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Incidence And Determinants Influencing Stopping Of Smoking Between Individuals Using Smoking Cessation Services In Primary Care Centers In Al Medina, Saudi Arabia 2024

Abdullah Tahsin Allam[1], Abdullah Saleh Aljohani[2], Abdullah Saud Alahmadi[3], Khaled Talal Alyami[4], Salem Mansour algorashi[5], Mohammed Mansour Alqurashi[6], Sami Muslim Saad Alloqmani[7], Khalid Hamoud Almutairi[8], Basem Musllam Aljohani[9], Sameer Ahmed Salim Al-Lahibi[10], Maher Ibrahim Abdulsalam[11], Maha Barjas Moflh Al-Dossary[12]

[1]Preventive medicine consultant, preventive medicine clinical services in Al-Miqat General Hospital, Saudi Arabia.
[2]Family medicine consultants, Population health medina, Saudi Arabia.
[3]Preventive medicine consultants, preventive medicine polyclinics medina, Saudi Arabia.
[4]Senior Registrar, Ohud Hospital, Saudi Arabia.
[5]General practitioner, Makkah health affairs, Makkah Saudi Arabia.
[6]Internal medicine consultant, Alnoor specialty hospital Makkah, Saudi Arabia.
[7]Family medicine specialists, Bagedo primary health care, Saudi Arabia.
[8]Nursing Technician, Director of Outpatient Clinics at Al-Miqat General Hospital in Madinah, Saudi Arabia.
[9]Family medicine consultant, Primary health care Saudi Arabia.
[10]Nursing, Supply Chains in Madinah Cluster, Saudi Arabia.
[11]Resident Doctor (GP), GDIPC, Branch of The Ministry of Health in Makkah Region, Saudi Arabia.
[12]Nursing Technician, King Khalid Hospital in Al Kharj, Saudi Arabia.

Abstract:

Background: Primary care doctors have a good opportunity to motivate the smokers to quit smoking in view of the accessibility of primary healthcare clinics to the public. Tobacco dependence is a chronic disease that often requires repeated interventions and multiple attempts to quit. Cigarette smoking is the leading preventable cause of mortality. Globally, an estimated 1.3 billion people smoke.

This study aimed to measure the effectiveness of the smoking cessation program adopted by the Primary Health Care in Al Medina, Saudi Arabia. This was achieved through calculating the percentage of smoking cessation service users (survival probabilities) who maintained the non-smoking status after selected follow up periods. Moreover, the study highlighted the possible association of selected explanatory variables with smoking cessation survival probabilities.

Methods: A historical cohort study 490 participants were recruited by simple random sampling who attended the smoking cessation clinics (SCCs) in PHCC. The participants were contacted by phone and invited to participate in the study. The participants who agreed to participate in the study were interviewed utilizing a structured questionnaire.

Results: Initially (63.5%) of the participants quitted smoking after receiving SCSs. There were statistically significant differences between quitting smoking and the nationality and the educational level of participants ($p \leq 0.001$ and 0.02 respectively). About one fourth (23.3%) of individuals who initially quitted smoking relapsed and resumed smoking as early as 6 weeks after completing their SCC visits. This relapse rate increased to 38.7, 47.2 and 51.1% after 12, 24 and 36 weeks respectively. Less than a half (45.8%) maintained the non-smoking status after 42 weeks from their initially quitting. **Conclusion and recommendations:** The findings of the study substantiate the effectiveness of SCSs designed within PHCC both in short- and long-term basis. Younger individuals, smokers with Arab ethnicity, smokers falling within high income and education groups were identified as high-risk groups and need highest focus. The accessibility to the service among the local population can be increased by up scaling the advertisement of the existing services.

Keywords: Smoking, Cessation, Incidence, Primary Care, Relapse.

Introduction:

Smoking carries high mortality and causes approximately 90% of all lung cancer deaths, 80% of all chronic obstructive pulmonary disease deaths and increases the risk for death from all causes in men and women worldwide [(1)]. Worldwide, tobacco use is still a major source of avoidable premature mortality and an increasing public health concern. Smoking is thought to be

the cause of 6 million fatalities worldwide each year; if current trends continue, smoking will be responsible for 8 million deaths yearly by 2030, with over 80% of those deaths occurring in low-middle-income countries [2-4]. With the smoking rate expected to fall by 2025, efforts are being made to combat tobacco smoking epidemics [5]. However, the number of smokers globally has increased to over billion due in major part to the pressure from the global tobacco business and the fast rise of the population [6-8].

Among the many tobacco products, cigarettes are the most widely used smoking item in different geographical locations [9, 10]. Various contexts have utilized smoking cessation programs to implement a range of interventions and preventive measures [11, 12]. Therapeutic and behavioral therapies make up the majority of these interventions [11, 13]. As part of a global coordinated effort to combat the tobacco epidemic, the WHO launched the Framework Convention on Tobacco Control (FCTC) [14]. The initiative promoted a number of strategies, such as enacting tax laws to limit tobacco use, encouraging smoke-free workplaces and public areas, limiting and outlawing all forms of tobacco product marketing, and bolstering laws to stop the illegal trade in tobacco products [15]. Despite these global initiatives, significant portions of the population continue to smoke globally [16].

Numerous factors, including but not limited to attitudes and beliefs, nicotine dependence, the availability of flavored tobacco products, e-cigarette use, prior experience smoking even a few puffs, depression, poor academic performance, and substance abuse, have been extensively discussed in the literature as contributing to the initiation of smoking [17-22]. Furthermore, smoking behaviors, the availability of smoking cessation services, and adherence to different cessation therapies are all associated with a number of characteristics. These mostly consist of smokers' socio-demographic traits, age, ethnicity, economic status, and cultural concerns [9].

Smoking cessation is more likely when a clinician is involved. Providing evidence-based services is the aim of smoking cessation facilities [23]. When administered promptly and effectively, tobacco dependency therapies dramatically reduce the risk of smoking-related morbidity and death [24, 25]. Documenting smoking status, giving cessation guidance, and assessing the patient's interest in stopping are all part of the clinician's job description. Next, provide resources, strategies, and follow-up for individuals who are interested in quitting. Motivational interviewing can be used by the clinician to help smokers who aren't ready to stop [26-29].

Saudi Arabia maintains a contemporary, well-established healthcare system that offers extensive primary care services, including evidence-based smoking cessation programs [30]. These treatments are often offered through many introductory and follow-up appointments. Smoking is still a serious public health issue in spite of these medical resources [31]. However, according to the STEP-wise survey, smoking was 16.4% of the population under study overall, and the smoking rate among males was about 27 times greater than that among women (31.9 vs. 1.2%) [31].

A smoking cessation guideline was created by PHCC with the goal of describing acceptable care based on the best available scientific evidence and widespread acceptance for smoking cessation practice. This was done in order to eliminate inappropriate variation in smoking cessation support practice and to encourage the efficient use of resources [32]. The primary components of the care that was given, as per that recommendation, were assessments of carbon monoxide levels and nicotine dependency using the Fagerstrom Test for Nicotine Dependency (FTND). The clinician's services mostly consisted of medication and general/behavioral counseling tailored to each individual case in addition to the assessment tests. Given that the PHCC already has SCSs in place, this study may examine the current state of affairs and identify any gaps or shortcomings in the services offered.

The main aim of the study is to investigate the demographic profile, attributes and the incidence of smoking cessation among individuals receiving smoking cessation services in primary care settings of Al Medina, Saudi Arabia, as well as assessing the rate of relapse for those who initially quitted smoking after attending the SCCs.

Methods

A historical cohort study was implemented on a primary care level. Smokers were recruited in the study that were accessing smoking cessation clinics and were registered at primary health care centers in Al Medina, Saudi Arabia from January to November 2024. Smokers who did not complete 42 weeks of follow-up since quitting smoking were excluded from the study. The non-parametric exponential model for survival analysis used to calculate the required sample size for performing survival analysis on persons who reported quitting smoking during their enrollment period for smoking cessation program [33].

The model was fed with the following parameters: Length of accrual period = 42 weeks; T, the length of follow-up period-time from end of accrual to analysis = 6 weeks; α, the significance level = (0.05); Two-sided test; Estimated Survival probability at time t = 11 weeks = 0.5; Upper and lower critical values for the estimated survival probability = 0.05 (95% confidence interval of 1-year survival rate of 0.45 to 0.55). The sample size required for performing the required survival analysis under the above model parameters was 330. Under the assumption of 50% rate for quitting smoking during the smoking cessation program visits we needed to double the required sample size to 660 to end with the required 330 who quitted smoking. In addition, we added another 130 participants to the required sample size to account for an expected 20% non-response rate. The final sample size became 790.

A simple random sample of 790 participants was extracted from the PHCC electronic registry of all attendees to the SCCs to take part in this study. That was after exclusion of those who did not complete 42 weeks of follow-up on that date. Of those participants, only 490 have given their verbal consents to participate in the study. The ethical approval was obtained from Institutional Review Board (IRB), General Directorate of Health Affairs in Madinah National Registration Number with NCBE-KSA: (H-03-M-84) and from the hospital directors. Furthermore, a written consent was obtained from the participants through an opening question after explaining the aim of the study. Confidentiality and anonymity were assured, and had the right to withdraw from the study at any time.

Data were collected by well-trained data collectors through phone interviews with the participants used a structured questionnaire form. Prior to data collection, the questionnaire was piloted amongst 20 selected past users of SCC and their feedbacks were used to make any necessary modifications. The structured questionnaire has developed by the researchers, the content and face validity have established by an extensive literature review, consultation of the community medicine faculty and experts in the field of smoking cessation (34-47). The questionnaire has originally prepared in English and translated into Arabic language with back translation to ensure its validity. The translation done by the lead researcher using several medical dictionaries and then was revalidated again by two Community Medicine Experts after reverse translation. After conducting an extensive literature, the aim and objectives of the study served as a guide for the researcher in developing the content of the questionnaire.

The final version of the questionnaire covered several areas which were the history of visits to SCCs with their initial outcome, the socio-demographic characteristics of participants, impact of smoking cessation on health status and the socio-economic status of participants, as well as the withdrawal symptoms of smoking cessation.

The component of the study tool which includes multiple choice questions, some of the patients may have more than eligible choices or responses. The interaction between the different choices or responses can influence the reported percentage of the overall response rates, for example the reasons for visiting SCC. Statistical analysis was done using IBM SPSS Statistics software version 28. Descriptive statistics were done first. The association between selected explanatory variables (age, gender, nationality, income, marital status, and educational level) and mean survival time for keeping the non-smoker status was tested for statistical significance by Kaplan Myer test in bivariate model.

The effectiveness (success) of the smoking cessation program will be assessed at two levels using incidence rates. The short-term success rate is the incidence rate of quitting smoking during the clinic contact time (primary smoking cessation rate/the percentage of participant quitted smoking directly by attending the SCC). Among those who successfully quitted smoking the long-term success will be calculated using the survival rate (being free from smoking habit relapse) after 1, 6, 12, 24, 36 and 42 weeks of quitting smoking during clinic visit.

Results

Table (1) showed that a total of 790 individuals were approached to participate in the study. Data was collected from 490 participants with a response rate 62%. A significant percentage of participants (43%) were within the range 30–39 years of age followed by 40–49 years of age group (28%). Most participants (n = 468) were males and had a smoking history of more than 10 years (90.2%). Majority were cigarette smokers (96.3%) followed by Shisha smoking (19.8%).

Table (1): Description of the study sample (N = 490)

Variable	Categories	N	%
Age group (years)*	< 30	43	8.8
	30–39	212	43.3
	40–49	137	28.0
	50–59	71	14.5
	60+	27	5.5
Gender	Female	22	4.5
	Male	468	95.5
Nationality	Saudi Arabian	359	73.3
	Arabs (excluding KSA)	65	13.3
	Others	66	13.5
Average monthly income	< 10,000	256	52.2
	10,000–39999	216	44.1
	≥ 40,000	18	3.7

Variable	Categories	N	%
Ever Married	No	61	12.4
	Yes	429	87.6
Educational level	Did not complete secondary school	79	16.1
	Completed secondary school	72	14.7
	Diploma/university and above	339	69.2
Duration of smoking habit (years)**	< 10	48	9.8
	10–19	199	40.7
	20–29	159	32.5
	30+	83	17.0
Type of smoking item***	Cigarettes	472	96.3
	Cigars	10	2.0
	Medwakh	46	9.4
	Shisha	97	19.8
	Pipe	3	0.6
	Electronic tobacco devices	22	4.5

*Age: mean = 40 year, SD = 10.2 years, range: (18–79) **Duration of smoking: mean = 19.5 years, SD = 9.6 years, range (1–60)
***The categories for type of smoking item are not mutually exclusive

Table (2) showed that more than 85% of participants reported that attending the SCCs was due to their self-decision followed by 18% reported family and relatives' pressure as a reason. This shows that making the decision to abstain from smoking is usually based on different motives and reasons, but in the end personal decision is the basis.

Table (2): The relative frequency of reported reasons for attending the SCCs, (N = 490)

The reported reason*	N	%	95% Confidence interval (%)
Self-decision	420	85.7	(82.4 to 88.6)
Spouse, children and/or relatives' pressure	88	18.0	(14.8 to 21.5)
Health complaint perceived as being related to smoking	45	9.2	(6.9 to 12)
Peers pressure	24	4.9	(3.2 to 7.1)
Reported reason behind attending the SCC-Doctor warning	22	4.5	(2.9 to 6.6)
COST	3	0.6	(0.2 to 1.6)
Friend's advice	1	0.2	(0 to 0.9)
Social media	1	0.2	(0 to 0.9)
*The categories for reported reasons are not mutually exclusive			

Table (3) showed that 311 (63.5%) of the study's participants have quitted smoking during their attending of SCCs and receiving the SCSs. This means that the person quit smoking during the period of his/her visit to the SCC to obtain the service, and this period usually ranges from one day to three weeks. It also showed that the relation between quitting of smoking with the nationality and the educational level of participants was statistically significant. Saudi Arabian had a significantly lower quit rate than the other two nationality groups. A lower educational level was associated with a significantly higher quit rate.

Table (3): The primary smoking cessation rate immediately after/during receiving of SCSs (range from 1 day to 3 weeks) by selected predictors, (N = 490)

Variable	Categories	Quitted smoking while visiting the smoking cessation clinic						*p*-value
		Negative		Positive		Total		
		N	%	N	%	N	%	
Age group (years)	< 30	22	51.2	21	48.8	43	100.0	0.299

Variable	Categories	Quitted smoking while visiting the smoking cessation clinic						*p*-value
		Negative		Positive		Total		
		N	%	N	%	N	%	
30–39		77	36.3	135	63.7	212	100.0	
40–49		48	35.0	89	65.0	137	100.0	
50–59		24	33.8	47	66.2	71	100.0	
60+		8	29.6	19	70.4	27	100.0	
Total		179	36.5	**311**	**63.5**	490	100.0	
Gender	Female	5	22.7	17	77.3	22	100.0	0.169
Male		174	37.2	294	62.8	468	100.0	
Nationality	Saudi Arabian	117	32.6	242	67.4	359	100.0	**<0.001**
Arabs (excluding Saudi Arabian)		39	60.0	26	40.0	65	100.0	
Others		23	34.8	43	65.2	66	100.0	
Average monthly income	< 10,000	89	34.8	167	65.2	256	100.0	0.600
10,000–39999		82	38.0	134	62.0	216	100.0	
≥ 40,000		8	44.4	10	55.6	18	100.0	
Ever married	No	25	41.0	36	59.0	61	100.0	0.448
Yes		154	35.9	275	64.1	429	100.0	
Educational level	Did not complete secondary school	18	22.8	61	77.2	79	100.0	**0.022**
Completed secondary school		28	38.9	44	61.1	72	100.0	
Diploma/university and above		133	39.2	206	60.8	339	100.0	
Duration of smoking habit (years) categories	- <10	25	52.1	23	47.9	48	100.0	0.125
10–19		72	36.2	127	63.8	199	100.0	
20–29		54	34.0	105	66.0	159	100.0	
30+		28	33.7	55	66.3	83	100.0	

Table (4) showed that only 2.3% of individuals who initially quitted smoking after SCC visits relapsed and resumed smoking as early as one week after completing their clinic visits. This relapse rate increased to 23.3% after 6 weeks and 38.7% after 12 weeks. After 24 weeks or more of quitting, this rate stabilized at around the level of 50%.

Table (4): Kaplan Myer survival analysis predicting smoking relapse for those who initially quitted smoking after receiving SCSs, (N = 311)

Time (weeks after completing SCC sessions) for those who initially quitted smoking	Cumulative incidence of smoking relapse after selected follow up periods (%)	Cumulative incidence of maintaining the non-smoking status after selected follow up periods (%)	95% confidence interval
1	2.3	97.7	(96 to 99.4)
6	23.3	76.7	(71.9 to 81.5)
12	38.7	61.3	(55.7 to 66.8)
24	47.2	52.8	(46.7 to 58.9)
36	51.1	48.9	(42.1 to 55.7)
42	54.2	45.8	(37.2 to 54.5)

Table (5) showed that all the tested explanatory variables failed to predict significant differences in the risk of smoking relapse for those who initially quitted smoking after getting SCSs. Otherwise, the results showed that the mean survival time (MST) increased visibly with age ≥ 40 years old and showed that there is difference in the mean between Saudi Arabian and other Arabs (30.9 vs. 24.4 respectively).

Table (5): The mean survival (maintaining the non-smoking status) time in weeks predicting smoking relapse for those who initially quitted smoking after attending SCCs

Variable	Categories	Mean survival time (weeks)	SE	95% confidence interval of survival time (weeks)	*p*-value
Gender	Female	23.2	3.6	(16.1 to 30.4)	0.917
	Male	25.7	1.1	(23.7 to 27.8)	
Age group (years)	< 30	18.4	3.4	(11.9 to 25)	0.391
	30–39	24.8	1.6	(21.7 to 27.9)	
	40–49	27.1	1.8	(23.5 to 30.6)	
	50–59	27.8	2.6	(22.6 to 32.9)	
	60+	27.1	3.8	(19.7 to 34.4)	
Nationality	Saudi Arabian	24.4	1.2	(22.1 to 26.7)	0.059
	Arabs (excluding Saudi Arabian)	30.9	3.3	(24.4 to 37.3)	
	Others	29.2	2.4	(24.4 to 33.9)	
Average monthly income	< 10,000	26.6	1.4	(23.9 to 29.3)	0.627
	10,000–39999	24.9	1.5	(21.9 to 27.9)	
	≥ 40,000	16.2	4	(8.3 to 24.1)	
Ever married	No	24.2	2.7	(18.9 to 29.4)	0.972
	Yes	25.7	1.1	(23.6 to 27.8)	
Educational level	Did not complete secondary school	26.9	2.2	(22.5 to 31.3)	0.861
	Completed secondary school	23.9	2.6	(18.8 to 29)	
	Diploma/university and above	25.7	1.3	(23.2 to 28.1)	
Duration of smoking habit (years)- categories	< 10	25.5	3.7	(18.3 to 32.7)	0.764
	10–19	24.5	1.6	(21.3 to 27.6)	
	20–29	26.9	1.7	(23.4 to 30.3)	
	30+	25.5	2.3	(21 to 30.1)	

Discussion

In Saudi Arabia, smoking cessation clinics (SCSs) combine clinical, social, and educational approaches in primary care settings. Depending on the circumstances, these treatments are typically offered during an initial appointment as well as multiple follow-up visits. The two-tier structure is made up of the many tactics used by the PHCC clinics. It starts with a nursing staff-led initial assessment, followed by clinician-led therapies that include behavioral, general, and pharmaceutical interventions.

The study's primary conclusions support the efficacy of SCSs created at PHCC on both a short- and long-term basis. This is supported by the fact that less than half of study participants (45.8%, or 29% of the total) continued to abstain from smoking 42 weeks after they first quit. Furthermore, the study showed that smokers who were younger, of Arab origin, or who belonged to high-income and educational categories were considered high-risk and required the greatest attention. The study's primary conclusions demonstrate that the tactics used in PHCC SCCs are successful and may be expanded with community involvement. According to recent studies, smoking is more common among younger age groups, especially among young people (48-50). It's interesting to note that the study's findings showed that smoking rates were higher among middle-aged people (30–49 years old), but they finally dropped among those over 60. Just 4.5% of the smokers in the study's sample were female, with the majority of recruits being men. Research indicates that men are more likely than women to use tobacco (35, 36, and 51). However, new research indicates that smoking patterns have changed, with a larger prevalence among women (37, 38). According to the literature, marginalized groups and ethnic minorities have greater smoking rates (49, 52). A significant percentage of smokers (73.3%) in this study were Saudi Arabian and represented the expat population. These findings substantiate the fact that smoking cessation services need to be adapted to meet the needs of these communities (53).

In the present study, more than half of the smokers included in the study had low- or middle-income status. These findings are comparable to studies conducted in the U.S. and China which indicate the association of poverty levels with current smokers (36, 37). Interestingly the findings of the study revealed a high prevalence of smoking among participants with a substantial educational background. In contrast, the literature suggests that tobacco consumption is more common among populations with

low literacy levels and comprising marginalized segments of society as previously discussed (36, 39).
Several studies have emphasized that social support including family and friends has the greatest effect on quit attempts, especially when it is continuing and nondirective as indicated by this study (39, 41, 45). There are various societal factors that may influence on quitting smoking. Literature highlights various factors namely; partner who dislikes smoking or support quitting had a positive influence on quit attempts (42, 54), social avoidance by non-smokers acts as motivation for smoking cessation (41) and relatives encouragement or illness act as specific reasons for quitting (55). Smoking cessation is usually mediated by the socioeconomic characteristics of people which affect their habits and decisions (56).
The findings of the study indicated the effectiveness of the smoking cessation services provided within primary care settings in Saudi Arabia as nearly two thirds of participants reported initially quitting smoking after receiving the services. One of the key findings of the study was that the rate of successful quitters in the long-term was 29% among the total participants in this study. Similarly, a study assessing the long-term outcome of smoking cessation in outpatient clinic reported a quitting success rate of 20.5% (57). Evidence suggests that sustained, accountable and comprehensive smoking cessation initiatives can be used to effectively manage tobacco consumption within communities and provide the necessary help for smokers to quit smoking (47-49). Interestingly, the average abstinence rates increase when multimodal interventions (pharmacological and non-pharmacological) are used (47).
Various studies have demonstrated the association between the age of smokers and compliance with smoking cessation services and expected outcomes. Apparently, the findings suggest that the younger the age group is the lower the likelihood of smoking cessation is, whereas compliance with cessation services increases with age (50-52). In this study, smoking cessation was relatively greater among females than among males. The literature suggests that quitting smoking differs between males and females to a certain degree, and many factors such as age, the amount of smoking, and many others may affect this difference (54, 57).
In this study, the rate of relapse to smoking increased dramatically over time until 24 weeks after the patient quit smoking. After that, the rate became relatively stable at approximately 50%. These findings are supported by other studies from different countries (58, 59). The relapse rate is greater among young people than among older people, as indicated in this study and others (60, 61). One study indicated that age was a significant predictor of smoking cessation (62). The same study showed that an earlier age at which smoking started was associated with not quitting smoking compared to when people started smoking at an older age (62). Age did not affect the relapse rate in another study (63).
It is a common assumption that the financial strain has a negative impact on smoking cessation interventions. Contrary to this perception the study findings indicate that the duration of smoking abstinence was inversely related with the level of monthly income. However, evidence indicates that ex-smokers experiencing financial burden are more likely to relapse or having a shorter smoking abstinence (58). This may be related to the negative impacts of financial strains on the mental and psychological status of people, which in turn may work as a basis for smoking relapse.
The effect of education level on smoking relapse or abstinence duration was relatively limited in the present study. On the other hand, another study indicated that education was a significant predictor of smoking cessation (62). Although there are a significant number of smokeless tobacco users' worldwide, cigarette smoking remains the most common route of tobacco consumption, as indicated in this study (49, 64). Cigarettes are easily available and can be bought at a cheaper price in Qatar than other tobacco products. This might also explain why most smokers (96.3%) consumed this smoking item.

Conclusion

The study systematically examined the various user factors and smoking cessation interventions practiced within a highly organized primary health care setting. The findings of the study substantiate the effectiveness of the interventions both in short- and long-term basis. There is a need to target high risk individuals and up scale the accessibility to the service among the local population by active community engagement, promoting a multi-sectorial approach strengthening legislative and policy measure for smoking cessation services and further advertisement of the existing services. Health education campaigns and preventive strategies should be devised to prevent the spread of modern alternatives for cigarettes such as vapes, pipes, and other tobacco products since they aren't widely spread or available in Saudi Arabia tobacco markets. Smoking cessation interventions within the PHCC should specifically focus on high-risk population as indicated by the main findings of the study.

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