

## Key Words, Essential Tools for Bibliographic Research: Analysis of Usage in ARCHIVOS DE BRONCONEUMOLOGÍA for Respiratory System Knowledge Areas

J.I. de Granda Orive,<sup>a</sup> F. García Río,<sup>b</sup> F. Roig Vázquez,<sup>a</sup> J. Escobar Sacristán,<sup>c</sup> T. Gutiérrez Jiménez,<sup>c</sup> and L. Callol Sánchez<sup>a</sup>

<sup>a</sup>Servicio de Neumología, Hospital General Básico de la Defensa, Valencia, Spain.

<sup>b</sup>Servicio de Neumología, Hospital Universitario La Paz, Madrid, Spain.

<sup>c</sup>Servicio de Neumología, Hospital Central de la Defensa, Madrid, Spain.

**OBJECTIVE:** To analyze key word usage in ARCHIVOS DE BRONCONEUMOLOGÍA, by comparing words used in the journal to those used in the Index Medicus database within various respiratory system knowledge areas, and to determine whether usage has changed over time.

**MATERIAL AND METHODS:** Original articles published in ARCHIVOS DE BRONCONEUMOLOGÍA from 1994 through 2001 were reviewed manually to gather the key words used. The list was translated to English and then compared to the medical subject heading (MeSH) terms used in the PubMed Browser.

**RESULTS:** Seven hundred six original articles published in the study period used a total of 1163 key words. Matches with MeSH terms were found for 62% (n=46) of the key words in smoking research, 48% (n=52) in asthma, 39% (n=82) in respiratory insufficiency and sleep disorders, 60% (n=49) in diagnostic and treatment techniques, 61% (n=35) in tuberculosis, 65% (n=87) in nontuberculous infections, 61% (n=121) in oncology, 60% (n=37) in circulation, 55% (n=47) in pleural diseases, 48% (n=21) in pathophysiology, and 64% (n=68) in interstitial diseases. We did not see a clear tendency in the evolution of the journal's key word usage for the knowledge areas analyzed during the study period. The percentage of matching key words held steady around 50% over the last 3 years.

**CONCLUSIONS:** Respiratory system key words in the knowledge areas we investigated are used correctly in ARCHIVOS DE BRONCONEUMOLOGÍA only about 50% of the time.

**Key words:** Descriptors. PubMed. Bibliographic search. Bibliometrics.

Las palabras clave como herramientas imprescindibles en las búsquedas bibliográficas. Análisis de las áreas del sistema respiratorio a través de ARCHIVOS DE BRONCONEUMOLOGÍA

**OBJETIVO:** Analizar las palabras clave utilizadas en las diferentes áreas de sistema respiratorio a través de la revista ARCHIVOS DE BRONCONEUMOLOGÍA, comparándolas entre sí, determinando su evolución y cotejándolas con las empleadas en el Index Medicus.

**MATERIAL Y MÉTODOS:** Se realizó una revisión manual de los originales publicados en ARCHIVOS DE BRONCONEUMOLOGÍA entre los años 1994 y 2001 y se anotó las palabras clave encontradas en ellos. Se efectuó una comparación de las palabras clave con las utilizadas por el MeSH Browser de PubMed, para lo que previamente tuvieron que traducirse al inglés.

**RESULTADOS:** Se encontraron 706 originales en el período estudiado. En ellos se emplearon un total de 1.163 palabras clave, de las que han resultado correctas, comparadas con las del MeSH, el 62% (n = 46) en tabaquismo, el 48% (n = 52) en asma, el 39% (n = 82) en insuficiencia respiratoria y trastornos del sueño, el 60% (n = 49) en técnicas diagnósticas y terapéuticas, el 61% (n = 35) en tuberculosis, el 65% (n = 87) en infecciones no tuberculosas, el 61% (n = 121) en oncología, el 60% (n = 37) en circulación, el 55% (n = 47) en pleura, el 48% (n = 21) en fisiopatología y el 64% (n = 68) en enfermedades intersticiales. No hemos encontrado una tendencia definida en la evolución de las palabras clave a lo largo de los años en las áreas analizadas. El porcentaje de palabras correctas se ha mantenido en torno al 50% en los últimos 3 años.

**CONCLUSIONES:** En las áreas de sistema respiratorio estudiadas sólo se emplean de una manera correcta alrededor del 50% de las palabras clave.

**Palabras clave:** Descriptores. Pub-Med. Búsqueda bibliográfica. Bibliometría.

### Introduction

ARCHIVOS DE BRONCONEUMOLOGÍA, first published in 1964, has acquired scientific status over time, as shown by its inclusion in the various international databases.<sup>1,2</sup> The official organ of the Spanish Society of

Correspondence: Dr. J.I. de Granda Orive.  
Cavanilles, 43, 7.º E. 28007 Madrid, España.  
E-mail: igo01m@saludalia.com

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Pulmonology and Thoracic Surgery (SEPAR) and the Latin American Thoracic Society (ALAT), ARCHIVOS DE BRONCONEUMOLOGÍA is currently a publication that enjoys considerable prestige in respiratory medicine and thoracic surgery and of course it is the most important Spanish language journal in the specialty. The journal is cited in the most prestigious international source journals and has acquired a respectable impact factor.<sup>1,3-6</sup>

ARCHIVOS DE BRONCONEUMOLOGÍA has gradually adapted to the international guidelines that reflect formal publication quality.<sup>7</sup> Key words were introduced to that end in 1994.<sup>2</sup>

Key words—or descriptors, a term that is not synonymous given that it assumes adherence to a controlled document vocabulary, or thesaurus—are essential tools for bibliographic research. Descriptors allow all related works to be located in large databases,<sup>8</sup> improving document retrieval. It is important to consider that the most common user errors in large database searches stem from inappropriate selection of search terms.<sup>8</sup> Key words are essential tools for locating works related to an area of interest, given that they are the means by which articles are cataloged and coded. Their importance should not be underestimated because problems with classification can impede a document's diffusion and even cause it to fall into oblivion.<sup>9</sup> The medical subject headings (MeSH) of the thesaurus of the US National Library of Medicine are the descriptors recommended for use as key words.<sup>8,9</sup>

The aim of the present study was to analyze key word use in several respiratory medicine knowledge areas recognized by SEPAR in comparison with the MeSH descriptors used by Index Medicus. We also set out to compare the areas and determine how usage had changed over time.

## Material and Methods

Original research articles published in ARCHIVOS DE BRONCONEUMOLOGÍA from 1994 through 2001 were reviewed manually in order to record the key words used. The articles covered the various knowledge areas related to the respiratory system—smoking, asthma, respiratory insufficiency and sleep disorders, diagnostic techniques and treatments, tuberculosis, nontuberculous infections, oncology, circulation, the pleura, pathophysiology, and interstitial diseases. The key words were compared with terms in the MeSH browser in PubMed, the online bibliographic search tool for Index Medicus. Specifically, the key words found in the articles were translated to English by entering them into the tool for that purpose available at <http://decs.bvs.br>, and they were also compared with the key words published in English in the journal ARCHIVOS DE BRONCONEUMOLOGÍA itself. This process was carried out on a random sample of 75 original articles from all areas, and all key word translations were found to be correct. They were then compared with controlled vocabulary for Index Medicus on the MeSH browser.

## Statistical Analysis

The SPSS version 8.0 software package for Windows (SPSS, Inc, IL, United States of America) was used to

analyze the data. For descriptive analysis, quantitative variables were expressed as arithmetic means (SD). The Dunnett method for analysis of variance (ANOVA) of continuous quantitative variables was used to compare means for more than 2 groups. The level of significance was set at  $P < .05$  (95% confidence interval).

## Results

Among the original articles published by ARCHIVOS DE BRONCONEUMOLOGÍA in the 1994 through 2001 period, 706 were located in the knowledge areas studied (26 for smoking, 34 for asthma, 74 for respiratory insufficiency and sleep disorders, 49 for diagnostic and therapeutic techniques, 40 for tuberculosis, 105 for nontuberculous infections, 153 for oncology, 37 for circulation, 75 for pleura, 24 for pathophysiology, and 89 for interstitial diseases). A total of 1163 key words were used, 74 in smoking, 108 in asthma, 211 in respiratory insufficiency and sleep disorders, 82 in diagnostic and therapeutic techniques, 57 in tuberculosis, 134 in nontuberculous infections, 199 in oncology, 62 in circulation, 85 in pleura, 44 in pathophysiology, and 107 in interstitial diseases. Matching MeSH terms were found for 62% (n=46) of the key words in smoking research, 48% (n=52) in asthma, 39% (n=82) in respiratory insufficiency and sleep disorders, 60% (n=49) in diagnostic and therapeutic techniques, 61% (n=35) in tuberculosis, 65% (n=87) in nontuberculous infections, 61% (n=121) in oncology, 60% (n=37) in circulation, 55% (n=47) in pleural diseases, 48% (n=21) in pathophysiology, and 64% (n=68) in interstitial diseases (Table 1). Table 2 shows the mean number of original articles overall per knowledge area, the mean numbers of key words and correct key words per area, and the mean percentage of correct key words per area.

No distinct pattern was seen over the years with regard to the percentages of correct key words, which held to approximately 50% in the last three years of the study (Figures 1 and 2).

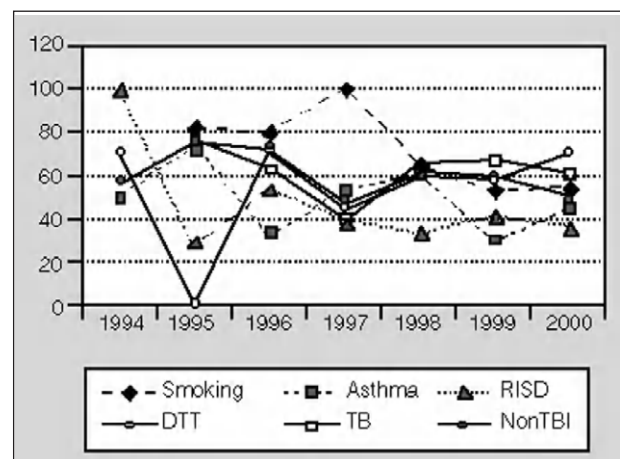


Figure 1. Variations in percentages of key words matching medical subject headings over the studied years in smoking, asthma, respiratory insufficiency and sleep disorders (RISD), diagnostic and treatment techniques (DTT), tuberculosis (TB), and nontuberculous infections (NonTBI).

TABLE 1  
Key Word Accuracy, by Respiratory System Knowledge Areas

	1994	1995	1996	1997	1998	1999	2000	Total
<b>Smoking</b>								
No. of original articles	1	2	2	1	8	5	7	26
No. of key words	0	6	5	2	22	15	24	74
No. of correct key words	0	5	4	2	14	8	13	46
Correct key words, %	–	83	80	100	64	53	54	62
<b>Asthma</b>								
No. of original articles	3	5	1	7	3	7	8	34
No. of key words	6	15	3	25	10	24	25	108
No. of correct key words	3	11	1	13	6	7	11	52
Correct key words, %	50	73	33	52	60	29	44	48
<b>Respiratory insufficiency and sleep disorders</b>								
No. of original articles	9	10	8	7	9	16	15	74
No. of key words	2	27	26	18	27	61	50	211
No. of correct key words	2	7	14	7	9	25	18	82
Correct key words, %	100	26	54	39	33	41	36	39
<b>Diagnostic and therapeutic techniques</b>								
No. of original articles	8	1	5	7	15	8	5	49
No. of key words	7	1	7	15	31	14	7	82
No. of correct key words	5	0	5	7	19	8	5	49
Correct key words, %	71	0	71	47	61	57	71	60
<b>Tuberculosis</b>								
No. of original articles	–	5	7	6	11	1	10	40
No. of key words	–	9	16	8	11	3	10	57
No. of correct key words	–	7	10	3	7	2	6	35
Correct key words, %	–	78	63	38	64	67	60	61
<b>Nontuberculous infections</b>								
No. of original articles	12	14	19	20	11	20	9	105
No. of key words	7	35	37	16	10	17	12	134
No. of correct key words	4	27	27	7	6	10	6	87
Correct key words, %	57	77	73	44	60	59	50	65
<b>Oncology</b>								
No. of original articles	24	10	25	23	33	23	15	153
No. of key words	9	13	36	29	46	35	31	199
No. of correct key words	2	11	21	16	27	24	20	121
Correct key words, %	22	85	58	55	59	69	65	61
<b>Circulation</b>								
No. of original articles	–	8	2	7	4	11	5	37
No. of key words	–	12	7	18	7	15	3	62
No. of correct key words	–	8	3	12	5	8	1	37
Correct key words, %	–	67	43	67	71	53	33	60
<b>Pleura</b>								
No. of original articles	–	14	15	14	12	12	8	75
No. of key words	–	17	31	24	3	8	2	85
No. of correct key words	–	10	18	13	3	3	0	47
Correct key words, %	–	59	58	54	100	38	0	55
<b>Pathophysiology</b>								
No. of original articles	–	4	4	5	3	–	8	24
No. of key words	–	6	4	11	2	–	21	44
No. of correct key words	–	3	3	6	0	–	9	21
Correct key words, %	–	50	75	55	0	–	43	48
<b>Interstitial lung diseases</b>								
No. of original articles	10	15	11	16	12	9	16	89
No. of key words	3	27	18	23	11	12	13	107
No. of correct key words	2	14	12	14	8	9	9	68
Correct key words, %	67	52	67	61	73	75	69	64

Table 3 shows the most frequently used key words by area and whether or not they matched MeSH terms.

In comparisons by Dunnet ANOVA between years one by one and together, the only significant difference was between 1997 and 1994 ( $P<.05$ ) for number of key words and number of correct key words. However, that finding can be explained by the fact that the number of key words in 1994 was lower because the journal introduced their use late in the volume. Likewise, significant differences between knowledge areas were found with regard to number of original articles (smoking vs nontuberculous infection, oncology, pleura, and interstitial diseases,  $P<.005$ ; asthma vs nontuberculous infections, oncology, pleura, interstitial diseases,  $P<.05$ ; nontuberculous infections vs pathophysiology,  $P<.05$ ; oncology vs diagnostic and therapeutic procedures, tuberculosis, circulation, and pathophysiology,  $P<.05$ ; pleura vs pathophysiology,  $P<.05$ ; pathophysiology vs interstitial diseases,  $P<.05$ ) and with regard to number of key words per original article (asthma vs diagnostic and therapeutic procedures, nontuberculous infections, oncology, pleura, and interstitial diseases  $P<.05$ ).

## Discussion

The present study was not designed to analyze whether or not the key words used were the ideal choices for each original article but rather to determine whether authors chose terms that were in the controlled vocabulary list used by Index Medicus. We found that key words in about half the original articles in ARCHIVOS DE BRONCONEUMOLOGÍA were MeSH terms. Such a low percentage will cause problems in the diffusion of the documents and may even lead to their being entirely overlooked due to problems of identification.<sup>8,9</sup> We therefore stress the importance of choosing key words appropriately. To improve key word identification, it would be useful to use the National Library of Medicine's MeSH thesaurus—which might be defined as a dictionary or catalog of terms according to the Real Academia Española (<http://www.rae.es>).

The MeSH thesaurus provides a controlled vocabulary for biomedical reference analysis. The list contains the medical terms used to index journal articles and catalog books and audiovisual material.<sup>10</sup> It is the main terminological tool for Index Medicus online (MEDLINE) and allows all databases so-indexed to be searched in a way that retrieves related supplementary key words used to describe single concepts, including a brief description of them. MeSH terminology also brings consistency to biomedical bibliographic indexes.<sup>10</sup> Moreover, the terms are organized hierarchically in tree structures so that the system can be exploded or narrowed with qualifiers. The controlled MeSH vocabulary is composed of titles or "headings." Several thousand main descriptors are supplemented by over 120 000 supplementary ones with cross references.

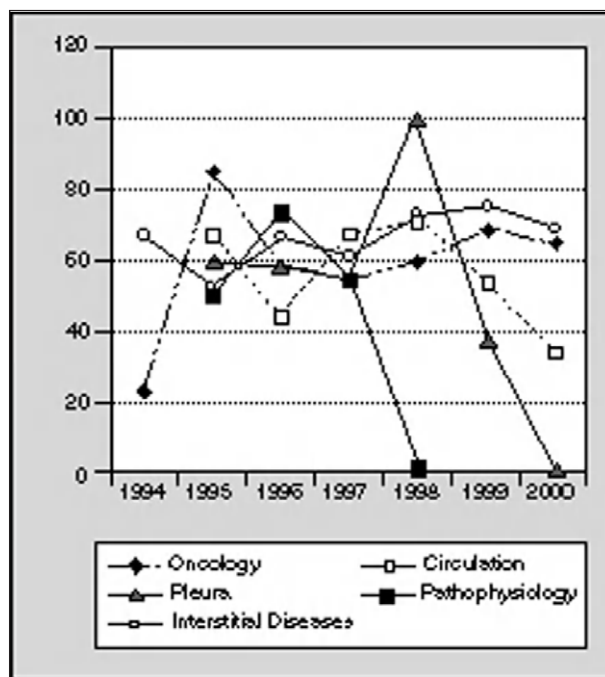


Figure 2. Variations in percentages of key words matching medical subject headings over the studied years in oncology, circulation, pleura, pathophysiology, and interstitial diseases.

TABLE 2  
Original Articles and Key Words for All Respiratory System Knowledge Areas

	Mean (SD)
No. of original articles	9.8 (6.51)
No. of key words	16.1 (12.49)
No. of correct key words	8.9 (6.89)
Correct key words, %	56.5 (20.32)

Subheadings, or qualifiers, describing particular aspects of a main descriptor are also available.<sup>10,11</sup> The MeSH browser is the tool used to locate medical descriptors and see how they cross reference. It is therefore a thesaurus whose construction is based on groups of categories or terms that are hyperlinked vertically or horizontally to show how they are related. Searches can be carried out on various levels of specificity. The quality of an information retrieval system is determined by the efficient assignment of controlled vocabulary, so that documents can be located easily.<sup>10</sup> To facilitate understanding of these concepts, the SEPAR web page currently provides a tutorial on MeSH terms.<sup>10</sup>

Key words are short natural language terms that are included in the indexers' thesaurus. All investigators must bear in mind a range of journals in their field as well as the MeSH terms employed therein. Information is structured according to a tree schema that branches out from general to specific. It is important to start searching broadly and gradually narrow the search fields, as sensitivity is lost if the searcher works in the opposite

TABLE 3  
Most Commonly Used Key Words, Matched Against MeSH Terms\*

Most Common Key Words in Each Area	Number (%)	Matching	Most Common Key Words in Each Area	Number (%)	Matching
<b>Smoking</b>			<b>Nontuberculous infections</b>		
Prevalence	6 (23)	Yes	Pneumonia	5 (4)	Yes
Smoking	6 (23)	Yes	Acyclovir	3 (2)	Yes
School/s	4 (15)	Yes	Pulmonary aspergilloma	3 (2)	No
Carbon monoxide	2 (8)	Yes	Aspergillosis	3 (2)	Yes
Pneumologists	2 (8)	No	Cystic fibrosis	3 (2)	Yes
Military Personnel	2 (8)	Yes	Community-acquired pneumonia	3 (2)	No
			Varicella pneumonia	3 (2)	No
<b>Asthma</b>			<b>Oncology</b>		
Quality of life	3 (12)	Yes	Lung cancer	18 (9)	Yes
Questionnaires	3 (12)	Yes	Surgery	7 (4)	Yes
Child/children	3 (12)	Yes	Pulmonary metastasis	7 (4)	No
Epidemiology	2 (8)	Yes	Video-assisted thoracoscopy	7 (4)	No
Bronchial hyperreactivity	2 (8)	Yes	Bronchogenic carcinoma	5 (3)	Yes
Bronchial provocation	2 (8)	Yes	Staging	5 (3)	Yes
Chronic bronchitis	2 (8)	Yes	Survival	4 (2)	Yes
<b>Respiratory insufficiency and sleep disorders</b>			<b>Circulation</b>		
COPD	26 (35)	No	Pulmonary embolism	4 (6)	Yes
Sleep apnea syndrome	7 (9)	Yes	Embolization	3 (5)	Yes
Polysomnography	5 (7)	Yes	Hemoptysis	3 (5)	Yes
Epidemiology	4 (5)	Yes	Diagnostic	2 (3)	Yes
Respiratory muscles	4 (5)	Yes	Rendu-Osler-Weber disease	2 (3)	No
Exercise test	4 (5)	Yes	Vena cava superior syndrome	2 (3)	Yes
Chronic bronchitis	3 (4)	Yes			
Sleep apnea	3 (4)	Yes	<b>Pleura</b>		
Primary health care	3 (4)	Yes	Pleural effusion	10 (12)	Yes
Oxygen therapy	3 (4)	Yes	Spontaneous pneumothorax	5 (6)	No
Prevalence	3 (4)	Yes	Cytology	3 (4)	Yes
			Pneumothorax	3 (4)	Yes
<b>Diagnostic and therapeutic techniques</b>			Thoracoscopy	3 (4)	Yes
Lung transplantation	5 (6)	Yes	Video-assisted thoracoscopy	3 (4)	No
Bronchoalveolar lavage	3 (4)	Yes			
Survival	3 (4)	Yes	<b>Pathophysiology</b>		
Fiberoptic bronchoscope	2 (2)	Yes	Total lung capacity	2 (5)	Yes
Rigid bronchoscope	2 (2)	No	Diaphragm	2 (5)	Yes
Foreign body	2 (2)	Yes	COPD	2 (5)	No
Tracheal stenosis	2 (2)	Yes	Spirometry	2 (5)	Yes
Fiberoptic bronchoscopy	2 (2)	No	Reference values	2 (5)	Yes
Mediastinoscopy	2 (2)	Yes			
Computed tomography	2 (2)	Yes	<b>Interstitial diseases</b>		
<b>Tuberculosis</b>			Bronchoalveolar lavage	5 (5)	Yes
Tuberculosis	8 (14)	Yes	Lung disease, interstitial	4 (4)	Yes
Resistance	3 (5)	No	Tracheobronchial amyloidosis	3 (3)	No
BCG	2 (4)	Yes	Biopsy	3 (3)	Yes
Pleural effusion	2 (4)	Yes	Computed tomography	3 (3)	Yes
Tuberculosis infection	2 (4)	Yes			
<i>Mycobacterium tuberculosis</i>	2 (4)	Yes			
AIDS	2 (4)	Yes			
HIV	2 (4)	Yes			

\*MeSH indicates medical subject headings; BCG, Bacillus Calmette-Guerin vaccine; COPD, chronic obstructive pulmonary disease; AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus.

direction. Descriptor usage has sometimes been criticized because the terms are introduced according to the indexer's interpretation. However, subjectivity is minor if the indexer is using a controlled vocabulary, or thesaurus; the possibility of adding qualifiers to go deeper into a subject is also present. Below each abstract, therefore, we should identify a series of key words that will help indexers recognize cross references. The Index Medicus MeSH terms should be used for this purpose, but if a field is new and terms are not yet available, other terms

in common use should be employed.<sup>8,9,12</sup>

Ideal key word and frequent key word use have been analyzed in various branches of biomedical science. In primary health care, Bravo and Campos<sup>13</sup> have mentioned the relative agreement among expert indexers and have reviewed previous experience with MeSH descriptors in order to determine the preferred topics of investigation in their field. Others have used personalized adaptations of MeSH terms<sup>14</sup> to identify preferred topics in other sciences or to determine the

journals most cited in a field.<sup>15</sup>

The most important finding from our study is that only half the key words in the knowledge areas we looked at were listed MeSH terms. However, it should be emphasized that the majority of the most commonly used terms were in fact MeSH. Noteworthy was the frequent use of the abbreviation COPD (*EPOC* in Spanish) in the knowledge area of respiratory insufficiency and sleep disorders, even though it will never be recovered in a search given that the concept is not included as such by Index Medicus.<sup>16,17</sup>

The abundance of scientific documents makes bibliometric analysis difficult if it is impossible to retrieve all of them. Therefore, information databases are constructed. Whether interdisciplinary or specialized, such structured databases, when properly used, provide bibliographic data in fields to facilitate bibliometric counting, analysis, and statistical processing of documents. From the descriptive information stored for documents come the elements needed for bibliometrics, namely the author or authors, name of the publication, year, type of document, language, references, abstract, and key words or descriptors. Thus, the importance of information in the key word field is evident.

In conclusion, only about 50% of the key words used in the respiratory medicine knowledge areas analyzed are used correctly, in accordance with the MeSH vocabulary applied by the Index Medicus. Nonadherence to MeSH terminology will prevent our documents from being retrieved in bibliographic searches such that they will be hidden from scientists who might be interested in them.

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