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Spine Surgery Fellowships in Mexico: Web Content and Accessibility

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ABSTRACT

Background: The emergence of spine surgery fellowship programs in Mexico is gaining significance; however, there exists a paucity of available information pertaining to the specific requirements and criteria employed for candidate selection, operational structure, and educational framework, which affects the ability of potential applicants to make informed decisions about their training options.

Methods: A systematic web search was executed to identify the official websites of the predominant private and public health care institutions that provide spine fellowship programs in Mexico. This search was carried out by 3 spine surgery fellows between December 2023 and January 2024 utilizing the Google search engine with specific keywords previously employed in similar studies. Subsequently, we performed an evaluation to ascertain the existence of 13 elements that are pertinent to residency candidates and the ease of finding information for each program.

Results: Twenty-five spine surgery fellowship programs were identified. Of these, 14 (56%) are endorsed by the Autonomous University of Mexico, 2 (8%) by La Salle University, and the remainder by various universities such as the Autonomous University of Guadalajara and the Autonomous University of Chihuahua, among others. The majority of programs were listed on the website of the Mexican Association of Spine Surgeons, with contact information being readily available in most cases (72%), whereas details about program chairs were primarily found on hospital websites (16%). The simplicity of the search revealed that 88% of programs could be easily located online.

Conclusions: Numerous spine surgery training programs are deficient in thorough online information, which creates challenges for prospective national and international applicants seeking details. Most programs depend on their reputation instead of an online presence, indicating a chance to improve marketing and visibility of spine surgery fellowship programs in Mexico.

Clinical Relevance: The training of spine surgeons is extremely important, so the visibility of training programs helps promote this specialty and, therefore, the training of surgeons.

Level of Evidence: 3.

Other and Special Categories

Keywords: cross-sectional Study, education, spine fellowship, spine surgery, websites

INTRODUCTION

Spine surgery fellowship programs in Mexico are gaining greater importance, but the information accessible online regarding the hospitals and universities, criteria for candidate selection, and working environment in these facilities is still scarce. Even though spine surgery fellowships have existed in Mexico for more than 10 years, there is still a lack of a thorough overview of the locations of these programs and the essential information that may be pertinent to potential candidates.

In contrast to the United States, where the North American Spine Society (NASS) Fellowship Directory serves as a centralized repository providing essential information about each spine surgery fellowship program,[1] including additional details available on their respective websites, we believe that Mexico currently lacks such a consolidated resource. This informational gap presents a significant challenge for aspiring candidates and hampers the dissemination of vital information related to spine surgery fellowships within the region.

Since the internet launched in the 1980s, its use for academic purposes in the United States increased rapidly. Individuals increasingly rely on the internet for various purposes, including research and making critical decisions, such as the selection of a medical specialty.[2] Today, the development of a website to

showcase services and features across various fields is indispensable, especially for fellowship programs.[2]

Although the transition to digital information acquisition is prevalent in numerous developed nations, it is still inadequately leveraged, particularly in the domain of orthopedic fellowships, where there exists a deficiency of comprehensive data and specialized web resources pertaining to each program.[3]

Approximately 90% of applicants rely on fellowship websites to explore available fellowships. These websites are preferred over online reviews, discussion forums, or external platforms. Interestingly, while social media has proven effective for recruitment in other medical specialties, applicants for orthopedic trauma fellowships tend to overlook this resource.[4]

In the past, residency programs relied on printed brochures sent to medical schools, which were then passed on to potential candidates. However, the sharing of residency information is crucial for both applicants and programs in graduate medical education, and over time, there have been significant changes in how this information is disseminated.[5]

The Fellowship and Residency Electronic Interactive Database Access was created by the American Medical Association in 1988 in the United States, marking the inception of the initial centralized electronic resource for candidates to explore programs.[6]

As the new millennium approached, and in recognizing this shift in accessing information, the National Residency Matching Program introduced the electronic, paperless Electronic Residency Application Service in 1995.[5]

In Mexico in 2023, the Ministry of Health, through the Interinstitutional Commission for the Training of Human Resources for Health, offered 18,529 medical residency positions via the National Examination for Medical Residency Applicants, resulting in approximately 20,000 to 30,000 physicians lacking opportunities for medical residency.

These institutions that offer fellowships provide brief information about the available positions for direct-entry specialties in Mexico on their respective websites; however, a fellowship in spine surgery is classified as an indirect-entry specialty because it necessitates a degree in orthopedics or neurosurgery to follow this path. Consequently, details regarding the available positions for this specialty are not easily attainable.[7]

The present study aimed to address spine fellowships website information by systematically gathering and analyzing data about spine surgery training in Mexico. Specifically, we aimed to investigate the geographic spread of specialized institutions, the criteria utilized in selecting candidates, and important information regarding the work atmosphere within each institution, university, hospital, or entity that focuses on this field. By presenting an all-encompassing summary, our study seeks to bridge the current information void, offering significant insights for both potential national and international candidates.

METHODS

Search Methodology

A comprehensive web search was conducted by 3 spine surgery fellows (F.A.-C., F.G.-G., and O.A.-M..) between December 2023 and January 2024, targeting the official websites of major private and public health care institutions, universities, and hospitals across Mexico and its 32 federative states. The search was performed using Google with the following keywords, each combined with the name of every state in Mexico: "Fellowship en cirugia de columna+ Mexico + [state]," "Especialidad en cirugia de columna+ Mexico + [state]," "Alta especialidad de cirugia de columna + Mexico + [state]," and "Subespecialidad de cirugia de columna + Mexico + [state]."

All programs found on a university, institution, association, or hospital website were included. After obtaining the fellowship program URL for each website, the same 3 reviewers conducted an assessment to determine the presence of the following 13 key elements relevant to a fellowship training program: (1) existence of an official website, (2) contact details such as telephone numbers or email addresses, (3) comprehensive information about the unit, (4) official validation or accreditation by a university, (5) financial support for fellows, (6) details about the selection process, (7) an academic curriculum or program, (8) information about the program's chairman, (9) details of associate or assistant professors, (10) information about current and past fellows, (11) research topics pursued by faculty members, (12) published academic work, and (13) social activities within the academic community. The collected data were then transferred to a spreadsheet for further analysis.

A second analysis was performed by a fourth reviewer (A.A.-A.) using the database of identified programs to assess ease of accessibility by conducting 4 additional searches with the following keywords: "Curso de postgrado en cirugía de columna vertebral + program name," "Alta especialidad en cirugía de columna vertebral + program name," "Fellow en cirugía de columna vertebral + program name," and "Subespecialidad en cirugía de columna vertebral + program name." This evaluation determined how difficult each program was to find and

Table 1. Fellowships hospitals with points and percentage of information visible online.

Fellowships	Points	Percentage[a]
General Hospital "La Villa," Secretary of Health, Mexico City	21	40%
Christus Muguerza High Specialty Hospital, Monterrey, Nuevo Leon	18	34%
Regional High Specialty Hospital of Bajío, Ministry of Health, León, Guanajuato	17	32%
Regional High Specialty Hospital, Ixtapaluca, Mexico	17	32%
General Hospital of Mexico "Dr. Eduardo Liceaga," Ministry of Health, Mexico City	16	30%
National Medical Center November 20, Mexican Social Security Institute, Mexico City	15	28%
National Institute of Rehabilitation, Ministry of Health, Mexico City	14	26%
Regional Hospital October 1°, Institute of Security and Social Services of State Workers, Mexico City	14	26%
Cisne Spine Academy, Star Medica Hospital, Chihuahua, Chihuahua	14	26%
Lomas Verdes Traumatology and Orthopedics Hospital, Mexican Social Security Institute, Naucalpan, Mexico	13	25%
ABC Medical Center, Santa Fe Campus, Mexico City	13	25%
ISSEMYM Medical Center, Ecatepec, Mexico	12	23%
Regional Hospital "Lic. Adolfo López Mateos," Mexico City	12	23%
Re-espalda A.C. Puerta de Hierro Hospital, Zapopan, Jalisco	12	23%
Central South High Specialty Hospital PEMEX "Picacho," Mexico City	10	19%
Regional Hospital Puebla, Institute of Security and Social Services of State Workers, Puebla de Zaragoza, Puebla	9	17%
General Hospital of Querétaro, Santiago de Queretaro, Queretaro	7	13%
Regional Hospital "Dr. Manuel Cárdenas," Culiacan, Sinaloa	7	13%
Médica Sur Hospital, Mexico City	6	11%
National Institute of Neurology and Neurosurgery "Dr. Manuel Velasco Suárez," Mexico City	5	9%
Angeles México Hospital, Mexico City	5	9%
Specialty Hospital, Medical Center XXI century "Bernardo Sepulveda," Mexican Social Security Institute, Mexico City	3	6%
University Hospital "Dr. José Eleuterio González," Monterrey, Nuevo Leon	2	4%
Traumatology Hospital "Victorio de la Fuente Narvaez," Mexican Social Security Institute, Mexico City	2	4%
Germán Díaz Lombardo Hospital, Mexico City	1	2%

Each program could receive a maximum of 13 points for website content and 1 point for searchability, for a total possible score of 14 points per website. Given that programs could have multiple official listings, each website was evaluated separately for a theoretical maximum of 53 points in 4 websites.
[a]Percentages are calculated based off the total possible score of 53 points.

whether a direct link appeared within the first 20 search results on the Google search engine. Programs appearing within the first 20 search results were classified as easy to find, while those that did not appear were classified as difficult to find.

Data Extraction and Statistical Analysis

Each program could receive a maximum of 13 points for website content and 1 point for searchability, for a total possible score of 14 points per website. Given that programs could have multiple official listings (eg, university website, hospital website, and association website), each website was evaluated separately. A program with multiple listings could accumulate additional points, up to a theoretical maximum of 53 points if it appeared across multiple platforms.

The data were organized and analyzed in the software MINITAB 21. Categorical variables were described using absolute and relative frequencies, and for quantitative variables, measures of central tendency and dispersion were used.

RESULTS

In total, 25 spine surgery fellowship programs in Mexico were found online (Table 1): 14 (56%) have the endorsement of the Autonomous University of Mexico, 2 of them (8%) are endorsed by La Salle University, 8 programs are each supported by a different university (Autonomous University of Guadalajara, Autonomous University of Nuevo León, Autonomous University of Querétaro, Autonomous University of Sinaloa, University of Guanajuato, University of Monterrey, Popular University of the State of Puebla, and Autonomous University of Chihuahua), and 1 program was found not to have information on the endorsement by any university (Table 2).

Regarding the website, it was found that 19 programs (76%) were found on the corresponding universities' websites, only 7 programs (28%) on the institution's websites, 10 programs (40%) on the hospitals' website, and 17 (68%) programs on the Mexican Association of Spine Surgeons (AMCICO) website.

Table 2. University endorsement of spine surgery fellowship program.

University	No. of Programs Endorsed	Percentage
Autonomous University of Chihuahua	1	4%
Autonomous University of Guadalajara	1	4%
Autonomous University of Mexico	14	56%
Autonomous University of Nuevo León	1	4%
Autonomous University of Querétaro	1	4%
Autonomous University of Sinaloa	1	4%
University of Guanajuato	1	4%
University of Monterrey	1	4%
La Salle University	2	8%
Popular University of the State of Puebla	1	4%
Unknown	1	4%
Total	**25**	**100%**

Among the relevant web pages identified that contained information regarding the fellowship programs, we assessed the additional 12 aspects of each of them. Contact information was available on 18 university sites (72%), 3 institutional sites (12%), 7 hospital sites (28%), and only 2 on the AMCICO site (8%).

The details related to the hospital unit hosting the specialty program were located solely on 1 university website (4%), 7 institutional websites (28%), and 3 hospital websites (12%). The AMCICO website provided information on 11 programs (44%).

In terms of university endorsements, data were located on 19 university sites (76%), 8 institutional websites (32%), and 8 hospital sites (32%). The AMCICO site contained information on just 10 programs (40%).

In terms of the information about financial assistance or scholarship opportunities, neither the university's nor the hospital's websites provided any relevant data; however, 1 institution's site did list information on a scholarship (4%), and the AMCICO website contained details about 7 programs (28%).

The selection process was found on 15 university websites (60%), 2 institution websites (8%), and 5 hospital websites (20%), and on the AMCICO website, information was found on 4 programs (16%).

The academic program appeared on 3 university websites (12%), 1 institution, and 1 hospital website, respectively (4%), and on the AMCICO site, this information was available for 7 programs (28%).

Details regarding the course chairman were located on 2 university websites (8%), 2 institution websites (8%), and 5 hospital websites (16%), and for the AMCICO website, we identified this information for 17 programs (68%).

In relation to the details about the current fellows or residents within the programs, no information could be located on the university's site, and for the AMCICO website, we discovered data on 2 institutional websites (8%) and 1 hospital website (4%). Nonetheless, there was no information available regarding current residents, only details pertaining to previous cohorts.

With respect to the research areas of the program or studies published by fellows, associate professors, or the chairman, there was a lack of information available on both the hospital and AMCICO websites; this information was discovered solely on 1 university website (4%) and 2 institutional webpages (8%).

The social component appeared solely on 1 institution's site (4%), while no details were available on the others.

Regarding the simplicity of finding the fellowship program on the internet, just 3 were categorized as difficult (12%), while 22 were easily found (88%).

The program that achieved the highest score, indicating the most web-based information, is located at General Hospital "La Villa," Secretary of Health, Mexico City, with a total of 21 points. This program was followed by Christus Muguerza High Specialty Hospital in Monterrey, which garnered 18 points, and the Regional High Specialty Hospital of Bajío, Ministry of Health, León, Guanajuato, along with the Regional High Specialty Hospital of Ixtapaluca, Mexico, each securing 17 points. Next is the General Hospital of Mexico Dr. Eduardo Liceaga, Ministry of Health in Mexico City, with 16 points, and the National Medical Center on November 20 in Mexico City, which received 15 points. Ten programs achieved fewer than 10 points (Figure 1 and Table 1).

In terms of geographical distribution within the nation, 14 programs are situated in Mexico City (56%); 3 in the State of Mexico (Ixtapaluca, Naucalpan, and Ecatepec) (12%); 2 in Monterrey, Nuevo León (8%); 1 in Zapopan, Jalisco (4%); 1 in Chihuahua, Chihuahua (4%); 1 in Puebla de Zaragoza, Puebla (4%); 1 in Santiago de Queretaro, Queretaro (4%); 1 in Culiacan, Sinaloa (4%); and 1 in León, Guanajuato (4%; Figure 2 and Table 3).

DISCUSSION

Spine surgery procedures in Mexico are presently carried out by neurosurgeons and orthopedic surgeons who have undergone a residency program where they gained adequate experience in this specialty or received training through a fellowship program either domestically or internationally. In Mexico, the residency programs or fellowships in spine surgery are endorsed by a specific organization known as the Mexican Association of Spine Surgeons, commonly referred to by its Spanish acronym, AMCICO, which is the principal and most significant association of spine surgeons in the country.[8]

The official AMCICO website (https://www.amcico.com.mx/amcico/index.html) features a directory of the fellowship programs it endorses; however, this directory lacks comprehensive details on every program. Similarly, this directory does not showcase all the programs available in Mexico and does not provide current information.

In comparison, the United States boasts various online directories that students utilize to assess the options accessible in relation to their area of expertise.[2] Specifically in spine surgery, the NASS directory[1] includes 74 programs, each accompanied by detailed

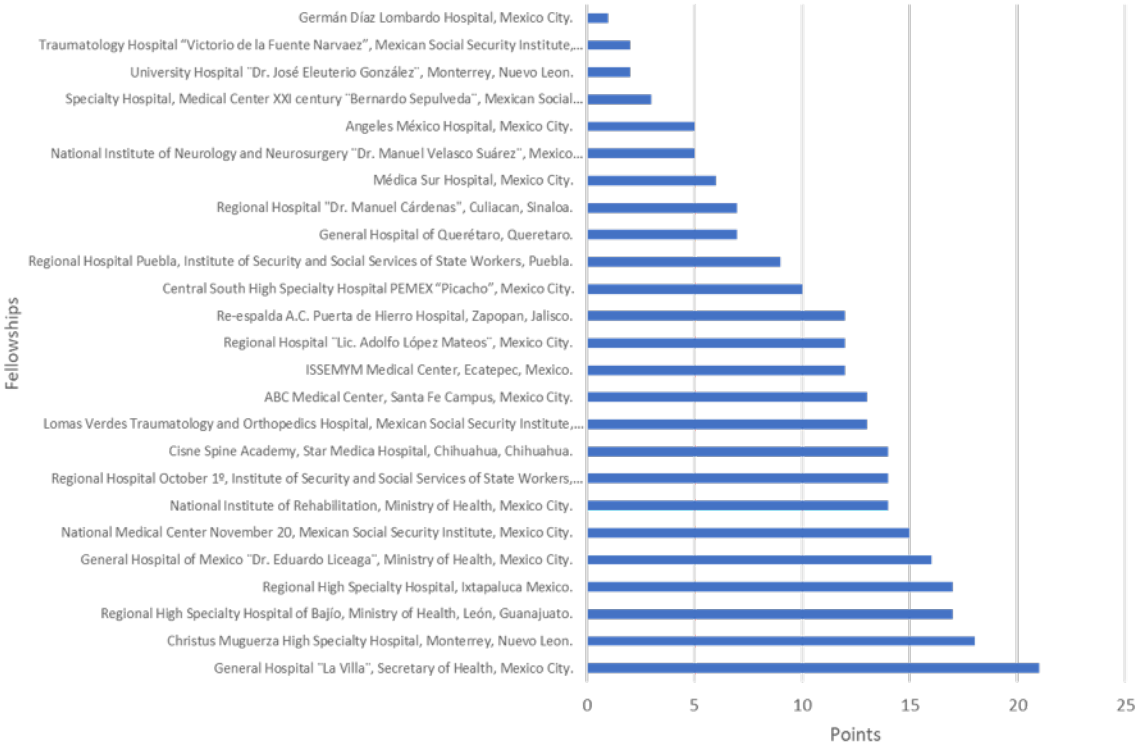

Figure 1. Punctuation of every fellowship web content in Mexico.

information regarding the program and its features, making it quite comprehensive, with unique websites that can be accessed through this directory.

In this study, a thorough investigation was conducted considering the search techniques and the collection of particular information previously utilized in comparable research in the United States for each significant website regarding the assessment of every specialty program.[1]

The directory available on the AMCICO website lists just 17 spinal surgery schools, whereas it could potentially feature a comprehensive list of all the institutions

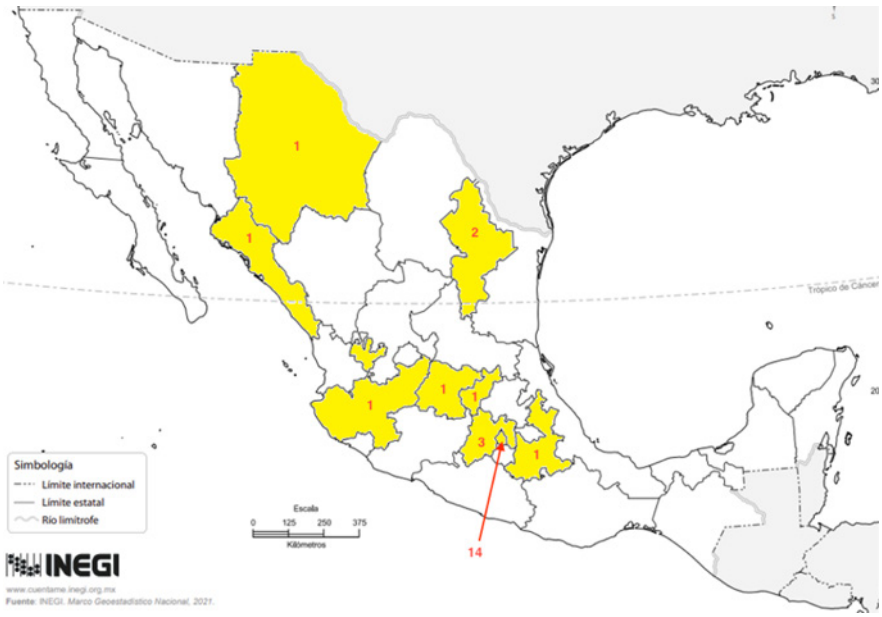

Figure 2. Location and number of fellowships in Mexico for each state.

Table 3. City/states with spine fellowship programs in Mexico.

City/State	No. of Programs	Percentage
Mexico City	14	56%
Monterrey, Nuevo Leon	2	8%
Ixtapaluca, Mexico State	1	4%
Naucalpan, Mexico State	1	4%
Ecatepec, Mexico State	1	4%
Zapopan, Jalisco	1	4%
Chihuahua, Chihuahua	1	8%
Puebla de Zaragoza, Puebla	1	4%
Santiago de Queretaro, Queretaro	1	4%
Culiacan, Sinaloa	1	4%
Leon, Guanajuato	1	4%

in Mexico, providing ample information for those who support them.

Residency candidates and programs increasingly turn to the internet to gather and exchange information throughout the application procedure.[9] To establish a successful academic specialty program, attracting top-tier candidates is essential; thus, maintaining visibility in today's technological landscape is fundamental. The interview process and the recommendations for candidates seeking the specialty are crucial elements that have been identified when assessing or selecting among applicants.[10] However, without effectively disseminating information about what is available for these candidates, it will be challenging to secure the most qualified individuals. Engaging with potential applicants through targeted outreach and online platforms can greatly enhance visibility and interest in specialty programs, ultimately leading to a more diverse and talented pool of candidates.

In the present study, we discovered a significant absence of crucial information available online regarding this specialty in Mexico. Nevertheless, we identified that the most effective method for learning about a program or spine surgery fellowship is by exploring the websites of the universities of interest and/or the AMCICO directory, as it contained the most comprehensive details about pursuing this specialty.

While certain centers possessed essential information for prospective candidates, crucial details such as research areas, published studies, funding opportunities, current fellows, and even social aspects related to or around the training centers are virtually absent from their websites. Among the institutions discovered, some merely listed the name of the affiliated hospital, indicating a significant lack of online information, a trend that has been observed in other specialties and fellowship programs.[1,11–18]

This study presents several limitations. First, the exhaustive search might have inaccuracies and miss information that was originally sought due to human mistakes, especially considering that it was conducted by only 3 observers. Second, the information discovered on each webpage was not assessed separately; it was merely determined whether each of the studied items was present or absent. It is possible that, among the present items, some are more comprehensive than others. Last, in today's world, social media serves as a significant channel for dissemination, and since no type of social media was considered during the search, certain programs probably contain more thorough information, or there may be programs that exclusively share information via these platforms; therefore, a search that incorporates the most popular social networks today could enhance the findings.

CONCLUSION

Numerous spine surgery training programs available online provide inadequate information for individuals or physicians interested in pursuing this type of fellowship. Furthermore, in certain instances, finding these websites can be quite challenging; hence, it is clear that programs lack the motivation to share information and thus attract more qualified candidates. Some programs enjoy a strong reputation and are well known within the medical community without relying on online content, thanks to referrals and recommendations. Nevertheless, this presents an opportunity to enhance the visibility of this specialty in Mexico and its official programs, considering that there might be additional programs in the country that lack an online presence.

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