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ORIGINAL ARTICLE

Brief counseling for smoking cessation and alcohol use reduction concomitant with hospital procedures: a randomized clinical trial

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Objective: To evaluate the effect of brief counseling on patient readiness for behavioral change and cessation/reduction of tobacco and alcohol use.
Methods: This clinical trial randomized patients in blocks, stratified by risk factor. Adult smokers or at-risk drinkers undergoing surgical or diagnostic procedures were recruited. Outcome assessments and analyses were blinded. Brief counseling was compared with educational materials for the outcomes progress in stage of change and smoking/alcohol cessation/reduction.
Results: Overall, 222 participants were randomly assigned to the intervention group and 218 to the control group. Among them, 28 and 18 patients were lost to follow-up, respectively. Progress in change stage was 94.1% at 1 month in both groups (RR = 1.00; 95%CI 0.95-1.05) and 94.8 vs. 90.5% at 3 months (RR = 1.05; 95%CI 0.99-1.11) in the intervention and control groups, respectively. Smoking cessation and alcohol reduction rates at 3 months were 57.2 vs. 41% (RR = 1.40; 95%CI 1.14-1.71) in the intervention and control groups, respectively. Only brief counseling led to significant differences in smoking cessation (51.4 vs. 35.1%; RR = 1.46; 95%CI 1.12-1.92).
Conclusions: Brief counseling and educational materials improved patient motivation for behavioral change, but brief counseling had a greater effect on smoking cessation.
Clinical trial registration: NCT03521622

Keywords: Counseling; smoking cessation; alcohol drinking; surgical procedures; diagnostic techniques and procedures; hospitals

Introduction

According to the World Health Organization (WHO), cardiovascular diseases were the primary cause of death worldwide in 2016 (17.9 million), followed by cancer (9 million).[1] In lower-middle income countries, the causes of mortality from chronic disease included ischemic heart disease, cerebrovascular disease, and respiratory disease. Alcohol consumption and smoking are risk factors for these diseases.[1] Studies in the hospital setting have demonstrated that interventions to mitigate such risk factors produce favorable results, reducing complications, surgical interventions, hospital readmissions, and mortality.[2] Such preventive interventions include strategies to quit smoking and reduce alcohol consumption.

Brief counseling, a short-term communicative activity that helps reduce risky behaviors, has been used with smokers and at-risk drinkers. An increased frequency of smoking cessation attempts and cessation rates,[3] as well as a 20 g/week reduction in alcohol consumption among hazardous and harmful drinkers has been observed with the techique.[4] Studies have evaluated the effects of different methods of providing information and developing skills to allow behavioral change according to the patient's willingness to modify risky behaviors: the five A's strategy, cognitive-behavioral skills training, social-cognitive theory, the trans-theoretical model of behavioral change, and motivational interviewing.[4,5]

Most studies on brief interventions have been carried out in primary care; however, studies in the hospital setting have also shown increased smoking cessation and reduced alcohol consumption.[6,7] Despite their positive effects on hospitalized patients, we found no major data about the effect of brief counseling on smoking

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cessation and reducing alcohol consumption among patients undergoing medical procedures, regardless of whether they were inpatients or outpatients.[8] The WHO has stated that hospitals are an appropriate setting for preventive interventions and, due to the changes in personal routines and the mandatory interruption of consumption, brief interventions could be effective in the context of scheduled medical interventions. Hence, this type of encounter represents an opportunity to modify coexisting behavioral risk factors.[9]

This study's research question was: What is the efficacy of brief counseling for smoking cessation and alcohol use reduction in patients undergoing medical procedures in a hospital setting? The primary objective was to evaluate the effect of brief counseling among patients admitted for a medical procedure (surgery or diagnostic) on the progress of behavioral change stage for smoking cessation and alcohol use reduction. The secondary goal was to assess the effect of the intervention on the cessation or reduction of these risk factors.

Methods

Study design

A superiority randomized clinical trial was conducted at the Hospital Universitario San Ignacio in Bogotá, Colombia. The study compared brief counseling interventions selected based on the specific risk factor (smoking or alcohol use) and considering patient motivation level for behavioral change[5,10] using written educational materials developed by the Colombian Ministry of Health.[11] These interventions were selected based on their potential for implementation in other hospitals and were carried out in patients scheduled for surgery or diagnostic procedures. The study protocol was registered in ClinicalTrials.gov (NCT03521622; Effectiveness of counseling interventions to modify risk behaviors in patients at the Hospital San Ignacio).

Participants and procedures

Participants were recruited between April 2018 and February 2020. Potential participants were identified by a research nurse from lists of scheduled surgical and diagnostic procedures and were screened according to eligibility criteria using a questionnaire. The candidates were then invited to participate.

The study included patients aged 19-64 years who were current smokers or at-risk drinkers. Current smoking was defined as using any number of cigarettes or tobacco products in the past month and more than 100 lifetime cigarettes. Risky alcohol consumption was defined as four or more standard drinks per day for women and five or more for men at least once in the last 12 months, and an Alcohol Use Disorders Identification Test (AUDIT) score between 8 and 15.[12] Participants had fixed addresses and contact information. Exclusion criteria included current treatment for or modification of these risk factors in the action stage of behavioral change.[13] People with impaired verbal communication, diagnosed alcohol use disorders, or who used other psychoactive substances were also excluded.

After providing informed consent, the participants answered a baseline questionnaire (administered by the same person who performed the intervention) on sociodemographics (age, sex, marital status, socioeconomic level, and educative level), family information (family type, family life cycle, and family functionality), clinical characteristics (comorbidities, type of medical attention [surgery or diagnostic procedure]), hospitalization (length of hospital stay), and information related to smoking (duration, smoking index, nicotine dependence, and cessation attempts) and drinking (intensity of alcohol consumption in the last month and reduction attempts). The questionnaire also assessed motivation for behavioral change.

In an electronic data capture system (REDcap 7.3.6. version, 2019: Research Electronic Data Capture), a randomization sequence was generated and configured by an epidemiologist prior to subject recruitment. It stratified individuals according to smoking status (Strata 1), risky alcohol consumption (Strata 2), or both factors (Strata 3). Blocks of eight participants were assigned to maintain balance among strata. After filling out the initial questionnaire, the system automatically assigned each patient to one of the two arms of the study in a 1:1 sequence, ensuring concealment of the sequence.

The interventions, which lasted approximately 10 minutes, were carried out in person after randomization near the time of the procedure, taking the opportunity while in the hospital setting and thus ensuring compliance, regardless of whether the participants were inpatients or outpatients. A 5- to 10-minute reinforcement telephone call was made a week after the initial intervention by the same researcher and included the same information as the initial intervention.

Brief counseling intervention (Group 1)

For smokers in the preparation (intending to take action in the next month) or contemplation (seriously thinking about change in the next 6 months) stages,[13] trained family physicians used the "5 A's" strategy. This intervention has proven effective and has been used in clinical studies.[5] It comprises: 1) asking about tobacco use, 2) advising the patient to quit, 3) assessing readiness for change, 4) helping develop an intervention plan, and 5) arranging follow-up contact.[5] For smokers in the precontemplation stage (no intention of changing behavior) we used the "5 R's" model (based on motivational interviewing)[5] which includes: 1) the relevance of quitting, 2) risk identification, 3) the rewards of quitting, 4) roadblocks to change, and 5) repeating the message.

For at-risk drinkers in the preparation or contemplation stages, family physicians used "simple advice", an intervention proposed by the WHO for clinical practice[10] that includes: 1) highlighting the relevance of safe drinking, 2) explaining AUDIT results[12] and defining the patient's location in the drinker's pyramid, 3) discussing the effects of high-risk drinking and the benefits of reducing alcohol intake, 4) explaining low risk limits and

defining a standard drink, and 5) inviting participants to set a reduction goal. For drinkers in precontemplation stage, a WHO-recommended ''brief motivational intervention'' was applied. Its components were: 1) contextualization and brief advice; 2) explanation of the AUDIT results; 3) exploration of ambivalence about change; 4) identification of motivations and barriers. and 5) promotion of goals for reduction.[10]

To standardize the interventions, we showed illustrated guides to at-risk drinkers. Printed material was provided to smokers at the end of the intervention. All material was in Spanish (Supplementary Material 1-5, available online only).

Prior to patient recruitment, family physicians who delivered the brief counseling intervention (Group 1) underwent a 48-hour training program on evaluating the stage of change and the above-described counseling strategies. After the training program, the fidelity and quality of the intervention were verified by one member of the research group based upon a checklist; if the physician scored below 4.5/5, retraining sessions were performed.

Educational intervention (Group 2)

A nurse read a standard printed document to each patient regardless of risk factor or level of motivation for behavioral change. The printed material included short messages about the relevance of avoiding smoking, adequate nutrition, physical activity, body weight control, and avoiding risky alcohol use. The document also included messages about the relevance of blood pressure, glycemia, and blood lipid level awareness. It promoted adhering to recommended medical treatments, adequate hydration, reducing emotional burdens, and keeping a positive attitude.[11]

Follow-up

At intervals of 1 and 3 months after the initial intervention, a nurse telephoned each participant, using a standardized questionnaire to ask about their current stage of behavioral change and about the frequency and intensity of tobacco or alcohol consumption since the intervention. The person who assessed the outcomes and the person in charge of data analysis were blinded to the type of intervention. No incentives were given to the participants. A quality assurance program was established to verify adherence to the counseling methodology. The interventions were recorded and 10% were randomly selected for auditing, which was performed by an experienced doctor. Based on the auditing results, feedback about the quality of the interventions was given. The interventions were carried out as planned.

Outcome measurement

The primary outcome was progress in behavioral change stages for smoking cessation and alcohol use reduction. This outcome was measured by a research nurse with a questionnaire (brief version of Prochaska and DiClemente's questionnaire).[14,15] This questionnaire includes three stages of change, precontemplation, contemplation, and action. However, this study did not include participants in the action stage; those in the contemplation stage were subdivided into two categories: contemplation (change in the next 6 months), and preparation (change in the next month), according with the stages of change originally proposed by Prochaska and DiClemente.[13] Progress was considered advancement from the precontemplation stage to the contemplation or preparation stage or advancing from the contemplation or preparation stage to the action stage.

The secondary outcomes were smoking cessation or reducing alcohol consumption to low-risk drinking. Cessation was defined as no tobacco consumption since hospital discharge or since the procedure for outpatients. Low-risk drinking was defined as an AUDIT-Concise (AUDIT-C, i.e., the first three questions of the complete version) score $\leqslant$ 3 in women and 4 in men during the same period.[4,16] These outcomes were assessed by an questionnaire with detailed information on the frequency and intensity of consumption. All outcomes were assessed by telephone at 1 and 3 months of follow-up.

Statistical analysis

For the primary outcome, we estimated that a sample size of 440 participants would identify a 10% difference in the effect (20% with brief counseling and 10% with the educational intervention), an alpha error of 5%, and a power of 80%. We described sociodemographic, family, and clinical characteristics using absolute and relative frequencies for categorical variables and mean or median for numerical variables. The prevalence of current smoking and risky alcohol consumption was calculated with the corresponding confidence intervals.

The evolution of stages of change was determined during follow-up. The relative risk (RR) of progress was estimated for each risk factor and overall for smokers and at-risk drinkers in the brief counseling and educational intervention arms with the corresponding 95%CIs. The RR of smoking cessation and reduced alcohol consumption was calculated. We compared median number of cigarettes smoked per month and the median AUDIT-C score between study arms using the Wilcoxon sum rank test.

A logistic regression model assessed differences among the results adjusted to follow-up time, since not all participants were evaluated at exactly 1 and 3 months after the initial intervention. The results were assessed in participants who were effectively followed up. Those lost to follow-up were considered as non-progressing and not having changed their risky behavior. All analyses were performed in R version 4.0.3.

Ethics statement

The ethics committee of the Pontificia Universidad Javeriana and the Hospital Universitario San Ignacio (act N° FM-CIE-0025-18 from 01/25/2018) approved the study.

Results

Between April 2018 and February 2020, 3,609 patients were screened for eligibility, of whom 3,169 were excluded (3,043 did not meet the inclusion criteria: 2,790 were not active smokers or at-risk drinkers and 253 for other criteria) and 126 declined to participate. In total, 440 people were selected for the study, of whom 222 were randomized to Group 1 (brief counseling intervention), and 218 to Group 2 (educational intervention). All participants underwent the intervention as planned (Group 1: 133 smokers, 61 drinkers, and 28 smoker/drinkers; Group 2: 131 smokers, 58 drinkers, and 29 smoker/drinkers). Follow-up occurred between May 2018 and April 2020.

The follow-up loss in Group 1 was 28 participants (12.6%) (21 could not be contacted, 4 declined further participation, and 3 experienced clinical deterioration). The follow-up loss in Group 2 was 18 individuals (8.2%) (14 could not be contacted, three declined further participation, and one experienced clinical deterioration). Follow-up analysis of the participants was performed according to the original study arm. At 1 month, 204 remained in Group 1 and 205 in Group 2. At 3 months, 194 remained in Group 1 and 200 in Group 2 (Figure 1).

Sociodemographic, family, and clinical characteristics were balanced among the groups. Of the total participants, 70.9% were male, 73.6% were $\geqslant$ 30 years of age, and 53.9% were married or living with a partner. The socioeconomic level of 97% was low or middle, while the educational level was predominantly elementary or high school (54.8%). Most participants belonged to nuclear families (58.6%), families launching children (35.9%), and well-functioning families (59.8%). Of the total, 77.7% underwent surgery, 43.6% had associated chronic illnesses, and 88.9% required hospitalization (most for 1-3 days) (Table 1).

The sample's tobacco and alcohol use characteristics are shown in Table S1. In the previous month, the prevalence of smoking was 8.9% (95%CI 8.0-9.9) (N=3,609; n=321 smokers) and the prevalence of risky alcohol consumption was 4.9% (95%CI 4.2-5.6) (N=3,609; n=176 drinkers) (Figure 1).

At the beginning of the study, most smokers were at the preparation stage of behavioral change (79.3% in Group 1 and 70.2% in Group 2), followed by contemplation stage

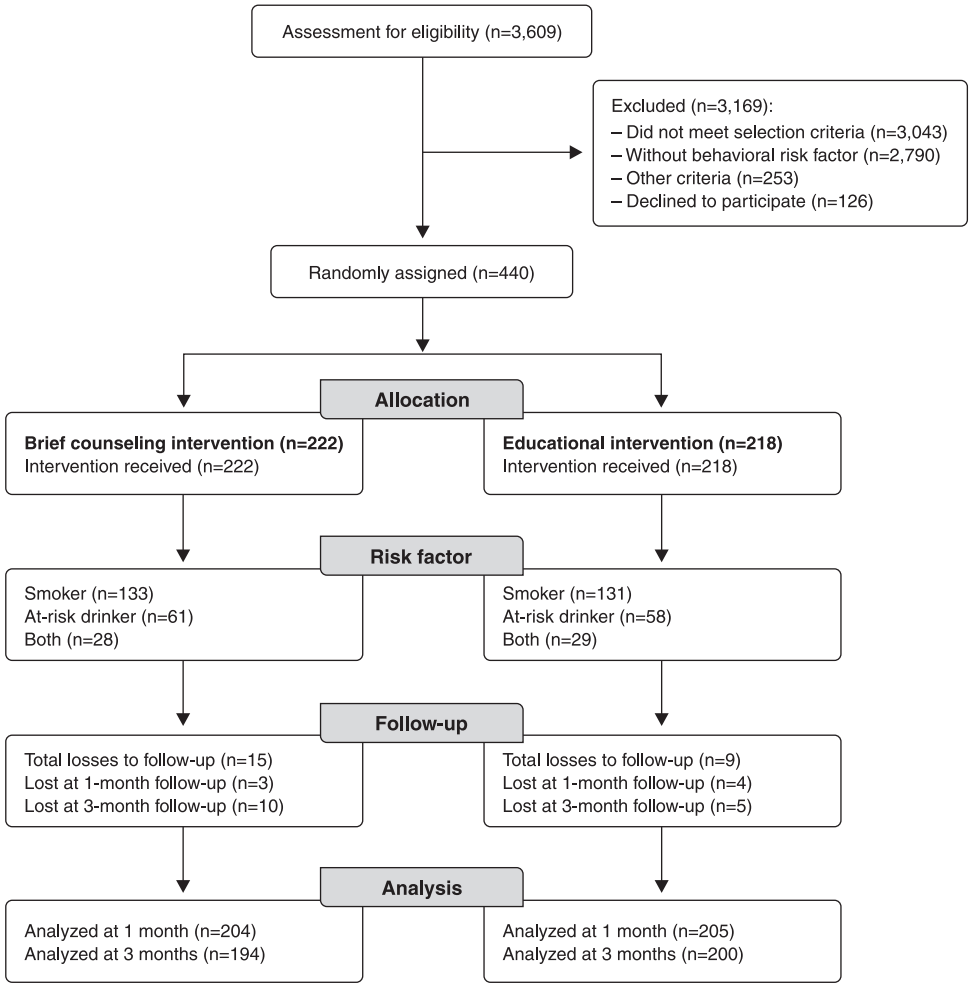

Figure 1 Study flowchart.

Table 1 Sociodemographic, family, and clinical characteristics of the study population

Characteristic	Brief counseling intervention (n=222)	Educational intervention (n=218)	Total (n=440)
Sex			
Female	70 (31.5)	58 (26.6)	128 (29.1)
Male	152 (68.5)	160 (73.4)	312 (70.9)
Age (years)			
9 to 30	57 (25.7)	59 (27.1)	116 (26.4)
31 to 45	72 (32.4)	67 (30.7)	139 (31.6)
46 to 65	93 (41.9)	92 (42.2)	185 (42.0)
Marital status			
Single	79 (35.6)	83 (38.1)	162 (36.8)
Divorced	16 (7.2)	20 (9.2)	36 (8.2)
Widowed	4 (1.8)	1 (0.5)	5 (1.1)
Cohabiting	123 (55.4)	114 (52.3)	237 (53.9)
Socioeconomic status[†]			
Low (1 and 2)	103 (46.4)	117 (53.7)	220 (50.0)
Middle (3 and 4)	109 (49.1)	98 (45.0)	207 (47.0)
High (5 and 6)	10 (4.5)	3 (1.4)	13 (3.0)
Education level			
Elementary school/high school	113 (50.9)	128 (58.7)	241 (54.8)
University	94 (42.3)	82 (37.6)	176 (40.0)
Postgraduate	15 (6.8)	8 (3.7)	23 (5.2)
Type of family			
Nuclear	128 (57.7)	130 (59.6)	258 (58.6)
Extended	21 (9.5)	22 (10.1)	43 (9.8)
Compound	17 (7.7)	14 (6.4)	31 (7.0)
Unipersonal	24 (10.8)	23 (10.6)	47 (10.7)
Other	32 (14.4)	29 (13.3)	61 (13.9)
Stage of the family life cycle			
Formation/expanding	70 (31.5)	64 (29.4)	134 (30.5)
Launch pad	75 (33.8)	83 (38.1)	158 (35.9)
Post-parental	25 (11.3)	22 (10.1)	47 (10.7)
Dissolving	17 (7.7)	13 (6.0)	30 (6.8)
Does not apply/not classifiable	34 (15.4)	36 (16.5)	70 (15.9)
Family APGAR score			
Severe dysfunction (< 9)	14 (6.3)	12 (5.5)	26 (5.9)
Moderate dysfunction (10-13)	24 (10.8)	23 (10.6)	47 (10.7)
Low dysfunction (14-17)	43 (19.4)	59 (27.1)	102 (23.2)
Good function (18-20)	140 (63.1)	123 (56.4)	263 (59.8)
No data	1 (0.5)	1 (0.5)	2 (0.5)
Comorbidities			
Yes	96 (43.2)	96 (44.0)	192 (43.6)
No	126 (56.8)	122 (56.0)	248 (56.4)
Type of clinical care received			
Diagnostic procedure	50 (22.5)	48 (22.0)	98 (22.3)
Surgery	172 (77.5)	170 (78.0)	342 (77.7)
Hospitalization required			
Yes	194 (87.8)	196 (89.9)	390 (88.9)
No	27 (12.2)	22 (10.1)	49 (11.1)
Days of hospitalization			
(1-3)	79 (35.6)	88 (40.4)	167 (38.0)
(4-7)	46 (20.7)	55 (25.2)	101 (23.0)
(> 7)	69 (31.1)	53 (24.3)	122 (27.7)
Behavioral risk factor			
Smoking	133 (59.9)	131 (60.1)	264 (60.0)
Risky alcohol consumption	61 (27.5)	58 (26.6)	119 (27.0)
Smoking and risky alcohol consumption	28 (12.6)	29 (13.3)	57 (13.0)

Data presented as n (%).
[†] Ordinal values based on region of residence.

(16% in Group 1 and 19.9% in Group 2), and precontemplation stage (4.7 and 9.9%, respectively). The majority of smokers in both groups were in the action stage at 1 month (Group 1: 96.7% vs. Group 2: 95.4%) and 3 months (Group 1: 96.4% vs. Group 2: 89.9%) (Table 2).

There was no difference between groups regarding stage progress (RR 1.01; 95%CI 0.97-1.06) at 1 month, but there was greater improvement for smokers in Group 1 at 3 months (96.4 vs. 89.9%; RR = 1.07; 95%CI 1.01-1.14) (Table 3). Among at-risk drinkers, 55% and 75.3% were in the preparation stage at baseline in Groups 1 and 2, respectively. The majority were in the action stage at 1 month (Group 1: 91.3% and Group 2: 93.8%) and 3 months (Group 1: 93.3% and Group 2: 92.3%) (Table 2). No significant differences between the groups were observed regarding total progress for both risk factors (Table 3). No differences were observed when the results were adjusted for follow-up time.

Reported smoking cessation at 1 month was 63.6% in Group 1 and 51% in Group 2 (RR = 1.24; 95%CI 1.02-1.51); at 3 months it was 51.4% in Group 1 and 35.1% in Group 2 (RR = 1.46; 95%CI 1.12-1.92). Similarly, 92.5% of drinkers in (Group 1) and 85.2% (Group 2) reported low-risk consumption (AUDIT-C score $\leqslant$ 3 in women and 4 in men) at 1 month (RR = 1.09; 95%CI 0.97-1.21), with 70.7% (Group 1) and 59% (Group 2) doing so at 3 months (RR = 1.20; 95%CI 0.95-1.52). Joint analysis of smoking cessation and drinking reduction indicated a higher probability of change in Group 1, both at 1 and 3 months (Table 4).

For participants who continued smoking, the median reduction in the number of cigarettes at 1 month was 60.0 in Group 1 and 65.0 (p = 0.6) in Group 2. At 3 months, the median reduction was 59.5 in Group 1 and 15.0 in Group 2 (p = 0.04). For participants who continued drinking, the median reduction in the AUDIT-C score at 1 month was 6 points (p = 0.6) in both groups. At 3 months, it was 4 points in Group 1 and 3.5 points in Group 2 (p = 0.4). The means and medians of cigarettes smoked per month in participants who did not quit smoking at 1 and 3 months of follow-up are shown in Table 5.

The assumption that there was no effect on stage of change in those lost to follow-up resulted in no differences between groups at 1 and 3 months for smokers and drinkers (Table S2). However, smoking cessation and alcohol reduction remained significantly higher in the brief counseling group at 3 months of follow-up (Table S3).

Discussion

We found no differences between brief structured counseling and educational materials regarding progress toward behavioral change in this sample of patients undergoing medical procedures. However, brief counseling by medical doctors according to a structured model (5 A's, 5 R's, simple advice, and brief intervention) had a greater short-term effect on smoking cessation and in the median number of cigarettes smoked per month.

We consider these results relevant due to the scarcity of data about the effects of brief counseling on tobacco and risky alcohol use in patients undergoing surgical or diagnostic procedures, whether inpatients or outpatients. Although hospitals are not usually recognized as a setting for interventions to address behavioral risk factors, patients undergoing medical procedures perceive themselves as more vulnerable, and the mandatory abstention required for for diagnostic or surgical procedures provides a good opportunity for short encounters to encourage change.[2,8]

Previous studies have shown that hospitalized patients prioritize addressing their risky behaviors and have higher rates of spontaneous smoking cessation than the general population.[17,18] Our findings attest to the relevance of hospital care as an opportunity for interventions in behavioral risk factors. However, the potential for other medical encounters in the hospital setting has barely been investigated. In fact, most studies have been conducted in outpatient settings or have involved inpatients with serious medical conditions.[6,7,19,20] Our study showed positive results in patients who were admitted for circumstances not necessarily related to smoking or alcohol consumption. Moreover, some of them had short hospital stays and no comorbidities, indicating a population type for whom intervention in behavioral risk factors would be worthwhile. Notably, brief counseling associated with intensive behavioral and pharmacological interventions, when indicated, should be routinely implemented, since several studies have demonstrated that such a strategy yields better results than one-time interventions.[21,22]

The progress we found toward behavioral change is consistent with reported associations between hospital care and high motivation for change,[15,17] thereby indicating that even non-structured interventions might have an effect. An advanced stage of readiness has been reported as a predictor of success for smoking cessation and reduction of alcohol consumption after hospital discharge or emergency admission.[23-25] However, improved motivation for change does not necessarily translate into healthier behavior, as indicated by our results. Despite the lack of significant differences in motivation levels between the study arms, greater progress was observed at 3 months of follow-up in smokers who received brief counseling. This difference could indicate that less-structured educational interventions for smokers lose their effect over time compared with interventions based on motivation level.[26-29]

We observed no significant differences between intervention types for reduced alcohol consumption. Nevertheless, brief interventions have shown positive results for controlling this risk factor.[19,30] Such reports may be explained by a high proportion of at-risk drinkers who reduced their consumption to low-risk levels during follow-up, which could affect assessment of the intervention effect. They could also indicate that the hospital setting itself is a trigger for behavioral change. Moreover, alcohol use may be considered normal in countries with a high prevalence of alcohol consumption among the general population[31] and, thus, patients and physicians may place less emphasis on identifying and addressing this risk factor.[32] The prevalence of smoking (8.9%) and risky alcohol consumption (4.9%) in our study was lower than

Table 2 Distribution of participant behavioral stage of change

Behavioral risk factor/change stages	Basal	1 month follow-up				3 month follow-up			
		Precontemplation	Contemplation	Preparation	Action	Precontemplation	Contemplation	Preparation	Action
Brief counseling									
Smoking									
Precontemplation	7 (4.7)	0	0	0	7 (100.0)	1	0	0	5 (83.3)
Contemplation	24 (16.0)	0	0	0	24 (100.0)	1	0	0	20 (95.2)
Preparation	119 (79.3)	3	1	1	114 (95.8)	1	1	1	110 (97.3)
Total	150 (100.0)	3	1	1	145 (96.7)	3	1	1	135 (96.4)
Risky alcohol consumption									
Precontemplation	8 (10.0)	4	0	0	4 (50.0)	1	0	0	6 (85.7)
Contemplation	28 (35.0)	1	0	0	27 (96.4)	2	0	0	25 (92.6)
Preparation	44 (55.0)	2	0	0	42 (95.5)	2	0	0	39 (95.1)
Total	80 (100.0)	7	0	0	73 (91.3)	5	0	0	70 (93.3)
Educational intervention									
Smoking									
Precontemplation	15 (9.9)	4	0	0	11 (73.3)	3	0	0	11 (78.6)
Contemplation	30 (19.9)	2	0	0	28 (93.3)	4	1	1	25 (80.6)
Preparation	106 (70.2)	1	0	0	105 (99.1)	6	0	0	94.2)
Total	151 (100.0)	7	0	0	144 (95.4)	13	1	1	133 (89.9)
Risky alcohol consumption									
Precontemplation	7 (8.6)	1	0	0	6 (85.7)	2	0	0	5 (71.4)
Contemplation	13 (16.0)	2	0	0	11 (84.6)	2	0	0	12 (85.7)
Preparation	61 (75.3)	2	0	0	59 (96.7)	2	0	0	55 (96.5)
Total	81 (100.0)	5	0	0	76 (93.8)	6	0	0	72 (92.3)

Data presented as n (%).

Table 3 Intervention effect on progression in behavioral stage of change

Behavioral risk factor	1 month follow-up			3 month follow-up		
	Brief counseling intervention (n= 204)	Educational intervention (n=205)	RR† 95%CI	Brief counseling intervention (n=194)	Educational intervention (n=200)	RR 95%CI
Progress in smokers	145/150 (96.7)	144/151 (95.4)	1.01 (0.97-1.06)	135/140 (96.4)	133/148 (89.9)	**1.07 (1.01-1.14)**
Progress in at-risk drinkers	73/80 (91.2)	76/81 (93.8)	0.97 (0.89-1.06)	70/75 (93.3)	72/78 (92.3)	1.01 (0.93-1.10)
Total progress in smokers or at-risk drinkers	195/204 (95.6)	196/205 (95.6)	1.00 (0.96-1.04)	186/194 (95.9)	183/200 (91.5)	1.05 (1.00-1.10)
Total progress in smokers and at-risk drinkers	192/204 (94.1)	193/205 (94.1)	1.00 (0.95-1.05)	184/194 (94.8)	181/200 (90.5)	1.05 (0.99-1.11)

Data presented as n (%), unless otherwise specified.
95%CI = 95% confidence interval; RR = relative risk.
† RR was calculated based on the probability of progress in the stage of change for each intervention.

Table 4 The effect of a brief counseling intervention on smoking cessation and reduced alcohol consumption

Behavioral change	1 month follow-up				3 month follow-up			
	Brief counseling intervention	Educational intervention	Total	RR† (95%CI)	Brief counseling intervention	Educational intervention	Total	RR (95%CI)
Smoking cessation	95/150 (63.6)	77/151 (51.0)	172/301 (57.1)	**1.24 (1.02-1.51)**	72/140 (51.4)	52/148 (35.1)	124/288 (43.0)	**1.46 (1.12-1.92)**
Reduced alcohol consumption	74/80 (92.5)	69/81 (85.2)	143/161 (88.8)	1.09 (0.97-1.21)	53/75 (70.7)	46/78 (59.0)	99/153 (64.7)	1.20 (0.95-1.52)
Smoking cessation or alcohol reduction	155/204 (76.0)	135/205 (65.9)	290/409 (70.9)	**1.15 (1.02-1.31)**	117/194 (60.3)	92/200 (46.0)	209/394 (53.0)	**1.32 (1.10-1.59)**
Smoking cessation and alcohol reduction	145/204 (71.1)	125/205 (61.0)	270/409 (66.0)	**1.17 (1.01-1.34)**	111/194 (57.2)	82/200 (41.0)	193/394 (49.0)	**1.40 (1.14-1.71)**

Data presented as n (%), unless otherwise specified.
Bold type denotes statistically significant values.
95%CI = 95% confidence interval; RR = relative risk.
† RR was calculated on the probability of smoking cessation and reducing alcohol consumption.

Table 5 Cigarettes smoked by participants who did not quit smoking during follow up

	Cigarettes smoked per month					
	Baseline[†]		1 month follow-up[‡]		3 month follow up[§]	
Intervention group	Mean (SD)	Median (Min-Max)	Mean (SD)	Median (Min-Max)	Mean (SD)	Median (Min-Max)
Brief counseling	153.6 (230.4)	90.0 (1.0, 2.340)	98.9 (214)	16.0 (1.0, 1.440)	58.9 (83.2)	20.0 (1.0, 300)
Educational intervention	157.5 (212.9)	90.0 (1.0, 1.800)	73.6 (113)	31.0 (1.0, 600)	93.8 (123)	40.0 (1.0, 600)

SD = standard deviation.
[†] Baseline: brief counseling n=150; educational intervention n=151.
[‡] One month follow-up: brief counseling n=55; educational intervention n=74.
[§] Three month follow-up: brief counseling n=68; educational intervention n=96.

those reported for the general adult population of Colombia (10.1 and 6%, respectively),[31,33] as well as the reported prevalence in previous in-hospital studies (15-54% for smoking and 31% for risky alcohol consumption).[34-38] Therefore, information bias due to the denial of consumption cannot be ruled out.

Our study has additional limitations. Self-reported outcomes without objective verification may have overestimated the effect of the interventions. However, this was a common condition for both arms of the study, so it cannot account for the differences. In addition, the use of an educational intervention instead of placebo as a comparator may have resulted in a lower magnitude for the effect of brief counseling. Finally, although the interventions were unblinded for both providers and participants, we believe that the lack of blinding did not introduce bias since there was no contamination between groups due to the independence of the providers.

Although only 3 months of follow-up was possible, brief counseling had a positive effect on smoking cessation among patients undergoing medical procedures, whether inpatients or outpatients. Given the risk perception and the medical setting, providing non-structured educational interventions might also improve readiness for behavioral change in these patients and could be a feasible alternative for scenarios with limited resources in low- and middle-income countries. However, further research is necessary to properly demonstrate the effect of both interventions on the proposed outcomes. Training and strengthening the skills of health professionals to manage risk factors in the hospital setting are necessary to ensure comprehensive healthcare at all levels.

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The authors report no conflicts of interest.

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