distribute free nicotine patches, it was noted that the number of calls to that quitline increased dramatically after it became known that the patches were available. Smokers who received the free NRT had higher quit rates than those who did not. This study showed that offering free NRT is both a highly efficacious and cost-effective way to promote smoking cessation.(21) A twelve month follow-up to this study demonstrated the quit rate to be 1.78 times higher for those smokers who received the free patches as opposed those who did not, even when factoring in the efficacy of the support of the quitline.(20)

Part of this research plan is to use a Brief Motivational Interview (BMI) along with NRT to promote smoking cessation. The patients included in this study are in a situation susceptible to intervention for smoking cessation because they presented to the emergency department with an acute exacerbation of a respiratory problem with known links to cigarette smoking. These patients presented in a "teachable moment": when they

were more receptive to smoking cessation counseling. Counseling has remained in the realm of the primary care provider and it is not currently standard of care for emergency physicians to provide counseling to these patients. One study revealed that even though a majority of patients in the emergency department reported being receptive to smoking cessation counseling, only 50% were advised to quit, and 9% were offered any type of assistance. (22)

Despite the lack of counseling taking place, there is strong evidence that it has great potential. Brief interventions have been successful in increasing quit rates in hospitalized patients. (23) However, this technique has not been evaluated for smokers who present to the emergency department.

BMI is a brief 5-10 minute counseling session that has been used successfully to reduce alcohol consumption in both clinic (24,25) and emergency department (26,27) populations. BMI is a patient centered approach that uses motivational enhancement techniques. In this study, providers were able to use the motivation provided by the patient's presentation to the ED with an acute respiratory illness requiring medical intervention. Patients were able to draw motivation from the negative consequences of their smoking.

The intervention used in this study was a combination of NRT and BMI. There is evidence that the use of counseling in conjunction with NRT has a higher quit rate than NRT alone for patients in an inpatient hospital setting. (28) The emergency department is a challenging setting where the brief, formatted approach of the BMI is particularly appropriate. Because BMI with or without NRT is not standard of care, this project was

set up to compare the effectiveness of BMI and combined NRT with the current standard of care.

By utilizing all of these factors as part of the study, this research looked into a particular area of smoking cessation to provide a viable and effective way to encourage asthmatic patients in the emergency department to quit. Given the evolving nature of care in the emergency department due to the limited access of ED patients to primary care along with the opportunity of a "teachable moment" due to the acute respiratory distress, this study was designed to demonstrate an efficacious and practical way to encourage smoking cessation in the emergency department.

Statement of Purpose

The purpose of this research is to evaluate the short term effectiveness of the use of more active intervention in helping asthmatics who present to the emergency department with an acute exacerbation to quit smoking. Currently, most people who present to the emergency department with an asthma exacerbation are asked about their smoking habits; however, that is usually where the conversation ends. Some patients are advised to quit smoking, but there are very few who are actually formally counseled. There are even fewer who are offered help with smoking cessation, whether it is a referral to a quitline, nicotine replacement, or pharmacological intervention. The first hypothesis for this study is that by using Nicotine Replacement Therapy (NRT) coupled with a Brief Motivational Intervention (BMI) there will be a higher rate of smoking cessation in this population versus the standard care provided in a typical emergency department visit for

acute asthma exacerbation. Furthermore, participants in the NRT/BMI group will have a reduction in the number of cigarettes smoked per day.

This study is targeting a specific subset of emergency department patients; smokers presenting with an acute asthma exacerbation. A good percentage of these patients are aware that their smoking may impact their asthma symptoms. However, they may not have previously attempted to quit. There is a great deal of research about smoking and asthma. The second hypothesis of this study is that the group that received the NRT/BMI will have greater improvement of their asthma symptoms when compared to the group that received standard care. This was measured using the number of return visits for asthma, peak flow, and medication requirements.

The primary aims of the study are as follows:

1. To evaluate the effectiveness of NRT /BMI for increasing rates of smoking cessation in Emergency Department patients presenting with acute exacerbations of asthma as measured by carbon monoxide levels, and self-reported tobacco use.

2. To assess the effectiveness of NRT/BMI in improving asthma outcomes as measured by peak expiratory flow rates, unscheduled medical visits for asthma, and medication requirements.

The secondary aim of this study was to evaluate the effectiveness of NRT/BMI in reducing cigarette consumption among asthmatic smokers.

Methods

The methods described for this study were submitted and approved through the Human Investigations Committee in May 2005. Patient enrollment began in July 2005.

Patient screening and enrollment was accomplished by the clinical team caring for patients or one of the investigators. Any patient presenting to the emergency department with an acute asthma exacerbation, who was not likely to be admitted, and was a smoker was screened with a three question Stage of Change (37) questionnaire.   Please see Table 1.

Stage of Change

1. Are you currently a smoker?
2. In the last year, how many times have you quit smoking for at least 24 hours?
3. Are you seriously thinking of quitting smoking?
    a. Yes, within the next 30 days.
    b. Yes, within the next 6 months
    c. No, not thinking of quitting.

Table 1: Stage of Change Questionnaire

The Stage of Change questionnaire is used to assess the patient's readiness to actually quit smoking. Patients are divided into one of three stages of change based on the answers given to the three questions. These stages are precontemplation, contemplation, and preparation. The precontemplation stage is when the patient is not aware that their smoking is problematic. In the contemplation stage, the patient is aware that their smoking is problematic and have begun to think seriously about quitting. However, in this stage, the patients have not yet committed to take action and begin a smoking cessation program. In the preparation stage of change, the patient is intending to take action within the next 30 days to begin a smoking cessation program.

The inclusion criteria is as follows:

1. Presentation to emergency department with an acute asthma exacerbation

2. Age 18-50 years

3. Previously diagnosed with asthma

4. Current smoker > 10 cigarettes/smoking day

5. Contemplation or Preparation stage of change

The exclusion criteria is as follows:

1. Previous adverse reaction to nicotine replacement or adhesives

2. Admitted to hospital this visit

3. Recent acute myocardial infarction or unstable angina

4. Acute psychiatric illness

5. Chronic Obstructive Pulmonary Disease (COPD)

6. Pregnancy/breast feeding (based on self report, or on ED urine testing when appropriate)

7. Currently in smoking cessation program

8. Currently taking nicotine replacement therapies (NRTs)

9. Currently taking Buproprion (as Zyban or Wellbutrin preparations)

10. Severe hypertension (SBP > 160)

11. Unstable arrhythmia

12. Not proficient in spoken and written English

13. Prisoners

14. Cognitively impaired (as determined by evaluating physician)

15. Concurrent use of drugs of abuse

16. Unstable psychiatric condition

Once a patient was deemed eligible for inclusion, their informed consent was obtained, and the patient was enrolled in the study. Subject numbers were randomly pre-assigned to either the nicotine or the control study groups. Each enrollee received a consecutive subject number that determined to which study group they would belong. Both groups received a smoking history inventory. This smoking history inventory included demographic information, age at first cigarette, age daily smoking began, number of days per week patient smokes, number of cigarettes per day, length of time for current smoking habits, brand of cigarette most commonly smoked, use of other tobacco products, how deeply the patient inhales, smoking habits of others in the household, smoking status of spouse or significant other, children in the household and concern of second hand smoke, time since last cigarette, most important cigarette of the day. Other questions dealt with the patient's asthma history including previous history of acute asthma exacerbations along with treatment, use of asthma medications, and severity of this acute asthma exacerbation.

Asthma treatment for both groups followed a standard emergency department protocol for acute asthma exacerbations based on the British Thoracic Society guidelines. (44) In addition, exhaled carbon monoxide measurements were taken. Carbon monoxide gas is found in cigarette smoke, and exhaled carbon monoxide levels measured in parts per million (ppm) are often used to verify a patient's self-reported smoking status. There is a great deal of research into the appropriate cutoff for carbon monoxide level to appropriately correlate with smoking status; however, a commonly accepted value is > 6 ppm. (47)

Follow-up for both groups took place at 7 days in the Urgent Care section of the emergency department and by telephone at 30 days. The 7-day follow-up involved a self-reported Follow-up Assessment that asked about smoking since discharge from the emergency department, use of NRT, side effects of NRT, return trips to the emergency department for asthma treatment, hospitalizations for asthma since discharge, current asthma severity, and use of asthma medications since discharge. At the time of the 7-day follow-up visit a repeat peak flow measurement and exhaled CO level measurement were obtained. The 30-day telephone follow-up involved only the Follow-up Assessment.

Three of the patients who were unable to make it back to urgent care for their 7-day follow-up were contacted by phone instead. These included 2 members of the standard care group and one member of the NRT/BMI group. Patients were asked to repeat a peak flow measurement at home and report it. No CO level measurements were obtained for these patients.

The control group received standard care which involved advice to stop smoking. There was no formal counseling or referral to a smoking cessation program in this group. The nicotine group received a standardized Brief Motivational Interview, as well as nicotine replacement therapy (NRT). For this study NRT consisted of a 7 day supply of 21 mg patches as well as 2 mg lozenges. Patients also received instructions on the use of the nicotine patches and lozenges. At the 7-day follow-up visit, subjects who found NRT useful, were offered an additional 3 week supply of patches and lozenges.

Statistical considerations included measurement of differences in proportions betweens groups using Fischer's exact test. These differences included stage of change, return visit for asthma, and presence of other smokers in the home. Differences between

group means were tested for significance using the two-sided Student t-test. These included number of years smoking, cigarettes per day, number of days per week patient smokes, self-reported severity of asthma symptoms, and peak expiratory flow upon presentation to the emergency department. One question dealt with time to first cigarette of the day. This question was asked with a time range. Using the midpoint of the range given, the mean time to the first daily cigarette was calculated for each of the two groups. The self-reported severity of asthma was determined by asking the patients to rate the severity of their asthma symptoms on a scale of 0-10. For this scale, 0 is absolutely no asthma symptoms and 10 being the worst asthma symptoms that the patient had ever experienced.

The results were analyzed as follows: The severity of asthma at 7 and 30 days, the weekly use of inhalers, and peak flow measurements at 7 and 30 days were compared using the student t-test. The Fisher exact test was used to analyze if participants required a return visit or not and whether there was a subjective improvement in their asthma symptoms or not.

The proportion of subjects abstaining from tobacco for one week was defined as negative self report and a CO level < 10 ppm. One week quit rates are not widely reported. A six week rate of 50% for counseling and combined NRT has been reported.(38) Using a two sided Fischer's exact test and assuming a quit rate of 10% for the control group and 40% for the NRT/BMI group and setting $\acute{\alpha}=0.05$ yields a power of 80% with n = 36 per group.

For the purposes of this study a successful quit at the 7-day follow-up was defined as 6 consecutive days of no cigarettes prior to the 7-day follow-up. For the 30-day

follow-up, a successful quit was defined as 29 days of no cigarettes prior to the 30-day follow-up. Also, a successful reduction in cigarettes is defined as at least 25% fewer cigarettes smoked per day. The quit data as well as the reduction data was analyzed using the Fisher's exact test.

Participants in both groups who followed-up received a $20 stipend to compensate for their time. Participants were paid after completing the requirements of the 7-day follow-up.

My involvement included assisting in the development of the initial smoking history inventory, 7-day, and 30-day Follow-up Assessment. I also participated in the screening, enrollment, and follow-up (7 and 30-day) of several test subjects. I completed the statistics presented in this thesis.

Results

Demographics

Patient enrollment began in July 2005 and continued through October 2006. During this time, a total 23 patients were enrolled in the study. The demographics included 15 women and 8 men. Among the patients enrolled 40% were Hispanic, 43% were African American, and 17% were Caucasian. (n = 23) Of the total number of patients enrolled in the study, 12 participants were randomly assigned to the control group (standard care) and 11 participants were randomly assigned to the Nicotine/BMI group. The randomization was performed as part of the study design and prior to the enrollment of the first patient in the study.

Although there were 23 patients enrolled in the study, 9 of the original patients were lost to follow-up before returning for the 7 day follow-up. This left 14 patients in

the study. The 14 remaining patients were divided evenly among the two participant

groups. 7 of the remaining participants were part of the standard care group and 7 of the

remaining participants were part of the Nicotine/BMI group.

All 14 of these study participants completed both the 7 day and 30 day follow-

ups. The original study design required patients to return to the Urgent Care section of

the Yale Emergency Department for the 7 day follow-up. The patient would answer the 7

day follow-up survey and have their peak flow measured along with their expired carbon

monoxide (CO). The expired CO was to verify the patient's self reported smoking status.

However, a significant number of participants were unable to return to the Emergency

Department for this 7 day follow-up. As a result, these 7 day follow-up contacts were

done by phone. The total number of patients who were contacted by phone to complete

the 7 day follow-up was 5. Therefore, the smoking status of the participants in the study

is considered self reported.

Despite the lack of data for CO levels of the participants, most were able to

provide a peak flow, as they had a peak flow meter at their home. However, peak flow

data obtained from the participants in the study is also considered self-report. Also, there

were 2 participants in the standard care group and 1 participant in the Nicotine/BMI

group who were included in the full study, but were unable to provide a 7 day peak flow

measurement.

All 14 participants in the full study were contacted at least 30 days following their

presentation to the Emergency Department with an acute asthma exacerbation. They

were asked to complete their 30 day follow-up questionnaire by phone.

The total enrollment in the study was well below the required 72, or n = 36 per group. However, the statistical analysis was completed to look at the makeup of the participants enrolled in the study, as well as to determine if there were any statistically significant differences between the participants enrolled in the standard care group versus the participants enrolled in the Nicotine/BMI group.

Looking at the number of cigarettes per day, as given by the participants on the initial smoking inventory that was collected the day that the patient presented to the ED with an asthma exacerbation, the mean number of cigarettes was not statistically significant. (NRT/BMI 18.6 $\pm$ 8.7, range 10-35; Standard Care 14.5 $\pm$ 5.3, range 10-21; p = 0.18) The smoking inventory also asked participants about the time, in minutes, between waking up and having their first cigarette of the day. Again, these results were found to be not statistically significant. (NRT/BMI 16.5 $\pm$ 15.7, range 5-45; Standard Care 20.4 $\pm$ 16.9, range 5- 45; p = 0.50)

Participants in the study were asked about other smokers in the home. In the Nicotine/BMI group, 57% (n = 7) had at least one other smoker living with them. Some had as many as 5+ other smokers living with them. In the standard care group, 71% (n = 7) had at least one other smoker living in the same home as they did. Using the Fisher exact test, the calculated p-value was 0.5. There is no statistical significance in the difference between groups.

The next piece of data evaluated for comparison within the two experimental groups is the age at which study participants smoked their first cigarette. There was no significant difference between the NRT/BMI group and the Standard Care group. (NRT/BMI 15.0 $\pm$ 3.2, range 9 – 20; Standard Care 14.1 $\pm$ 3.7, range 12 – 20; p = 0.53)

Closely associated with the age at first cigarette is the age at which participants first

started smoking cigarettes on a daily basis. There was also no significant difference

between these values in the two groups. (NRT/BMI 16.3 $\pm$ 3.3, range 11-21; Standard

Care 16.8 $\pm$ 3.6, range 12 – 24; p = 0.7)

The next smoking demographics evaluated for statistical significance between the

two groups was the number of years, in total, that the participants had been smoking

cigarettes as well as the number of days per week that the participants smoked. These

numbers were, again, not statistically significant. (NRT/BMI 13.9 $\pm$ 6.9, range 5.5 – 25;

Standard Care 9.3 $\pm$ 8.2, range 2 – 30; p = 0.25)

The final smoking demographic looked at the number of days per week the

participants would smoke. In the Nicotine/BMI group, each of the participants smoked 7

days per week. In the standard care group, all but two of the participants smoked 7 days

a week. One participant smoked only 5 days per week and the final participant smoked

only 2 days per week. The means for the two groups were not found to differ by a

statistically significant amount. (NRT/BMI 7 $\pm$ 0, range 7 -7; Standard Care 6.4 $\pm$ 1.5,

range 2 – 7; p = 0.21)

The next area of demographics to be analyzed looked at the Stage of Change.

One of the criteria for participation in this study was that the patients be either in the

contemplation or preparation stages of change as far as being ready to quit smoking. This

would ensure that patients were more mentally prepared to quit smoking. The

questionnaire asked if patients were contemplating quitting smoking in the next 30 days,

the next 6 months or not at all. In the Nicotine/BMI group, 100% (n = 7) were

considering quitting smoking within the next 30 days and 0% (n = 0) were considering

quitting in the next 6 months. For the standard care group, 86% (n = 6) of the

participants were considering quitting in the next 30 days and 14% (n = 1) of the patients

were considering quitting in the next 6 months. The Fisher exact test demonstrated a p-

value of 0.5.

The final area of demographics to be analyzed was the severity of the asthma

symptoms of the participants in the study. Participants were asked to subjectively rate

the severity of their asthma upon presenting to the Emergency Department. The means

of the two groups were found to be statistically similar. (NRT/BMI 6.1 $\pm$ 1.4, range 4 –

8; Standard Care 6.6 1.9, range 3 – 9; p = 0.56) .

Overall, it appears that both the Nicotine/BMI group and standard care group

were drawn from the same population of patients. Although, there was wide variability

in individual pieces of data collected, none of the smoking habit demographics or asthma

symptom severities mean values were significantly different after statistical analysis.

Please see Tables 2 and 3 which follow.

Characteristic	Mean NRT/ BMI	SD NRT/BMI	Mean Standard Care	SD Standard Care	P- Value
# Cig/Day	18.5	8.7	14.5	5.3	0.18
Time (min) to 1st Cig	18.6	18.5	20.4	15.9	0.50
Age 1st Cig	15.0	3.2	14.1	3.7	0.53
Age Daily	16.3	3.3	16.8	3.6	0.70
# Yrs Smoke	13.9	6.9	9.3	8.2	0.25
Days/wk Smoke	7.0	0.0	6.4	1.5	0.21
Asthma Severity (0-10)	6.1	1.4	6.6	1.9	0.56

Table 2: The data collected on all enrolled participants was broken down into the appropriate study groups, either Nicotine/BMI or Standard Care. It includes the means, standard deviations, and the p-values that were calculated using the two-sided student t test.

Characteristic	% NRT/BMI	% Standard Care	P-Value
Preparation Stage of Change (Vs Contemplation)	100	86	0.5
Other Smokers in Home	57	71	0.5

Table 3: The data collected on all enrolled participants and separated into Nicotine/BMI or Standard Care. It is the percentages of the listed characteristics for each group along with the p-values calculated using the fisher exact test.

Because the number of participants that were lost to follow-up was so high in this study, an analysis and comparison of the characteristics of the participants who followed-up versus those who didn't was performed. This was done to ensure that there were no statistically significant differences between the group that followed-up and the group that did not follow-up that may have contributed to the huge percentage that were lost to follow-up. The results can be found in Tables 4 and 5 below. Overall, the only statistically significant difference was the age at first daily cigarette. The group that did not follow-up had a mean of age 14.7 while the group that did follow-up had a mean age of 17.7.

Characteristic	Mean Followed-Up	SD Followed-Up	Mean Didn't Follow-Up	SD Didn't Follow-Up	P- Value
# Cig/Day	15.7	7.0	17.7	7.9	.53
Time (min) to 1st Cig	19.1	18.4	16.7	12.3	.73
Age 1st Cig	15.0	3.9	13.8	2.4	.41
Age Daily	17.7	3.6	14.7	2.18	.041
# Yrs Smoke	13.3	7.9	8.9	7.4	.26
Days/wk Smoke	6.9	.53	6.4	1.6	.39
Asthma Severity (0-10)	6.1	1.4	6.9	1.9	.29

Characteristic	Followed-Up	Didn't Follow-up	P-Value
Preparation Stage of	93	56	0.054

Table 4: The data collected on all enrolled participants was broken down into the appropriate study groups, those that followed-up and those that did not. It includes the means, standard deviations, and the p-values that were calculated using the two-sided student t test.

Table 5: The data collected on all enrolled participants and separated into those who followed-up and those who were lost to follow-up. It is the percentages of the listed characteristics for each group along with the p-values calculated using the fisher exact test.

Primary Outcomes

In analyzing the first hypothesis: there will be a higher rate of smoking cessation among the asthmatics treated with Nicotine/BMI versus the standard care group, the 7 day and 30 day quit rates were evaluated. The statistical analysis was done by looking at the 14 patients who completed all phases of the study. In the Nicotine/BMI group, only 2 of the 7 participants, or 28.6%, had quit smoking after 7 days. In the standard care group, 3 of the 7, or 42.9%, had quit smoking. However, using the one-sided Fisher exact test to examine the statistical significance of these findings, the calculated p-value was found to be 0.367. Therefore, the findings are not considered statistically significant.

Similar results were obtained by examining the 30-day quit rate. In the case of the Nicotine/BMI group, again 2 of the 7 participants remained smoke free at 30 days. For the standard care group, there were also 2 of the 7. It should be noted that one of the participants in the standard care group was still smoking at 7 days, but had quit at the 30 day follow-up. For the purposes of this study, the participant was still considered a smoker. These results were 28.6% nonsmokers in each group and a p-value of 0.424.

The second hypothesis was that patients in the Nicotine/BMI group would have greater improvement of their asthma symptoms than those in the standard care group. This was measured using the peak flow, number of return visits for asthma, medication requirements, and subjective monitoring of asthma symptoms.

First, the mean 7 day peak flow of the Nicotine/BMI group, using the data available, was not found to be statistically different. (NRT/BMI 308 $\pm$ 40.8, range 250 – 375; Standard Care 325 $\pm$ 94.3, range 160 – 400; p = 0.7)

Each of the participants was asked if they had to return to the emergency department for treatment of their asthma symptoms since their initial presentation and enrollment in the study at both the 7 and 30 day follow-ups. In the Nicotine/BMI group, none of the participants required a return visit to the emergency department. In the standard care group, there was one participant who required a single return visit to the emergency department during the 30 day course of their study participation. Using the Fisher exact test, this results in a p-value of 0.5.

One of the medication requirements used to evaluate the improvement in asthma symptoms was the use of an inhaler by study test subjects. Participants were asked on which days they required the use of their inhaler as a result of unexpected asthma symptoms during the course of their participation in this study. These values were averaged out to a value representing the number of times per week that test subjects were requiring supplemental inhaler therapy for their asthma symptoms. These results were not statistically significant. (NRT/BMI 2.15 $\pm$ 0.66, range 2-7; Standard Care 3.14 $\pm$ 1.86, range 1-7; p = 0.52). Please see Figure 1.
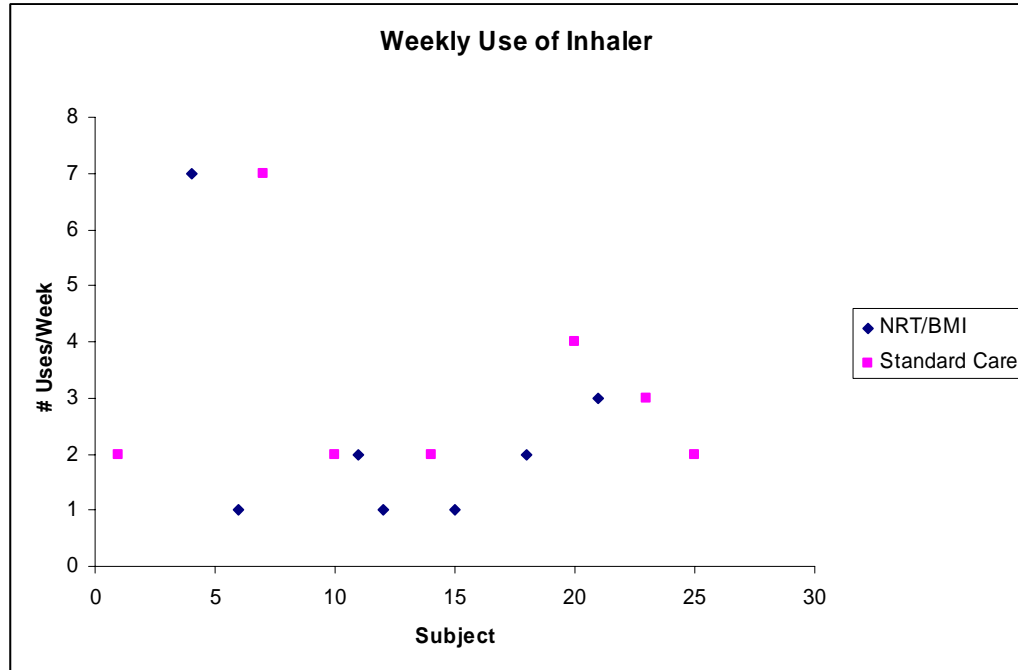
Figure 1: Weekly inhaler use for the two study groups.

Finally, participants were asked to rate the severity of their asthma symptoms on a scale of 1-10 in the same manner as in the initial smoking and asthma questionnaire at both 7 and 30 days. As expected, during the 7 day follow-up, 100% of the participants reported a lower severity of symptoms when compared to their initial subjective assessment while being treated in the Emergency Department. The mean values were, again, not statistically different. (NRT/BMI 2.5 ± 1.97, range 0-6; Standard Care 1.8 ± 1.3, range 0 -3; $p = 0.5$) The 30 day subjective assessment of subject's asthma symptoms yielded similar results. (NRT/BMI 2.33 ± 1.37, range 0 – 4; Standard Care 2.7 ± 1.8, range 0-5; $p = 0.68$)

The final measure of the severity of asthma symptoms between the two groups was to look at the subjective improvement of symptoms of the two groups between the 7 and 30 day follow-ups. These results were not statistically significant. In the

Nicotine/BMI group, 2 test subjects reported improvement in the severity of their

symptoms, while 5 reported that their symptoms either stayed the same or worsened over

this time period. In the standard care group, only 1 test subject reported that the severity

of their asthma symptoms had improved, while 6 reported that their symptoms had either

stayed the same or worsened. Again, the p-value was calculated using the Fisher Exact

test. In this case, the p-value was calculated to be 0.5.

Secondary Outcome

Although the quit rates were not as high as expected, there are some data to

suggest that even if the test subjects were unable to quit smoking cigarettes, they were

able to at least cut down on the number of cigarettes smoked on a daily basis. During

both the 7 and 30 day follow-ups, participants were asked to quantify the number of

cigarettes they smoked each day. Because there is no way to measure the accuracy of the

number of cigarettes reported by each of the participants, this data is all self-reported.

However, in the Nicotine/BMI group, all 5 of the people who reported smoking since

their presentation to the Emergency Department also reported a decrease in the number of

daily cigarettes at 7 and/or 30 days by at least 25% when compared to their initial

smoking questionnaire. Please see Figure 2. In some cases, the decreases were fairly

dramatic. Two participants decreased their daily cigarette consumption by more than

half. When looking at the standard care group, only 3 of the participants that were unable

to quit were able to decrease the number of cigarettes they were smoking on a daily basis

by greater than 25%. In fact, two of the participants in the standard care group actually

increased the number of daily cigarettes. Please see Figure 3. Again, statistical analysis

was performed using the one-sided Fisher Exact Test. The result of this calculation was a

p-value of 0.035. In this case, the difference is statistically significant between the

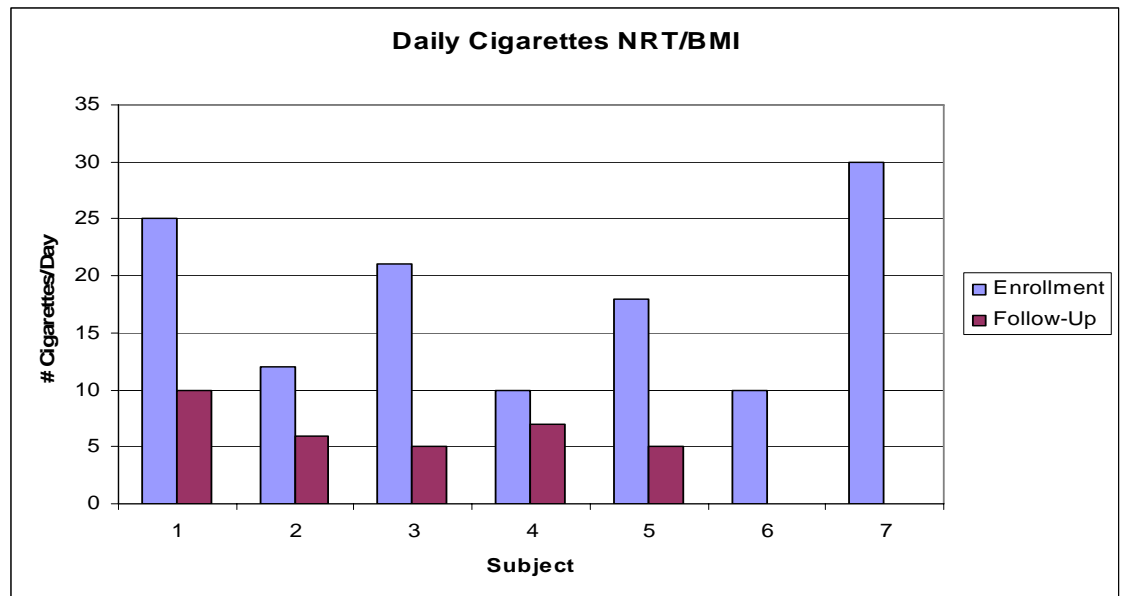Nicotine/BMI group and the standard care group.

Figure 2: Comparison of the number of daily cigarettes at enrollment and follow-up of the patients enrolled in the Nicotine/BMI group who were unable to quit smoking during the study.
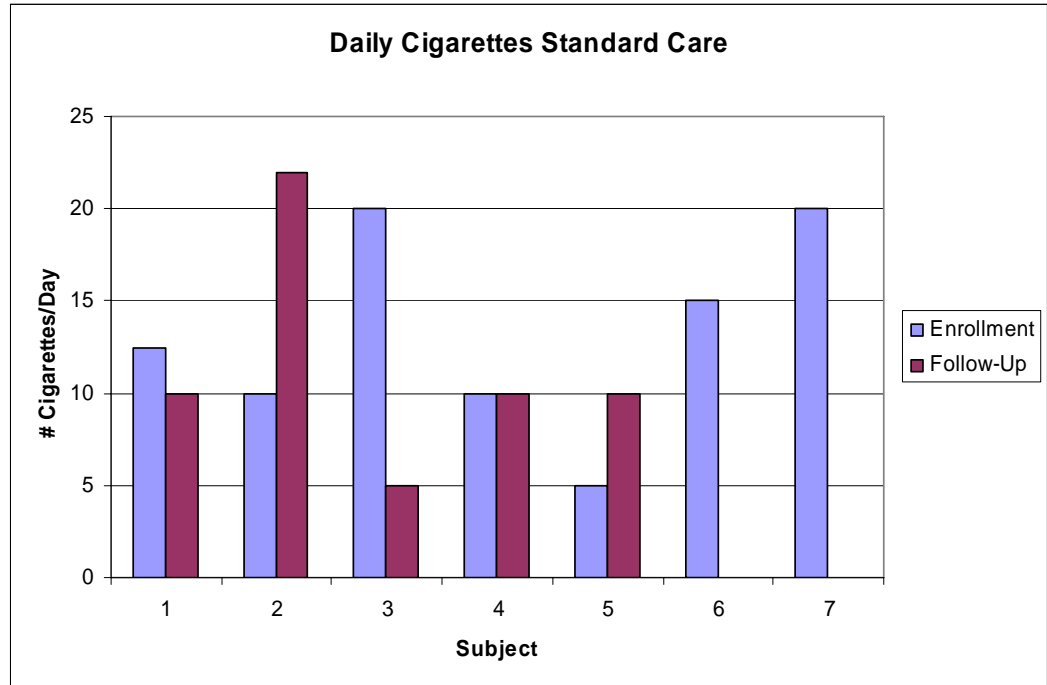
Daily Cigarettes Standard Care

Figure 3: Comparison of the number of daily cigarettes at enrollment and 30 day follow-up of the patients enrolled in the Standard Care group who were unable to quit smoking during the study.

Adverse Events

Because the NRT/BMI group was being treated with nicotine patches and lozenges, this group was also surveyed about side effects of the patch and lozenges along with actual use of the NRT provided. Of the 7 participants in the NRT/BMI group, 2 patients reported a side effect of a rash from using the nicotine patch. Both participants were unable to continue use of the patch due to the discomfort of the rash. One patient reported a dry mouth, but continued using the patch.

Of the seven NRT/BMI participants, none of the patients used the patches provided for the full 30 days. Two of the participants stopped within a few days due to the severity and discomfort of a rash. Two participants used the patch for 3 days and then

started smoking again. One patient used the patch for 2 weeks before stopping its use.

One patient used the patch for three days and was then able to quit for the remaining

period of the study and one patient used the patches for about 2 weeks and was also able

to successfully quit for the study period of 30 days.

Only one of the NRT/BMI participants reported using the lozenges on a regular basis.

This patient used them for the first two weeks. The remainder of the study group

reported either no interest in using the lozenges or a bad taste that prevented them form

using the lozenges.

Discussion

The purpose of this study was to examine a potential way to promote smoking

cessation in the emergency department. The study population, consisting of asthmatic

smokers presenting to the emergency department with an acute exacerbation, was thought

to be most susceptible to intervention. Further, in order to qualify for the study,

participants were required to already be in a state of mind to quit smoking. In this case,

the appropriate state of mind is defined as in the contemplation or preparation stage when

given the Stage of Change Survey as described in earlier sections. Furthermore, another

goal of this study was to ultimately see an improvement in the severity of asthma

symptoms for the patients who participated in the study and were able to successfully quit

smoking.

Overall, the results were encouraging. Despite the small sample size, there was a

statistically significant decrease in the number of daily cigarettes smoked by members of

the NRT/BMI group when compared to the standard care group. In fact 100% of the

participants in the NRT/BMI group reported a lower number of daily cigarettes at the 7 or

30 day follow-up when compared to the number they reported upon joining the study at their presentation to the emergency department with an asthma exacerbation. These included two members of the group who reported complete smoking cessation at the 30 day follow-up. In the standard care group, only 40% of the participants reported a lower number of daily cigarettes at either the 7 or 30 day follow-up.

Although the data obtained indicates a potentially positive outcome from the study, the information used is based on self-reported numbers. In the case of self-reported data there is always the potential problem of bias on the part of the test subject. The participants were aware that the purpose of the study was to investigate ways to promote smoking cessation. Also, the study participants were obviously aware of whether or not they were part of the Nicotine/BMI or standard care group. These factors may have caused participants to underestimate the number of cigarettes they reported smoking at the 7 day follow-up visit or the 30 day phone follow-up.

Despite the potential data problems from this aspect of the study, there is strong evidence that even a reduction in the number of cigarettes can have an eventual impact on respiratory health. One study promotes the use of an intermediate step in smoking cessation. This allows patients to be able to first reduce the number of cigarettes they smoke gradually as a stepping stone to full smoking cessation. Although there was no indication of improvements in morbidity or mortality, the study demonstrated that a successful reduction the amount of cigarettes provided motivation to proceed to full smoking cessation (43).

A significant body of research demonstrates that smoking cessation improves outcomes in asthma. Therefore, it is a good idea to promote any practice that will lead to

smoking cessation, even if it is only an intermediate step. The benefits in outcomes measured in this study, such as severity of asthma symptoms, may not be directly affected by a decrease in cigarette consumption. However, the increase in motivation provided by this reduction may eventually lead to complete abstinence from smoking. This will lead to measurable improvements in asthma outcomes. Therefore, even a modest reduction in cigarette consumption may be seen as a positive outcome.

Because of the extremely small sample size, there was no statistical significance to support the hypothesis that the Nicotine/BMI intervention was more effective than the current standard of care practiced in emergency departments for short term smoking cessation. There was also no statistical evidence to support the second hypothesis that there would be improvement in asthma symptoms in those patients that were treated with the Nicotine/BMI intervention

Statistical analysis of the make-up of both the Nicotine/BMI and standard care groups supports the fact that there was no significant difference in the two populations. Specific areas that were analyzed included, number of cigarettes smoked per day, years of smoking, age at first cigarette, age of first daily cigarette, time to first daily cigarette, days per week of smoking, peak flow on presentation to the emergency department, stage of change, and presence of other smokers in the household.

Due to the fact that 39% of the participants were lost to follow-up, a separate statistical analysis of the initial data provided in the first survey was performed to see if there were any statistically significant differences in the two groups that may have led the participants to follow-up or not. The only data that ended up being significant was the age at which the participants began smoking daily. For the group that was lost to follow-

up, the age was a younger 14.7 years old compared to 17.7 years old in the group that did

follow-up. However, there was no significant difference in the mean number of years

that participants had been smoking. Therefore, it may not have had any impact on

whether or not participants were more likely to follow-up. All other data points that were

compared showed no significance and it is likely that the participants were drawn from

similar populations.

This study specifically targeted a short term quit rate. In this case, 30 days. Short

term quit-rates may be a first step towards a longer term quit rate. However, it is difficult

to define a short term quit rate. For example, there was one participant in this study who

was still smoking at the 30 day follow-up, but managed to stop smoking the last 2 weeks

leading up to the 30 –day follow-up. Longer term follow-up research may help to clarify

the impact of short term quitting demonstrated in this research project.

There is strong evidence that smoking cessation leads to improvement of asthma.

There is also support for the idea that the emergency department is an appropriate place

to initiate smoking cessation. The emergency department has become the sole provider

of healthcare to many patients and may be the only opportunity for a provider to promote

the idea of smoking cessation. Furthermore, in many studies, nicotine replacement

therapy has been shown to be an effective method of promoting smoking cessation. The

methods used in this study, specifically a combined regimen of NRT using the patch and

lozenges, has even been shown to increase the rate of smoking cessation over

monotherapy with NRT. (22)

There was no evidence that the combined Nicotine/BMI therapy yielded a higher

quit rate than the current standard of care after 7 days. The effect, if any, is not strong

enough to be demonstrated with a small population size. There are several reasons that this first hypothesis was not born out, especially given the extremely small sample size with which the calculations were performed. The initial study design required sample sizes of n = 36 for both the Nicotine/BMI and standard care groups in order to achieve a power of 80%. The number of test subjects enrolled in the study was n = 11 for the Nicotine/BMI group and n = 12 for the standard care group. Therefore, the total number of enrollees was about 1/3 of what was needed to achieve power of 80%.

Enrollment appears to have been a problem for several reasons. The inclusion criteria for the study were fairly restrictive. There were several factors about this emergency department population that made enrollment more of a challenge. Firstly, the patients were automatically excluded if they were going to be admitted to the hospital. The population of patients for this hospital tend to be very sick, and therefore make discharging patients to home more difficult. Secondly, patients must be proficient in spoken and written English. There is a significant proportion of the emergency department population that speaks little or no English. In this hospital it is 15% and may be even higher for asthma patients   There were some patients who presented to the emergency department with asthma exacerbations during the enrollment time that did not meet the criteria for minimum number of 10 cigarettes per day. There were also a number of patients that were otherwise eligible for the study, but were not yet in the contemplation or preparation stage of change. Therefore, over the 16 months that this portion of the study was ongoing, there was a limit to the number of eligible patients and enrollment was surprisingly low.

Although enrollment was a problem, follow-up was just as much of a problem. The original study design required that patients return to the Urgent Care section of the Emergency Department 7 days following their enrollment in the study. Patients assigned to the Nicotine/BMI group would receive an additional supply of patches and lozenges, if desired. All patients would have a repeat measure of their expired CO to confirm the self-reported smoking status as well as a repeat peak flow measurement to use as data for their asthma control. In addition, patients answered a follow-up survey.

A high percentage of patients, 39%, were lost to follow-up. There were several issues concerning follow-up. Firstly, many patients were not able to be contacted with the information they provided on the initial questionnaire. Therefore, they were unable to be reminded about returning for their follow-up visits. Secondly, it was not always convenient for patients to return to the emergency department due to job and/or family commitments. Whenever possible, participants that were unable to make the trip back to the emergency department for follow-up were contacted by phone.

As a result of patients lost to follow-up, the already small number of participants was decreased even further. The final number of test subjects ended up being an n = 7 for the Nicotine/BMI group and also n = 7 for the standard care group.

One reason that the Nicotine/BMI group was not as successful as predicted in their smoking cessation may have been that this was one of their first smoking cessation attempts. It is well documented that the average smoker requires multiple quit attempts before finally succeeding in a permanent abstinence from cigarettes. The American Lung Association reports that it takes, on average, two to four attempts for a smoker to finally quit smoking. The initial smoking inventory used as part of the enrollment in this study

did not address the quitting history of the participants. This information may have been useful in determining the likelihood that this quit attempt would be successful. However, it would not have been possible in the setting of this study to address the reasons for the failure of past attempts and/or set precautions into motion to prevent a similar relapse to smoking.

The American Lung Association also recommends setting a "quit date". This allows patients to make arrangements at home to remove all smoking paraphernalia from the home and to prepare emotionally for smoking cessation. Participants in this study were asked to quit smoking on the day that they presented to the emergency department. This may have contributed to the low efficacy of the NRT/BMI therapy.

Some studies suggest that although nicotine replacement therapy is an efficacious way to promote smoking cessation in general, there is no one type of nicotine replacement program that works best. In fact, since smokers vary so widely in their smoking habits, personalities, and motivation, there is a need to tailor the nicotine replacement therapy to each smoker individually. The protocol for this study had available only one dose (21 mg) of the nicotine patch along with the lozenges. The patches were intended to supply a steady stream of nicotine while the lozenges were for additional cravings throughout the day. Although this is a commonly utilized and efficacious combination, it did not take into consideration the patients that could not tolerate the lozenges. Very few of the members of the Nicotine/BMI group reported using the lozenges and the most common reason given was the unpleasant taste. This would leave the participants vulnerable to the additional cravings.

One study that was recently published dealt with the lack of long-term abstinence from smoking, even with the use of nicotine replacement. This study suggested that one of the reasons for this lack of success was failure to tailor the therapy to an individual smoker's specific needs, including pharmacologic requirements (39).   Tailoring nicotine replacement therapy may be more advantageous to promoting smoking cessation; and should be considered in future research.

Although none of the data showed a clear trend either for or against the primary hypothesis, there are several reasons why the Nicotine/BMI group did not achieve a higher smoking cessation rate. One reason for this may be the fact that not all members of the Nicotine/BMI group were able to come in for their 7 day follow-up, and therefore did not receive an additional supply of nicotine patches and lozenges. Some of the participants may have realized that a 7 day supply would not be enough to help them maintain abstinence on a long term basis, even 30 days. Some of the participants were later contacted by phone, but had already resumed smoking and were no longer interested in smoking cessation using nicotine replacement therapy.

There are several factors important to the success of a smoking cessation attempt that were not addressed in this study as either part of the standard care or Nicotine/BMI group. Although there is documentation to suggest the importance of these factors, it would not always have been practical or feasible to address these concerns in the emergency department setting. Among these factors are some of the more intangible measures like motivation and other psychological factors. Other factors include family/social support for the patient's decision to quit smoking, removing temptations in

the patient's home, work, and/or social environments, and follow-up phone calls and/or visits.

One recent study looked at a population of hospitalized cardiology patients and the factors that contributed to successful smoking cessation (40). Although the patients in this study were not hospital inpatients, they were in similar circumstances given the fact that they were being treated for a smoking related illness in an emergent setting and had the benefit of the "teachable moment". Both sets of patients are thought to be in a position that makes them more susceptible to the promotion of smoking cessation.

The results of this study suggest that psychological factors, especially self-efficacy and positive social influences were important in the patients who were able to successfully quit smoking (40). Self-efficacy, or the belief that a person is capable of achieving smoking cessation, is not something that can be taught in a single emergency department encounter. Furthermore, although certain family and/or friends may be with the patient in the emergency department, there is no way to control the patient's full range of family and social interaction. In fact, although this factor may be important for successful smoking cessation, there is not a significant amount of influence that any health care provider or setting can use on social contacts in order to help the patient quit smoking.

Other studies also promote the idea that strong, positive family support for smoking cessation is vital to success for the patient (41). In this study, 57% of the Nicotine/BMI group and 71% of the standard care group shared their home with other smokers. One study followed 349 patients from a smoking cessation clinic and discovered that one of the biggest predictors of success in smoking cessation was positive

family support (41). This indicates that a key factor that may be critically important in smoking cessation may not be susceptible to outside influence from healthcare professionals.

This same article also discussed the fact that follow-up phone calls and/or visits were important to successful smoking cessation. This is one area that may be possible to explore in the emergency department setting. Once contact is established with a patient, it may be possible to periodically re-contact that individual to provide positive reinforcement and motivation. However, this is generally outside the realm of emergency medicine. It may be possible to refer patients to a smoking cessation clinic or program. More research could be done to compare the efficacy of the positive influences of follow-up by a healthcare provider versus family/social support, if family/friends are unwilling or unable to provide the required support.

There is also research to indicate that the temptation to relapse back to smoking is higher, not only without family/social support, but if there is smoking related paraphernalia in the home. This may include ashtrays, lighters, or cigarette cases. This equipment may become a trigger that causes an unexpected relapse. Having other smokers in the same home make it difficult to remove the paraphernalia from the patient's home. There is also the idea that being around other smokers is a temptation all its own. One study looking at smokers who attempted to quit after contacting a quitline, demonstrated that former smokers exposed to a higher number of temptations were far more likely to relapse within the first 6 months of an otherwise successful smoking cessation attempt (42).

Again, this may be one of the factors that is not practical or feasible to address completely in an emergency department setting. However, it may be possible to at least mention to the patient that successful smoking cessation may depend on removing him or herself from temptation whenever possible. Even if it may not be possible, it will provide the patient with a warning of a large potential pitfall and help the patient to at least be aware and perhaps motivate themselves in that manner in the face of inevitable temptation.

The overall results of this study did not support either of the two proposed hypotheses, however, there were several limitations to this study that likely impacted the outcomes. These included small study size, a large percentage lost to follow-up, and time and scope of practice limits on emergency department providers. Improvements in patient enrollment and follow-up may help. There were other intangible factors not taken into consideration in this study that may or may not be important to promote smoking cessation. Although some of these factors are not within the scope of emergency department visits, making the patient aware of these factors and providing tips to use them in their own favor may also have a positive impact on smoking cessation.

Asthma, along with many other diseases, can be directly impacted by the use of cigarettes. It is important that health care providers in any setting, especially the emergency department devise ways to promote smoking cessation among their patients. Using nicotine replacement therapy along with the Brief Motivational Interview is one way. Further research may impact the proven efficacy of these methods in the emergency department.

Characteristics of emergency department care continue to evolve as the healthcare system evolves. There is a large percentage of the population for whom the emergency department is their only contact with the healthcare system and/or a healthcare provider. It is imperative that providers not only discover the smoking status of their asthma, and other, patients, but also that they devise a way to promote smoking cessation among this patient population.

There are some things that can be done differently in future studies to improve the outcomes. These may include using telephone follow-up exclusively. Patients in the NRT/BMI group could be mailed their patches and lozenges. This may improve the number of patients who follow-up because it will be much less of a hassle. It may also be useful to use non-providers to enroll patients in the study. The emergency department can be a very busy place and many potential subjects may not get enrolled due to time constraints placed on providers working in the emergency department. There may also be room to allow for smokers of fewer daily cigarettes into the study group. There are several doses of nicotine patches available. It may be useful to have different doses provided for different levels of cigarette consumption.

Although the outcomes of this study were not overwhelmingly successful, there is room for improvement in future studies based on the same theory. There was one positive trend in the apparent reduction in the number of cigarettes smoked by members of the group that received nicotine replacement and counseling. Smoking cessation promotion in the asthmatic population is vital to the care of these patients. Continuing research in this area should focus on ways to help achieve this goal and ongoing enrollment in this study may increase power and yield positive results.

References

1. CDC. Annual Smoking-Attributable Mortality. MMWR. 2006;55:44

2. Bernstein S and Becker BM. Preventive Care in the emergency department: diagnosis and management of smoking and smoking-related illness in the emergency department. Acad Emerg Med. 2002; 9:720-729.

3. Lowenstein SR, Koziol-McLain J, Thompson M, et al. Behavioral risk factors in emergency department patients: a multisite study. Acad Emerg Med. 1998; 5"781-7.

4. Heatherton TF, Kozlowski LT, Frecker RC, Fagerstrom KO. The Fagerstrom Test for Nicotine Dependence: A Revision of the Fagerstrom Tolerance Questionnaire. British Journal of Addictions. 1991; 86:1119-27

5. Bernstein, SL, Cannata, M. Nicotine dependence, motivation to quit, and diagnosis in emergency department patients who smoke. Addictive Behaviors. 31(2):288-97.

6. Silverman, RA, et al. Cigarette smoking among asthmatic adults presenting to 64 emergency departments. Chest. 123(5):1472-9.

7. Teo, Koon K. Ounpuu, Stephanie. Hawken, et al. Tobacco use and risk of myocardial infarction in 52 countries in the INTERHEART study: a case-control study. Lancet. 368(9536):647-58.

8. Ulrick CS, Backer V, Dirkson A: A 10 year follow-up of 180 adults with bronchial asthma: factors important for the decline of lung function. Thorax 1992, 47:14-18.

9. Peat JK, Woolcock AJ, Cullen, K. Rate of decline in lung function of patients with asthma. Eur J Respir Dis 1987, 70:171-9.

10. Boulet, L, Lemiere, C, Archambault, F, et al. Smoking and asthma: clinical and radiologic features, lung function, and airway inflammation. Chest.129(3):661-8.

11. Siroux, V, Pin I, Oryszczyn MP, Le Moual N, Kaufman F. The relationships of active smoking to asthma and asthma severity in the EGEA study. Eur Respir J 2000.15:470-7.

12. Gusbin, N. Garzaniti, NLR. Asthma and tobacco. Revue Medicale de Liege. 61(2):81-6.

13. Jindal, SK, Gupta D, Singh A. Indices of morbidity and control of asthma in adult patients exposed to tobacco smoke. Chest. 1994: 106:746-9.

14. Eisner MD, Yelin EH, Henke J, Shiboski, SC, Blanc PD. Environmental tobacco smoke and adult asthma. Am J Resp Crit Care Med. 1998; 158:170-5.

15. Chaudhuri, R., Livingston, E., et al. Effects of smoking cessation on lung function and airway inflammation in smokers with asthma. Am J of Resp Crit Care Med. 174(2):127-33.

16. Transdermal Nicotine Study Group: Transdermal nicotine for smoking cessation. Six-month results from two multicenter controlled trials. JAMA 1991, 266(22):3133-8.

17. Silagy C, Lancaster T, Stead L, Mant D, Fowler, G. Nicotine replacement for smoking cessation. (update of Cochrane database Syst Rev. 2001; (3):CD0000146;PMID11686953)

18. Sweeney, C T. Fant, R V. Fagerstrom, K O. McGovern, J F. Henningfield, J E. Combination nicotine replacement therapy for smoking cessation: rationale, efficacy and tolerability. CNS Drugs. 15(6):453-67.

19. Fiore, MC, Baily, WC, Cohen SJ, et al. Treating tobacco use and dependence. Clinical practice guideline. Rockville: U.S. Department of Health and Human Services, Public Health Service 2000.

20. Cummings, KM, et al. Free nicotine patch giveaway program 12-month follow-up of participants. American Journal of Preventive Medicine. 31(2):181-4.

21. Cummings, K Michael, et al. Reach, efficacy, and cost-effectiveness of free nicotine medication giveaway programs. Journal of Public Health Management & Practice. 12(1):37-43.

22. Bock, BC Becker,B,Montiero, R. Partridge, R. Fisher, S. Spencer, J. Physician intervention and patient risk perception among smokers with acute respiratory illness in the emergency department. Preventive Medicine. 32(2):175-81.

23. Stevens, VJ, Glasgow RE, Hollis JF, Mount K. Implementation and effectiveness of a brief smoking cessation intervention for hospital patients. Medical Care 2000;38:451-9.

24. Wallace, P, Cutler S, Haines A. Randomized controlled trial oc general practitioner intervention in patients with excessive alcohol consumption. BMJ 1988;297:663-8.

25. WHO Brief Intervention Study Group. A cross-national trial of brief interventions with heavy drinkers. Am J Public Health 1996;86:949-55.

26. Longabaugh RH, Woolard, RF, Nirenberg, TD, Minugh AP, Becker B, Clifford PR, Carty K, Sparadeo F, Gogini, R. Evaluating the effects of a brief motivational

intervention for injured drinkers in the emergency department. J Stud Alcohol
2001;62:806-16.

27. D'Onofrio G, Degutis, LC. Preventive care in the emergency department: Screening
and brief intervention for alcohol problems in the emergency department: A systemic
review. Acad Emerg Med 2002;9:627-38.

28. Molyneux, A. Lewis, S. Leivers, U. Anderton, A. Antoniak, M. Brackenridge, A.
Nilsson, F. McNeill, A. West, R. Moxham, J. Britton, J.
Clinical trial comparing nicotine replacement therapy (NRT) plus brief counseling, brief
counseling alone, and minimal intervention on smoking cessation in hospital inpatients.
Thorax. 58(6):484-8.

29. Hanania, N.A., David-Wang A., Keston, S., Chapman, K.R. Factors Associated with
Emergency Department Dependence of Patients with Asthma. Chest 1997, 111(2), 290-5.

30. Vokes, Natalie I. Bailey, Jeannine M. Rhodes, Karin V.

"Should I give you my smoking lecture now or later?" Characterizing emergency
physician smoking discussions and cessation counseling. Annals of Emergency
Medicine. 48(4):406-14.

31. Prochazka, A., Kozoil-McLain, J., Tomlinson, D., Lowenstein, S.R. Smoking
Cessation Counseling by Emergency Physicians: Opinions, Knowledge and Traing
Needs. Acad Emerg Med. 2000; 7:348-53.

32. Llovera, Ingrid. Ward, Mary F. Ryan, James G. LaTouche, Thalia. Sama, Andrew. A
survey of the emergency department population and their interest in preventive health
education. Academic Emergency Medicine. 10(2):155-60.

33. Boudreaux, Edwin D. Baumann, Brigitte M. Friedman, Kim. Ziedonis, Douglas M.
Smoking stage of change and interest in an emergency department-based intervention.
Academic Emergency Medicine. 12(3):211-8.

34. Ong, K C. Cheong, G N. Prabhakaran, L. Earnest, A. Predictors of success in
smoking cessation among hospitalized patients. Respirology. 10(1):63-9.

35. Emmons, K.M., Goldstein, M.G. Smokers Who are Hospitalized: A Window of
Opportunity for Cessation Interventions. Preventive Medicine. 1992:262-9.

36. Stevens, V.J., Glasgow, R.E., Hollis, J.F., Lichenstein E., Voght, T.M. A Smokking
Cessation Intervention for Hospital Patients. Medical Care 1993:65-72.

37. DiClimente CC, Prochaska JO, Fairhurst SK, Velicer WF, Velasquez MM, Rossi JS.
The Process of Smoking Cessation: An analysis of Precontemplation, Contemplation and
Preparation Stages of Change. J Consult Clin Psych 1991, 59(2), 295-304.

38. Blondal T, Gudmondsson LJ, Olafsdottir I, et al. Nicotine Nasal Spray with Nicotine Patch for Smoking Cessation: Randomized Trial with Six Year Follow-up. BMJ 1999;318:285-8.

39. McClure, Jennifer B. Swan, Gary E. Tailoring nicotine replacement therapy: rationale and potential approaches. CNS Drugs. 20(4):281-91, 2006.

40. Segaar, Dewi. Bolman, Catherine. Willemsen, Marc C. Vries, Hein de. Determinants of adoption of cognitive behavioral interventions in a hospital setting: example of a minimal-contact smoking cessation intervention for cardiology wards. Patient Education & Counseling. 61(2):262-71, 2006.

41. Akkaya, Ahmet. Ozturk, Onder. Cobanoglu, Hafize. Bircan, Haci Ahmet. Simsek, Sener. Sahin, Unal. Evaluation of patients followed up in a cigarette cessation clinic. Respirology. 11(3):311-6, 2006.

42. Segan CJ. Borland R. Greenwood KM. Can transtheoretical model measures predict relapse from the action stage of change among ex-smokers who quit after calling a quitline?. Addictive Behaviors. 31(3):414-28, 2006.

43. Zellweger, J P. Reduction of cigarette consumption: an intermediate stage before a total stop? Revue Medicale Suisse. 2(72):1701-3, 2006.

44.   British Thoracic Society. British Guideline on the Management of Athma. Thorax. 58:Supplement I, 2003.

45. Brown MD, Reeves MJ, Meyerson K, Korzeniewski SJ. Randomized Trial of a Comprehensive Asthma Education Program After an Emergency Department Visit *Ann Allergy Asthma Immunol.* 2006;97:44-51.

46. Frank, P, Morris, J., Hazell, M., et al. Smoking, respiratory symptoms and likely asthma in young people: evidence from postal questionnaire surveys in the Wythenshawe Community Asthma Project (WYCAP). BMC Pulmonary Medicine 2006, 6:10 .

47.   Jarvis, Belcher, Vesey, Hutchinson. Low Cost Monoxide Monitors in Smoking Assessment, Thorax 1986; 41; 886-887.