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Scientific production and bibliometric impact of a representative group of Spanish internists with established research careers☆

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Abstract
Objective: To study the temporal evolution of the bibliometric indices of internists with established research experience in order to predict the future behavior of researchers and to assess whether output focused on a specific area of internal medicine helps obtain greater visibility than in general internal medicine.
Materials and methods: We analyzed a representative group of members of the Spanish Society of Internal Medicine (SEMI) based on data obtained from the Web of Science. As an indicator of productivity, we analyzed the number of articles published. As impact indicators, we studied the impact factor (IF), the number of citations and the *h*-index.
Results: We analyzed 42 internists, with a mean experience of 30 years and a total of 6655 publications. The mean (SD) number of studies was 158 (96), the number of citations was 2850 (2865), the IF was 711 (549) and the *h*-index was 25 (11). These figures were higher for the specialist internists than for the general internists. There was a good relationship between the impact and productivity indicators ($R^2 = 0.61–0.89$) and a poor relationship between these indicators and the years of experience ($R^2 = 0.13–0.19$). The temporal evolution of these indicators for

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each individual researcher and for all researchers as a whole was adjusted to a second-degree polynomial model, with the *h*-index having the highest R^2 values.
Conclusions: The *h*-index is the factor that had the best adjustment and least variability and could therefore help predict the future scientific output and impact of internists. The specialist researchers achieved greater visibility than the general internists.

PALABRAS CLAVE
Índice *h*;
Bibliometría;
Impacto bibliométrico;
Factor de impacto;
Producción científica

Producción científica e impacto bibliométrico de un grupo representativo de internistas españoles con trayectoria investigadora consolidada

Resumen
Objetivo: Estudiar la evolución temporal de los índices bibliométricos de internistas con una trayectoria investigadora consolidada, con el fin de predecir el comportamiento futuro de un investigador y evaluar si la producción centrada en un área concreta de la medicina interna permite obtener mayor visibilidad que en medicina interna general.
Material y método: Se analizó un grupo representativo de miembros de la Sociedad Española de Medicina Interna a partir de los datos obtenidos de la Web of Science. Como indicador de productividad se analizó el número de artículos publicados y como indicadores de repercusión el factor de impacto, el número de citas y el índice *h*.
Resultados: Se analizó a 42 internistas, con una media de 30 años de experiencia y un total de 6.655 publicaciones. La media (DE) del número de trabajos fue de 158 (96), el número de citas 2.850 (2.865), el factor de impacto 711 (549) y el índice *h* 25 (11), siendo superiores estos datos en los internistas especializados respecto a los generalistas. Hubo buena relación entre indicadores de repercusión y de productividad (R^2 = 0,61–0,89) y poca entre estos y los años de experiencia (R^2 = 0,13–0,19). La evolución temporal de estos indicadores para cada investigador individual, y para todos ellos en conjunto, se ajustó a un modelo polinomial de segundo grado, teniendo el índice *h* las R^2 más altas.
Conclusiones: El índice *h* es el que mejor se ajusta y menos variabilidad presenta, lo cual podría permitir predecir la producción e impacto científico futuro de los internistas. Los investigadores especializados obtienen más visibilidad que los generalistas.

Background

Measuring scientific output has been an object of analysis in practically all medical disciplines. These assessments are fundamental when granting healthcare and teaching posts, research project funds, prizes and even when designing public policies.[1–3] Although the financial resources for conducting science have always been limited, the mechanisms of selection for assigning funds play a particularly relevant role in the current context of the financial crisis and the marked competition for available resources. The selection process is complex and not exempt from challenges, given that determining the quality of a research study is a complex task that involves considering a considerable quantity of issues. A single methodology therefore cannot be used for its evaluation.

It is assumed that peer review is the best method for assessing an article. Nevertheless, this review process is subject to a certain level of subjectivity, leading to a varying degree of reliability.[4] Several authors have proposed tools that, with the application of statistical or mathematical methodology, enable a more neutral assessment of studies performed by researchers in various fields. One of the first steps in this regard was provided by Eugene Garfield,[3] with the development of the impact factor (IF). This method's original purpose was to assess the quality of journals. With time, however, it became a tool for assessing researchers. This strategy is not without controversy[4] because a journal can contain articles of greater and lesser quality. However, the IF gained ground and even incorporated the accumulated IF within the individual scale (the sum of the IFs of the publications during a specific period),[5] which has become one of the most widely used tools for assessing the scientific output of researchers.

To overcome the IFs problems, various alternatives have been proposed, such as the Eigen factor, the source normalized impact per paper (SNIP), the Scimago Journal Rank (SJR) and the Article Influence Score.[6–8] All of these options have their advantages and disadvantages. One of the alternatives that has been gaining the most coverage in recent years was proposed in 2005 by Jorge Hirsch, a physicist from the University of California.[9] The indicator, known as the *h*-index, includes a researcher's output and impact in a single parameter and, therefore, better describes the researcher's influence than that of the journal in which they publish. The indicator postulates the following: ''A scientist has a specific h-index if h of their N_p studies received at least h citations each, and the other $(N_p - h)$ studies have at most h citations each.''[9] For example, an author has an h-index of 7 if they have 7 articles that have been cited at least 7 times each. This indicator helps measure the quality of the researcher more effectively, because it better differentiates influential authors in the scientific world (those who are frequently cited) from those who simply publish numerous studies.[1–10] The disadvantages of the h-index include the fact that it is not sufficiently adequate for comparing different fields of knowledge. Due to the index's dependence on the number of citations created within the specialty, the index is subject to the number of researchers of each field and the speed with which the specialty ages or become obsolete.[11]

In Spain, there are several studies measuring overall scientific output,[12,13] as well as output in certain specific areas.[13–17] To date, no study has assessed the behavior of these visibility and impact indicators for researchers with established experience in the field of internal medicine. Our objective was to study the temporal evolution of the bibliometric indices in a group of internists with established research experience in order to predict the future behavior of researchers and to assess whether output focused on a specific area of internal medicine helps obtain greater visibility than in general internal medicine.

Materials and methods

A descriptive study was conducted from April 15 to 18, 2013, with a series of researchers who were selected based on a search in the Science Citation Index Expanded, which can be found in the Web of Science (WoS). This database is accessed from hospitals, universities and research centers through the Spanish Foundation of Science and Technology (http://www.accesowok.fecyt.es/). We extracted 100 of the most productive authors whose publications (we ruled out abstracts and minutes) were affiliated with the terms ''Spain'' and ''Department of Internal Medicine'' (in English and Spanish). We subsequently removed 25 authors with very common last names due to the likelihood that various authors could be included under the same last name (homonymy). Of the remaining authors, we chose only those who were members of the Spanish Society of Internal Medicine (SEMI) as an indicator of belonging to the specialty. Of the remaining 57 authors, we conducted an analysis of their individual output. We selected those who (1) had been conducting research for 15 years or more; (2) had published 45 or more articles; (3) had a minimum accumulated IF of 100 points (we used the IF for 2011, regardless of the year the article was published, according to the Journal Citation Report [JCR], which was also viewable on the WoS)[18]; and (4) had an h-index $\geq$10 at the time the database was accessed. This process further identified 3 ''authors'' who had counterparts and were therefore rejected. Ultimately, 42 authors were included in the final analysis. The names of these researchers were kept in a disassociated private database and have not been made public in the present study.

The selected authors were divided into two groups using the classification of studies offered by the WoS: (1) authors with scientific output in highly diverse fields (none exceeds 50%) or whose main field ($\geq$50%) is general internal medicine, who will be referred to as ''general researchers'' and (2) authors with 50% or more of their publications in a field other than general internal medicine (e.g., infectious diseases/microbiology, rheumatology, hepatology and cardiovascular) and who will be referred to as ''specialist researchers'' throughout this text.

As a productivity indicator, we used the number of published documents. As impact indicators, we used the accumulated IF, the total number of citations received and the h-index. These indices were calculated when the data acquisition for the study was conducted and for each year of the researcher's experience, considering year 1 the year in which the researcher published their first indexed study. We therefore aimed to create a researcher experience arc for the individuals, the subgroups and the group as a whole over time.

From the acquired data, we calculated the mean and median measures of central tendency. As measures of dissemination, we considered the standard deviation (interquartile range) and the coefficient of variation. To assess the association among the quantitative variables, we used a linear regression model. In addition to the linear model, we used a second-degree polynomial model to assess the evolution of the output and impact markers according to the years of experience. The degree of association and its statistical significance were quantified by calculating R^2 and the p-value, respectively. For all statistics employed, statistical significance was considered when the p-value was <.05 or if there was no overlap between the 95% confidence intervals (CI). The database was prepared using Microsoft Excel®, and the calculations were performed with SPSS® version 18.

Results

We analyzed 42 internists who signed their articles as members of a Spanish department of internal medicine and as members of SEMI. The selected group had a mean research experience of 30 (7.1) years since the first publication. We counted a total of 6655 publications for the entire group in 772 different journals. The 20 journals with the highest number of publications represented 46.8% (3134 publications) of the total. In this group, we observed that, with the exception of three journals, the chosen sources for dissemination were in English (Table 1). In terms of IF, there was a wide range in the means of dissemination for publishing studies. On one end, we had the *New England Journal of Medicine* (43 articles), with an IF of 53,298. On the other end, we had journals such as the *European Journal of Hospital Pharmacy Practice* and *Annals of Ophthalmology* (2 articles), with IFs of 0.154 and 0.090, respectively.

Table 2 shows the results for the researchers' most common indicators of production and impact. We can see that the number of accumulated citations was the indicator with the highest coefficient of variation, in contrast to the h-index. When the general researchers (n = 10) were compared with the specialist researchers (n = 32), we could see that output and visibility were higher for the latter group.

The relationship among the impact indicators (number of citations, IF and h-index) was good and statistically

Table 1 The 20 main means of dissemination used by the authors of the present study.

Journal	Number of publications (%)
Medicina Clínica	1216 (18.3)
Revista Clínica Española	375 (5.7)
Lupus	153 (2.30)
Annals of the Rheumatic Diseases	144 (2.20)
Clinical Infectious Diseases	132 (2)
Journal of Hepatology	86 (1.3)
European Journal of Clinical Microbiology & Infectious Diseases	84 (1.3)
Journal of Hypertension	82 (1.2)
Medicine	82 (1.2)
AIDS	81 (1.2)
Antimicrobial Agents and Chemotherapy	81 (1.2)
Infectious Diseases and Clinical Microbiology	81 (1.2)
Arthritis and Rheumatism	75 (1.1)
Journal of Rheumatology	72 (1.1)
Lancet	72 (1.1)
Clinical Microbiology and Infection	70 (1.1)
Antiviral Therapy	69 (1)
Journal of Clinical Microbiology	63 (1)
Journal of Antimicrobial Chemotherapy	60 (1)
Archives of Internal Medicine	56 (1)
Total	3134 (46.8)

significant, with R^2 values ranging from 0.65 to 0.89 (data not shown). Similarly, the relationship between any of these indicators and the output indicator (number of published studies) was also statistically significant but somewhat less, with R^2 values between 0.61 and 0.82. This caused a substantial change in the ordering of each author depending on the marker by which they were evaluated. For researcher 37, this change resulted in a shift of 21 places out of the possible 42 (Table 3). Likewise, research experience was barely related to the output and impact indicators. In this respect, the *h*-index achieved the best relationship (R^2 = 0.19) (Fig. 1).

When we analyzed the temporal evolution of the indicators for the 42 researchers, we found that there was an excellent fit to a second-degree polynomial model for all researchers and all indicators. In this case, the R^2 for each author was always >0.90 (Fig. 2). Similarly, we observed good fit for the overall group, and the *h*-index once again achieved the best fit (Fig. 3).

Discussion

There are several noteworthy results from the present study conducted with a representative group of high-level researchers in the internal medicine setting. There is a good correlation among the various impact indicators, with the *h*-index showing the least variability. There is a slight relationship between the scientific impact and the years of experience or production achieved. The positioning of the analyzed researchers changes depending on the selected indicator. The evolution of the authors, both individually and collectively, fit well to a second-degree polynomial model for all evaluated indicators, with the *h*-index having the best fit to the model. When the overall analysis of the authors was performed, a curve was defined with a CI in which it was likely to find an author with the same characteristics analyzed in this study. There is a preference for journals and for the English language when publicizing the studies. Finally, we observed that the authors who were mainly focused on a field of internal medicine had greater scientific output and impact than the general practitioner internists.

The good correlation among the impact indicators is understandable given that they quantify the same characteristic. It is of even more interest that there is a low correlation between scientific output and impact and even less between years of experience and impact. Despite the fact that all of the authors were grouped into the same field of knowledge (internal medicine), the impact achieved by each author rarely depended on their output (an author can be prolific but largely unrecognized) and even less on their years of experience (an author's visibility is scarcely related to the number of years they have spent in research). The better results achieved by the authors in the specialist research group (Table 2) could be due to publications in journals with higher IFs, such as those corresponding to fields of infectious diseases and immunology. These authors would

Table 2 Overall characteristics of the 42 researchers analyzed in the present study and comparison between the group of general practitioner researchers and the group of specialist researchers.

	All researchers			General practitioner researchers (n = 10)	Specialist researchers (n = 32)	*p*-Value[a]
	Mean (DE)	Median (Q_1/Q_3)	CV	Median (Q_1/Q_3)	Median (Q_1/Q_3)	
Years of experience	30 (7)	32 (26/36)	23%	31 (25/35)	34 (29–38)	.18
No. of published studies	158 (96)	149 (87/187)	60%	126 (70/169)	180 (142/358)	.01
No. of accumulated citations	2.850 (2865)	1.672 (974/4184)	101%	1.372 (939/2140)	4.438 (2686/8162)	.001
Accumulated impact factor	711 (549)	529 (358/898)	77%	433 (315/704)	1.065 (781/2037)	<.001
h-Index	25 (11)	22 (17/30)	45%	20 (15/26)	34 (28/46)	.001

Abbreviations: SD, standard deviation; min/max, minimum/maximum; CV, coefficient of variation; Q1, Q3, quartile 1 and quartile 3, respectively.

[a] Calculated using the Mann–Whitney *U* parametric test.

Table 3 Differences in the order of the authors according to the various evaluated parameters of output and impact. The table is presented with the authors ordered from top to bottom following the criterion of greater to lesser experience.

Years of experience (author reference number)	Output		Impact	
	No. of studies (ordinal position)	No. of citations (ordinal position)	Impact factor (ordinal position)	*h*-Index (ordinal position)
39 (1)	166 (16)	4573 (8)	1174.136 (6)	30 (10)
39 (2)	88 (32)	1087 (29)	336.049 (33)	19 (28)
39 (3)	171 (13)	2777 (13)	808.694 (13)	28 (14)
37 (4)	291 (5)	7814 (4)	2014.219 (3)	40 (6)
37 (5)	153 (21)	999 (31)	476.777 (24)	17 (30)
36 (6)	125 (26)	1573 (22)	364.984 (32)	22 (21)
36 (7)	463 (1)	9204 (3)	2.106.967 (2)	47 (3)
36 (8)	169 (14)	1906 (19)	649.962 (19)	26 (18)
36 (9)	204 (8)	1781 (20)	537.463 (21)	20 (25)
36 (10)	338 (3)	10,017 (2)	1406.239 (5)	51 (2)
36 (11)	222 (6)	4783 (7)	846.761 (12)	30 (12)
35 (12)	186 (11)	2626 (14)	897.482 (11)	30 (11)
35 (13)	189 (10)	4303 (10)	956.197 (8)	34 (8)
35 (14)	157 (19)	1947 (18)	704.291 (16)	21 (22)
34 (15)	72 (34)	517 (38)	314.679 (35)	13 (37)
34 (16)	200 (9)	2204 (17)	703.229 (17)	26 (17)
34 (17)	62 (37)	1489 (24)	215.727 (39)	11 (40)
34 (18)	126 (25)	815 (37)	317.505 (34)	15 (34)
33 (19)	163 (18)	7387 (5)	782.78 (14)	44 (5)
32 (20)	431 (2)	12,183 (1)	1932.923 (4)	51 (1)
32 (21)	212 (7)	4388 (9)	1085.888 (7)	35 (7)
31 (22)	134 (24)	7183 (6)	913.997 (9)	45 (4)
31 (23)	154 (20)	1770 (21)	519.729 (22)	23 (19)
30 (24)	186 (12)	2603 (15)	710.073 (15)	30 (13)
30 (25)	166 (17)	3020 (12)	897.815 (10)	27 (16)
30 (26)	65 (36)	1398 (25)	307.459 (37)	23 (20)
29 (27)	145 (22)	2412 (16)	699.086 (18)	28 (15)
29 (28)	333 (4)	4144 (11)	2422.315 (1)	33 (9)
29 (29)	85 (33)	934 (35)	312.502 (36)	15 (35)
29 (30)	48 (41)	506 (39)	161.16 (40)	11 (41)
27 (31)	139 (23)	1172 (28)	407.553 (26)	21 (23)
26 (32)	45 (42)	354 (42)	101.642 (42)	10 (42)
25 (33)	123 (27)	952 (34)	546.879 (20)	14 (36)
25 (34)	107 (30)	1346 (27)	380.103 (29)	21 (24)
24 (35)	121 (28)	966 (33)	378.740 (30)	17 (32)
24 (36)	55 (39)	1047 (30)	245.973 (38)	20 (26)
20 (37)	167 (15)	865 (36)	459.176 (25)	15 (33)
15 (38)	50 (40)	378 (41)	133.395 (41)	12 (39)
15 (39)	120 (29)	976 (32)	381.764 (28)	17 (31)
15 (40)	94 (31)	1370 (26)	389.638 (27)	18 (29)
15 (41)	69 (35)	1512 (23)	485.637 (23)	19 (27)
15 (42)	61 (38)	402 (40)	378.213 (31)	12 (38)

therefore have greater visibility than those who focus their study on several areas simultaneously or on more restricted fields.[18] These issues complicate the comparison between the groups because the comparison would be subject to the same limitations as the comparison between different disciplines. It is interesting to observe that the difference is less in the variable for the number of published studies (126 for general researchers vs. 180 for specialist researchers; $p = .01$) than in the accumulated IF (433 vs. 1065; $p < .001$) and the *h*-index (20 vs. 34, $p = .001$). The reason for this difference might be due to the fact that the latter two indices are related to the number of citations received and are therefore more dependent on the specific area of research.

There is broad debate as to the ideal indicator for assessing researchers' experience. The *h*-index assessment has recently gained importance because it establishes a good balance between the number of articles an author publishes (output) and how often these articles are cited (impact or visibility). Similarly, we can see that this index has less

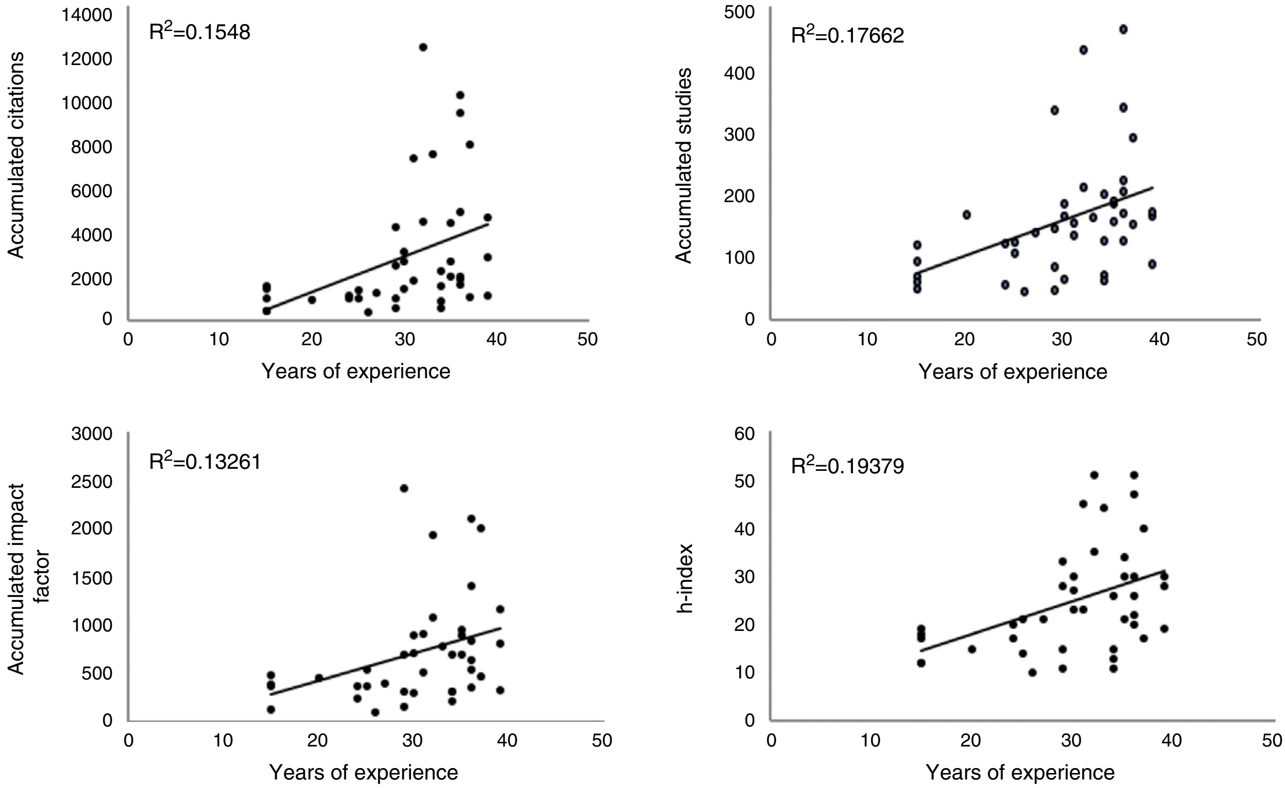

Figure 1 Relationship between the researcher's years of experience and the value that the researcher has achieved in various markers of scientific production and impact when the study was performed. The best-fit line was derived using a linear regression model.

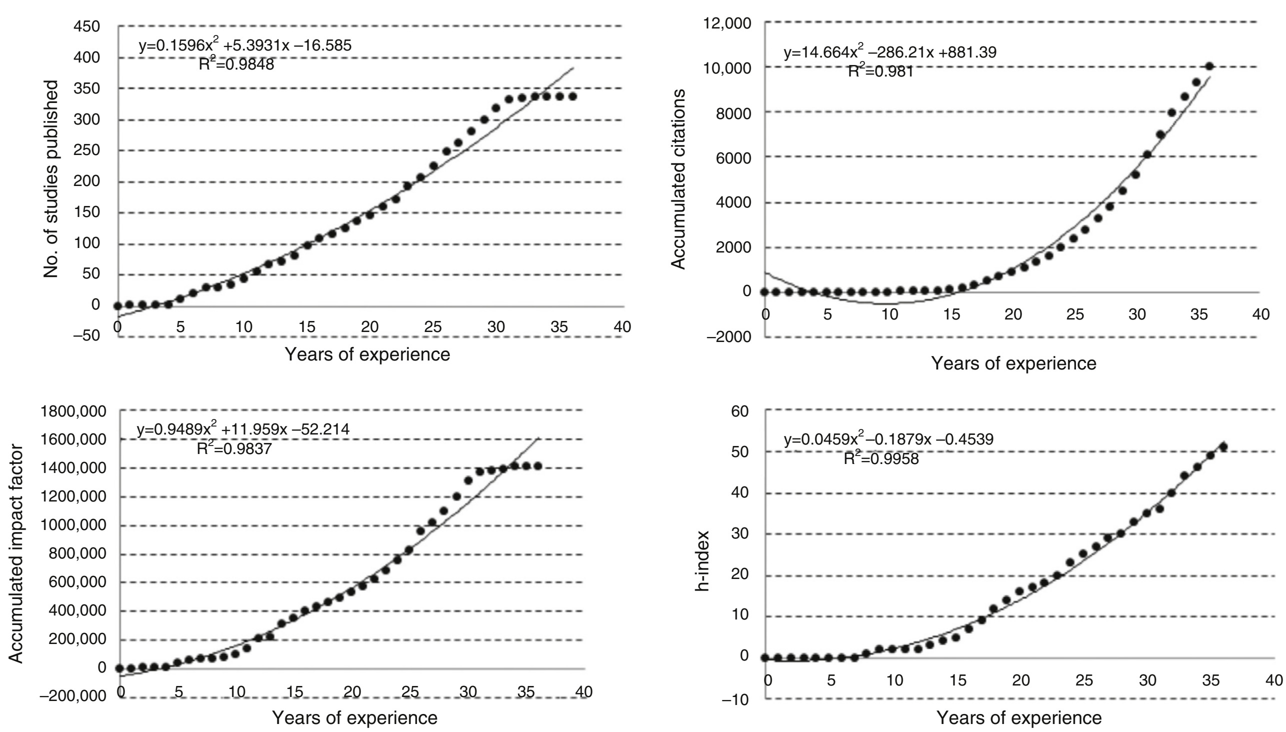

Figure 2 Example of the temporal evolution of the scientific output and impact markers of one of the evaluated researchers who best fit the model in this study (researcher 16). The best-fit line was derived using a second-degree polynomial regression model.

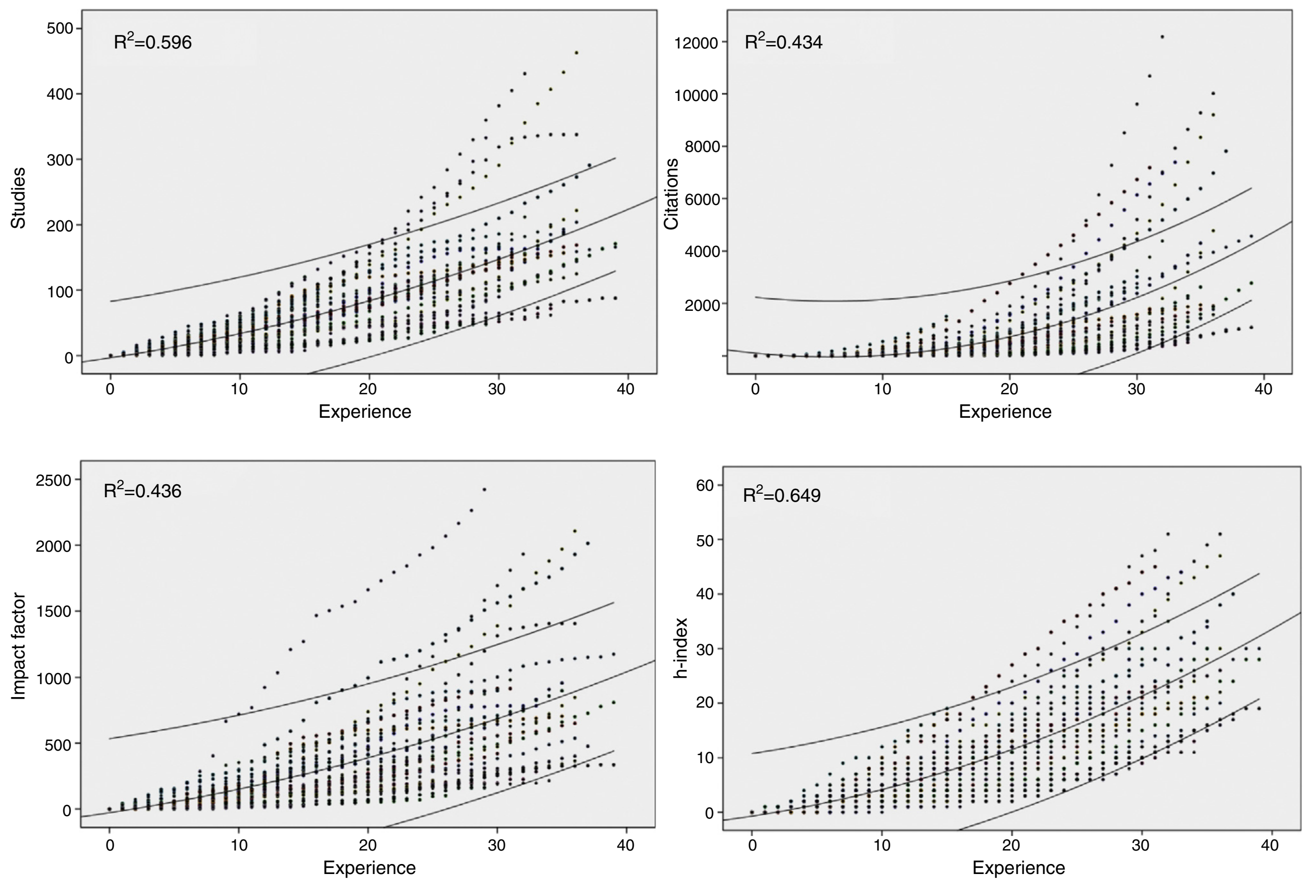

Figure 3 Overall analysis of the temporal evolution of the scientific output and impact markers over the course of the research career of the 42 analyzed physicians. The center line corresponds to the fit line, which was derived using a second-degree polynomial regression model, and the lower and upper lines correspond to the fit lines for 95% of the points in the sample. The experience corresponds to years.

variability in the data, according to the coefficient of variation. The index also has less variability among the various research subjects as shown by the IF, with variations of up to 10 times in the position of the journals depending on the use of one index or another. This result suggests that this indicator groups authors regardless of the characteristics of each individual, offering a relatively more homogeneous comparison than that provided by other indicators. Despite its advantages, the *h*-index is a tool that does not assess all measures of an author's research activity because it penalizes inexperienced authors and favors (as does the IF) authors who publish review studies, putting those authors who work on creating new knowledge at a disadvantage. Therefore, work continues on developing proposals such as the g-index,[19] whose drawback is the need for more complex calculations and access to and processing of large volumes of data from sources such as WoS and Scopus. It is expected that in the coming years we will have access to better and more sensitive tools for assessing researchers.

One of the issues of greatest interest in the bibliometric analysis of researchers is the ability to predict their future experience. In this study, we can see that the data distribution fits very well to a second-degree polynomial curve, specific for each individual. Hypothetically and provided the same environmental conditions are maintained, there is the possibility of using this model to predict the scientific impact of an author in the coming years of their research career and compare differentiated potential scores based on years of experience. Suppose, for example, that we have to choose between two researchers who apply to an internal medicine post. The first has an *h*-index of 4 nine years after their first publication. The second has an *h*-index of 7 after 15 years of experience. It is clear that the second candidate has a higher *h*-index; however, the second also has more experience. Which of the two should we choose if we kept exclusively to the criteria proposed in this study? If we use the mean curve of the internists analyzed in our study ($y = 0.012x^2 + 0.377x - 0.732$) (Fig. 3), we can see that at 9 years, the mean *h*-index for this selected group of researchers is 3.63; at 15 years, the mean *h*-index is 7.62. Thus, although both researchers are within the range of Spanish internists with high scientific output, the first candidate is above the mean, and the second is below. As a result, the projection at 25 years of experience, for example, would be better for the first researcher than for the second. Of course, this result is subject to a difficult to measure variable: the researcher's personal environment.[12] If we assume a stable situation, however, this tool could have considerable relevance to the selection process for research, teaching and other positions. This index is of particular interest to younger researchers, who are currently at a disadvantage compared with their more experienced peers,[20,21] as shown in the example. Similarly, the index helps explain the variations in output in all evolutionary phases of the research experience, which will eventually help determine the causes of those variations and introduce mechanisms for improvement at the personal, institutional and state levels.

The combination of the curves from all of the evaluated internists also showed a good fit to the second-degree polynomial model, especially when using the *h*-index (Fig. 3). The importance of this curve is that all the physicians evaluated are Spanish internists, although they come from different institutions and autonomous communities. One of the limitations of the *h*-index is that it does not provide a proper comparison between disciplines, due to the variations caused by the size of the group and their field of application,[9] although a number of studies have attempted to overcome this limitation.[21,22] The curves of the Spanish internists with considerable experience allow for their comparisons. However, it is possible that we cannot properly compare them with their peers in other countries. Among other reasons, research activity in Spain was significantly affected by the sociopolitical situation during a considerable portion of the past century and, unlike other European countries and the USA, gained a significant boost starting in the 1980s.

The data analysis helps us understand, along with the analyzed indicators, the publication habits of established Spanish internists. Almost half of the articles (47%) were published in 20 journals. Of these, the first two are Spanish publications. The next one is down in 12th place; the rest were written in English. Of these three Spanish journals, the first allows for the publication of articles in English on rare occasions, while the other two published in Spanish and English interchangeably. This fact shows a significant trend by this group of authors for publishing in media where English is the lingua franca. The explanation for this trend could lie in the policies aimed at rewarding the impact of the publications on the scales used within the healthcare, research and university teaching careers.[23] We should also consider the authors' desire for greater international visibility, which is why they choose well-placed journals within their field, a fact that is not common among Spanish publications.[24]

All of the analyzed researchers have established experience and thereby do not represent all Spanish internists who are members of SEMI or internists who have initially successful experience (from a bibliometric perspective) but whose subsequent experience is truncated for whatever reason. It should be noted that we have at no point intended for the analyzed group (which represents approximately 1% of the members of SEMI) to represent internists in general. Our study attempts to determine whether there is a system for identifying whether other internists in the initial phases of their research career might belong to a small but highly productive group.

This study has certain limitations. Given that all of the authors are internal medicine specialists, we can assume that the impact of their output will not be particularly affected by the law of scientific literature obsolescence[25] or by the differing behavior among specialties within medicine.[25,26] Moreover, the analysis did not include all researchers who could have been analyzed due to the problem of last name homonyms. Additionally, when there were variations in the initials of the authors' names or when one or two last names were used interchangeably, the system assumed that they were different authors. This fact, along with the possibility that an author published with a foreign affiliation (e.g., during a training stay), could have resulted in the loss of a publication for a specific author, despite the effort during the individual assessment phase of each author. We also did not include authors who were not members of SEMI, in order to reflect only those authors with a clear sense of membership to the internal medicine collective. A possible important issue that was not analyzed in this study is the impact of self-citations in an author's visibility indices. Hirsch minimized the role of self-citations in the assessment of the *h*-index, and there have been inconclusive studies on this issue.[27,28]

Despite the limitations listed above, we believe that this study helps us better understand the dynamics of research in the field of internal medicine in Spain, both at the individual and group level. We can conclude that the *h*-index is possibly the best indicator of a researcher's output and impact for the group of Spanish internists with highly established experience. Additionally, the evolution of the authors fit almost perfectly to a second-degree polynomial curve, which, extrapolating to the evaluation of an emerging research career, could provide a good prediction of future behavior under ideal conditions. Finally, the specialist researchers achieved better indicators than the general researchers, although it should be taken into account that the bibliometric behavior among the various areas of knowledge is variable, as is behavior among the various scientific disciplines. Further studies are needed with larger numbers of researchers and other research methodologies to confirm these findings. The aim of these studies should be to search for tools that help in the difficult assessment of the future experience of researchers when faced with investing the limited resources of public and private institutions.

Conflict of interest

The authors declare that they have no conflicts of interest.

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