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Assessment of the Health Complaints among White-Collar and Blue-Collar Workers Using the Electronic Health Records

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ABSTRACT

Electronic health records (EHRs) are a useful tool to determine the causes and trends of work-related diseases in terms of periodic check-ups or emergency interventions at the workplace. To detect and prevent work-related diseases, EHRs could be important determinants for assessing interactions between health complaints and work-related factors. This study aimed to address the prevalence of diseases that cause potentially work-related diseases and the relationship between blue-collar/white-collar work status, by using EHRs. We retrospectively analyzed the clinical and demographic data from EHRs (46 white-collar and 94 blue-collar) by using descriptive and correlation statistic tests. We found that type 2 diabetes, influenza, acute pharyngitis, and liver fat had a higher prevalence among blue-collar workers while urinary infection and myalgia had a higher prevalence among white-collar workers. The work status had a very weak positive correlation with type 2 diabetes (r=0.236, p=0.005) and had a very weak negative correlation with myalgia (r=-0.167, p=0.048) and urinary infection (r= -0.248, p= 0.003). Consequently, the present study provided that the work status and EHRs are important determinants for assessing interactions between health complaints and work-related factors that were attributable to specific work status such as blue-collar and white-collar.

Keywords: Occupational Health, Work-Related Disease, Electronic Health Records, Blue-Collar Workers, White-Collar Workers .

ÖZET

Elektronik sağlık kayıtları (EHR), işyerinde periyodik kontroller veya acil müdahaleler açısından işle ilgili hastalıkların nedenlerini ve eğilimlerini belirlemek için yararlı bir araçtır. İşle ilgili hastalıkları tespit etmek ve önlemek için EHR'ler, sağlık şikâyetleri ve işle ilgili faktörler arasındaki etkileşimleri değerlendirmek için önemli belirleyiciler olabilir. Bu çalışma, potansiyel olarak işle ilgili hastalıklara neden olan hastalıkların yaygınlığını ve mavi yakalı/beyaz yakalı çalışma koşulları arasındaki ilişkiyi EHR'leri kullanarak ele almayı amaçlamıştır. 46 beyaz yakalı ve 94 mavi yakalı çalışana ait EHR'lerden klinik ve demografik verileri tanımlayıcı ve korelasyon istatistik testleri kullanarak geriye dönük olarak analiz ettik. Mavi yakalı çalışanlarda tip 2 diyabet, grip, akut farenjit ve karaciğer yağlanmasının daha yüksek prevalansa sahip olduğunu, beyaz yakalı çalışanlarda ise üriner enfeksiyon ve miyaljinin daha yüksek prevalansa sahip olduğunu bulduk. Çalışma koşullarının tip 2 diyabet ile pozitif korelasyonu (r=0.236, p=0.005) ve miyalji (r=-0.167, p=0.048) ve üriner enfeksiyon (r= -0.248, p=0.003) ile çok zayıf negatif korelasyonu vardı. Sonuç olarak bu çalışma, çalışma koşullarının ve EHR'lerin sağlık şikayetleri ile mavi yakalı ve beyaz yakalı gibi belirli çalışma koşullarına atfedilebilen işle ilgili faktörler arasındaki etkileşimleri değerlendirmek için önemli belirleyiciler olduğunu göstermiştir.

Anahtar Kelimeler: İş Sağlığı, İşle İlgili Hastalıklar, Elektronik Sağlık Kayıtları, Mavi Yakalı Çalışanlar, Beyaz Yakalı Çalışanlar.

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I. INTRODUCTION

The blue-collar workers and the white-collar workers are two main different occupational groups in many sectors. The blue-collar workers work physically demanding while the white-collar workers work at the office or in administrative-like jobs. Many studies reported that the health problems among the blue-collar workers were more compliant than the white-collar workers [1-4]. The work status have an important role in the work-related diseases because the workers spend a significant amount of time at workplaces during the day. Previous studies confirmed the relationship between poor working conditions and poor health [5-8]. However, several factors affect the work-related diseases such as the work environment and work status together with many other risk factors [9,10].

To prevent the work-related disease, the primary health service providers perform preventive periodic health check-ups, pre-clinical diagnoses, and emergency intervention at the workplaces. The periodic health check-ups increase the probability of an early diagnosis of disease, depending on its frequency. However, it can be complicated to decide on a work-related disease because of work status itself. Therefore, some diseases could be classified initially as non-work-related diseases rather than work-related disease as part of occupational. In this context, health, electronic health records (EHRs) are a useful source to determine the causes and trends of the work-related diseases. EHRs consider multi factors information that related to work status (the field of activity and functions of the workplace, job titles, job descriptions, job area, etc.), health conditions (health complaints, disease history, laboratory and clinical tests, diagnosis, etc.), the demographic information (age, gender, weight, height, etc.), and other information [11,12]. In terms of the periodic check-ups or emergency interventions, EHRs can be a source of information for a decision support system at the workplace, which can provide early diagnosing the work-related diseases, managing work status, and preventative health care of workers. Therefore, it is important to raise awareness of the use of EHRs for a more accurate estimate of the causality, prevalence, and incidence rates of diseases that can cause work-related diseases. Thanks to the occupational health and safety legal regulations in many countries, the health interventions and periodic health check-ups of the workers are provided by the primary health service providers at the workplaces. However, the utilization of EHRs data for the detection and prevention of work-related diseases is not at the same level [13 -15].

In the present study, the motivation was to investigate whether EHRs provide potentially useful information to find correlations between work status and health complaints that could cause work-related disease. Therefore, this study aimed to address the prevalence of diseases that potentially cause work-related diseases and the relationship between white-collar/blue-collar work status by analyzing the EHR data .

II. METHODS

A. Data Collection

The EHR data recorded from 140 workers (white-collar=46 and blue-collar=94) were retrospectively collected between 2016 and 2018 years at Mersin Turkish Telecom Company. The study group included 119 male (average age=42.08±7.88) and 21 female (average age=37.43±5.67). Clinical and demographic information from EHRs were extracted by considering the number of the subject instead of the number of visits to the clinic or periodic controls at the workplace. For the analysis, the diseases were defined the based on the International Classi-

fication of Diseases, Tenth Edition (ICD-10). This study was carried out with the permission of the ethics committee by Tarsus University, dated 16.04.2021 and numbered 2021 / 11.

B. Statistical Analysis

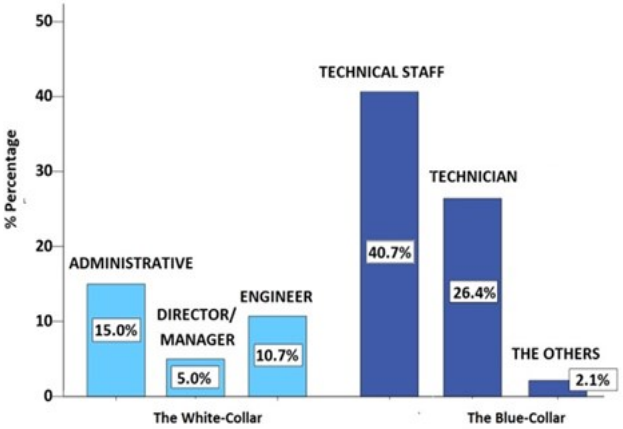
All statistical analysis were performed by using IBM SPSS 22.0 (SPSS Inc., Chicago, IL, USA). Shapiro-Wilk test was applied to all the dependent variables for the assumption of normality. Descriptive statistics were shown as frequencies or percentages (%), mean and standard deviation (SD). For the variables normally distributed, the student-t test was used in group comparisons. For the variables with non-normally distributed, non-parametric Mann-Whitney U test was used. We used the Pearson correlation test to quantify the correlation between the two categorical variables for normally distributed variables. When the variables were non-normally distributed, Kendall's Tau test was used to quantify the correlation. The significance level was determined as $p \leq 0.05$.

III. FINDINGS

Depending on the work status, the job titles of the white-collar workers were defined as an engineer, director, administration, and manager who work in an office or administrative-like jobs. The job titles of the blue-collar workers were defined as technical staff, technicians, and others who work with physically demanding work. Figure 1 shows the percentage of each job title related to the work status.

In the present study, according to the employment position at the workplace, we defined sub-groups of white-collar (32.9%) and blue-collar workers (67.1%) as technical staff (40.7%), technicians (26.4%), administrative staff (15.0%), engineers (10.7%), manager/directors (5.0%), and other professions (2.1%).

Figure 1: The comparison results of the workers by job title



The data of the white-collar and blue-collar workers including pre-clinical diagnoses, demographic characteristics, work-site, and the job title was analzed by using the EHRs. Table 1 shows demographic characteristics of workers.

In Table 1, there were statistically significant difference ($F=39.717$, $p=0.000$) for the gender between white-collar workers (39.1% female and 60.9% male) and blue-collar workers (3.2% female and 96.8% male) but no statistically differences ($F=0.127$, $p=0.722$) was found for the ages between white-collar workers (41.06±7.40) and blue-collar workers (41.54±7.96). There were also statistically significant difference ($F=43.439$, $p=0.000$) between white-collar workers (26.1% high school, 2.2% college, 69.6% bachelor's degree, and 2.2% postgraduate) and blue-collar workers (10.6% primary school, 9.6% elementary school, 18.1% high school, 60.6% college, and 1.1% bachelor's degree) for educational backgrounds.

Table 1: Demographic characteristics of the white collar and blue-collar workers

Variance		The Blue-Collar Mean±SD	The White-Collar Mean±SD	Total Mean±SD
Age	year	41.5±7.9	41.0 ±7.4	41.4±7.7
Height	cm	174.2±0.7	169.8±1.0	172.8±7.1
Weight	kg	85.4±1.6	72.5±1.7	81.1±16.2
		Number (%)	Number (%)	Number (%)
Gender	Female	3 (3.2)	18 (39.1)	21 (15)
	Male	91 (96.8)	28 (60.9)	119 (85)
Marriage	Single	16 (17.0)	17 (37.0)	33 (23.5)
	The married	78 (83.0)	29 (63.0)	117(76.4)
Training	Primary School	10 (10.6)	-	10 (7.2)
	Elementary School	9 (6.4)	-	9 (6.4)
	High School	17 (18.1)	12 (26.1)	29 (20.7)
	Collage	57 (60.6)	1 (2.2)	58 (41.4)
	Bachelor's Degree	1 (1.1)	32 (69.6)	33 (23.6)
	Post graduate	-	1 (2.2)	1 (0.7)
Smoking	Yes	55 (58.5)	35(76)	90 (64.3)
	No	39 (41.5)	11(23)	50 (35.7)

SD=standard deviation, %=percent, cm=centimeter, kg=kilogram

Figure 2 shows the relative frequencies and percentage distribution of the pre-diagnosed diseases as a result of analyzing the EHRs. The diseases were considered with high prevalence (≥5,0%) including type 2 diabetes (20.0%), influenza infection (13.6%), myalgia (13.6%), acute pharyngitis (10.0%), urinary infection (7.9%) , and fatty liver (5.0%) for the comparison analysis. The other diseases were not included because of their low prevalence and frequency for accurate evidence for the statistical analysis. For example, although the diseases including tinea pedis, tinea corporis, pneumonia, osteoporosis, vertigo, soft tissue injury, gastroenteritis, dyspepsia, brucella, and acute bronchitis were pre-diagnosed only among blue-collar workers, the relative frequencies of this disease were low (≤2.9). The result of comparisons between pre-diagnosed diseases and the work status is shown in Figure 3.

With respect to the comparison of pre-diagnosed diseases with high prevalence and work status, myalgia, type 2 diabete, and urinary infection showed significant differences ($F=15.22$; $p=0.049$, $F=50.04$; $p=0.005$, and $F=40.48$;$p=0.003$, respectively) between white-collar and blue-collar workers but no significant difference for acute pharyngitis, influenza, and fatty liver. Table 2 represents the results of the correlation analysis between the diseases with high prevalence and the work status, gender, age, height, and weight.

The blue-collar/white-collar work status had very weak positive correlation with type 2($r=0.236$, $p=0.005$) while very weak negative correlation with myalgia ($r=-0.167$, $p=0.049$) and urinary infection ($r=-0.248$, $p=0.003$). Also, the gender factor had a very weak negative correlation with influenza ($r=-0.211$, $p=0.012$) and age.

Figure 2: The pre-diagnosed diseases and relative frequencies according to the electronic health records

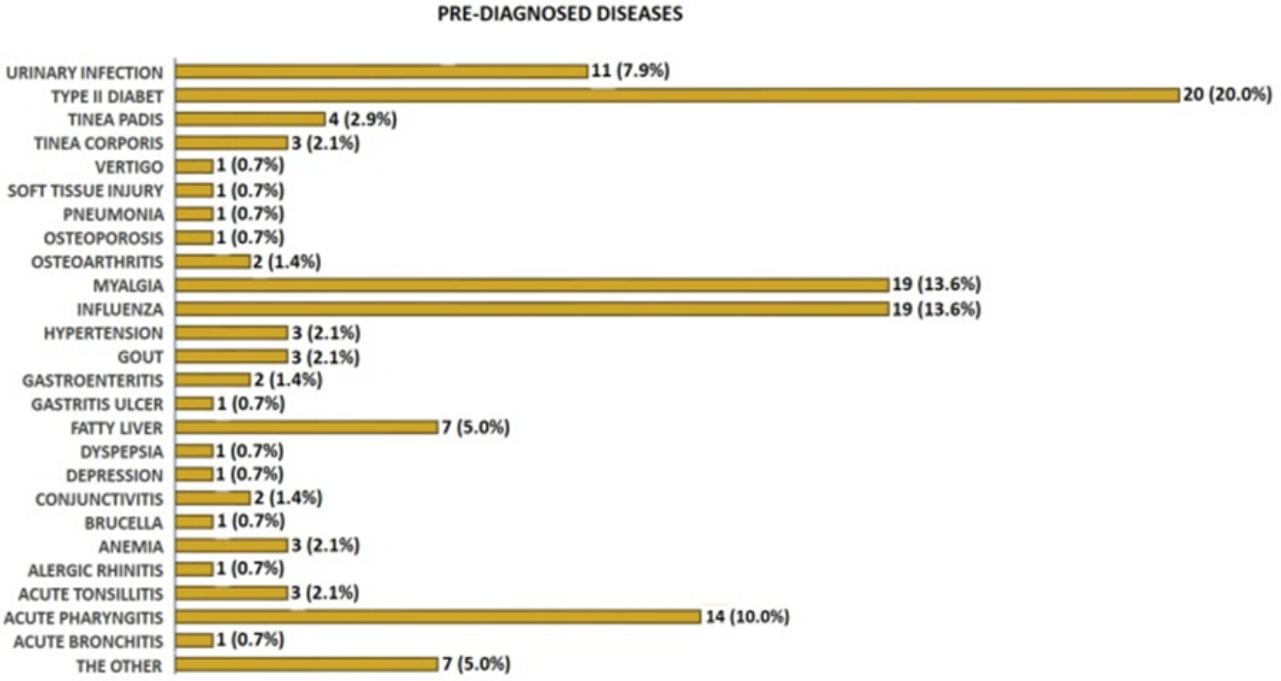
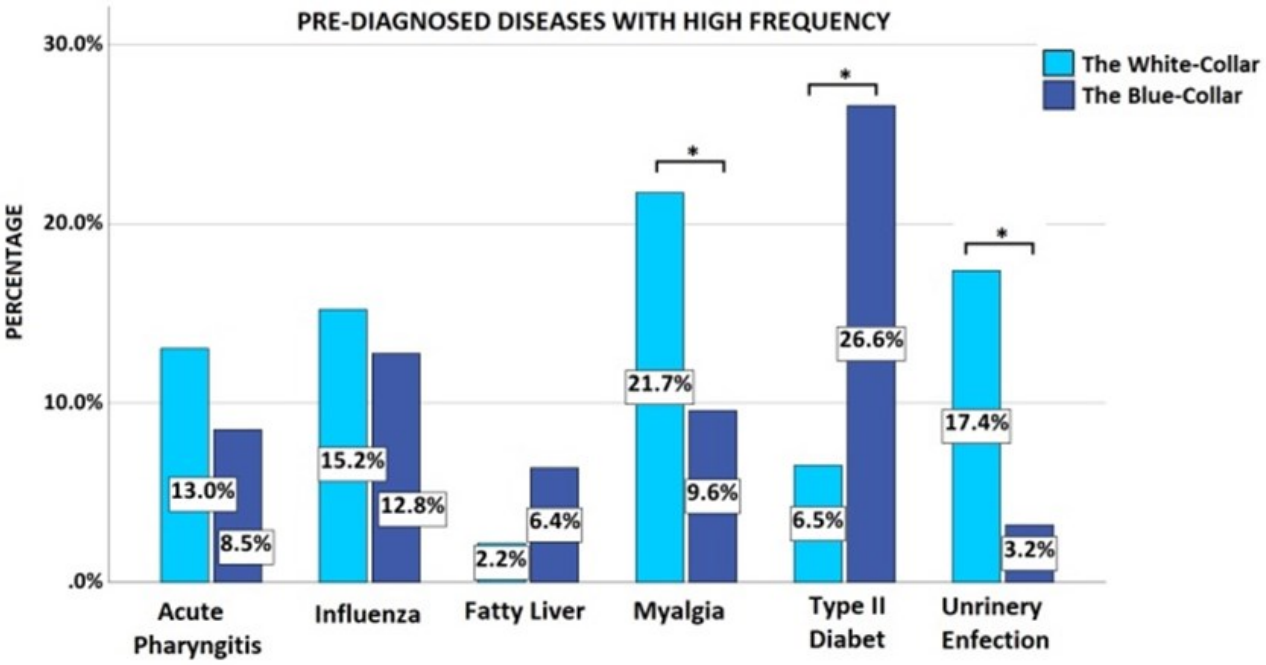


Figure 3: The result of the comparison between pre-diagnosed diseases and the work status



"*" denotes statistically significant level (P<0.05) for student-t test based on normal distributed variables.

Table 2: The results of correlation analysis

Variables		Work Status	Gender	Smoking	Age	Height	Weight
Acute Pharyngitis	r	-0.071	-0.073	0.153	-0.151	0.055	0.017
	p	0.405	0.389	0.070	0.075	0.521	0.844
Influenza	r	-0.034	0.067	-0.090	-0.211	0.065	-0.059
	p	0.693	0.430	0.290	0.012*	0.445	0.491
Fatty Liver	r	0.091	-0.096	0.106	-0.127	-0.101	0.003
	p	0.286	0.257	0.214	0.134	0.235	0.968
Myalgia	r	-0.167	0.067	0.040	0.016	-0.047	-0.106
	p	0.049*	0.430	0.639	0.849	0.584	0.211
Type II Diabetes	r	0.236	-0.210	-0.104	0.352	0.057	0.113
	p	0.005**	0.013*	0.222	0.000**	0.504	0.182
Urinary Infection	r	-0.248	0.175	-0.055	0.001	-0.121	-0.130
	p	0.003**	0.039*	0.520	0.988	0.156	0.127

r= Pearson correlation coefficient of correlation analysis for normally distributed features, p= statistically significant level Sig.(2-tailed), *= Correlation is significant at the 0.05 level, **= Correlation is significant at the 0.01 level

IV. DISCUSSION AND RESULTS

inşa For the definition of the work-related disease, many factors should be considered together, such as health problems and complaints, symptoms, work status, education, medical history, habits, physical and psychological status of the workers. Although many studies emphasized that blue-collar workers had higher risk factors [1-4]), the risk of the diseases can be different between the blue-collar workers and white-collar workers. In the present study, the EHRs were analyzed, which were filled by the health providers during the periodic health check-ups or examinations at the workplace. The information observed from EHRs included the patient's history, clinical examination, clinical or functional tests, and observations during follow-up by a physician or medical doctor. According to our knowledge, no study has been reported so far on the correlation between those factors and diseases based on the EHRs in Turkey.

First, the demographic and educational backgrounds of white-collar and blue-collar workers were compared. As expected result, the white-collar workers were well-educated people (see Table 1). When compared gender ratios, female workers were a higher ratio among white-collar than blue-collar workers. Female workers may do less intense, heavy, and hard work than the male in terms of physical conditions and workload. Regarding pre-diagnosed diseases with high prevalence, myalgia had a higher ratio among white-collar workers than blue-collar workers. Although many previous studies reported that myalgia had a high prevalence among the blue-collar workers [16-19]. The correlation analysis of the pre-diagnosed diseases and the work status showed that a statistically significant correlation between myalgia and the blue-collar/white-collar workers. Myalgia is relevant to persistent muscle pain caused by excessive and uncontrolled working of muscles. It can also be known as muscle rheumatism. Besides, some virus infections such as influenza and flu may cause myalgia. An important explanation for the high prevalence of musculoskeletal disorders relevant to myalgia among the blue-collar workers might be heavy work-load and body-based work conditions. Some previous studies reported that blue-collar workers have a higher risk than white-collar workers because they work more shifts [20-

22]. However, although the evidence in this study was limited, the findings presented the contrary of this general result. These results may be related to work status of the white-collar workers because of a long-term sitting and standing in the same position. Previous studies also confirmed that the neck, muscle aches, and musculoskeletal disorders have been more common among the office workers [23-26].

The present study showed that fatty liver and type 2 diabetes had a higher prevalence among blue-collar workers than white-collar workers. The reason of this result may be because of the high rate of male workers among blue-collar workers, besides their eating habits because fatty liver can be seen more in male workers relevant to lifestyle with excessive drinking, obesity, and low vegetable diet [27]. However, in the present study, the fatty liver had no correlation with the work status, gender, age. On the other hand, there was a correlation between type 2 diabetes and the blue-collar/white-collar work status. Type 2 diabetes had a higher prevalence among the blue-collar workers, which can be potentially associated with insulin insensitivity and obesity. Unhealthy nutrition habits and obesity can cause many health problems, such as diabetes, cardiovascular diseases, high blood pressure, some types of cancer, respiratory and musculoskeletal diseases. The differences between white-collar and blue-collar workers are relevant to not only education but also the health-promoting lifestyles such as exercise and nutrition [28,29]. Previous studies also reported that healthy eating habits and exercise activities can be better among the white-collar workers than the blue-collar workers depending on the education and socio-economic situation [28,30]. In the present study, urinary infection was more common among white-collar workers than blue-collar workers. Urinary infection had also a correlation with the gender and the work status. Urinary tract infections are quite common, especially among women that are fifty times more common in women when compared to men [31]. Our result may be because of the high number of female workers among white-collar workers. Furthermore, while influenza infection and acute pharyngitis had high prevalence among the workers, no correlation was found with the work status. A correlation was foun only between the influenza and age. Influenza and acute pharyngitis diseases may have appeared mostly in cold weather because of seasonal and climate conditions. Besides, insufficient nutrition, dressing, and preventive measures may have increased the prevalence of these diseases. We expect that the prevalence of these diseases has high prevalence among the blue-collar workers because they work outside and are exposed to too many infectious viruses, but these diseases had higher prevalence among the white-collar workers. This result may be due to office conditions, close distance, ventilation, etc.

There were some limitations in the present study. First, there were not high number of EHRs to be analyzed, in particular, the less number of the white-collar workers. Second, there were limited sources of information from EHRs because of retrospective study. For example, it was an important deficiency that health records did not include the source of information to evaluate the socio-economic inequalities of diseases and workers together. The reasons for the high prevalence of the diseases among white-collar workers and blue-collar may not only be related to the work status but also these may be related to non-work environment conditions, personal-subjective factors such as education, health-promoting lifestyles, exercise and nutrition [32,33]. To estimate the work-related diseases in future studies, detailed etiological studies of larger populations where disease consequences can be investigated about work-related risk factors and other potential non-work-

related factors. Thus, the findings from EHR can be realized at a scale that can serve as an estimate of the prevalence of various work-related diseases in larger populations.

In occupational health settings, using EHRs can facilitate the flow of information throughout the health care and treatment at workplace. The EHRs have the potential for sharing health-related information among health service providers. Furthermore, EHRs could be clinical decision support tools such as more informed clinical diagnosis and treatment plans, more effective policies, interventions, and preventative medicine strategies, better health care of the workers, and better workplace safety. Therefore, EHRs can be considered as a tool that documents abnormal findings and diagnoses with probable work-related attributes by investigating causes and relationships with the work status.

Consequently, this study concluded that EHRs could be potentially an important source for identifying and managing work-related diseases at the workplace. The health complaints and work status of workers should be considered together as an assessment of the extent to the workers' health problems are attributable to specific work status such as blue-collar and white-collar. Therefore, EHRs can provide health service providers better manage complete information about work-related diseases, working condition

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