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Original Article

Neurosurgery societies around the world: A study and discussion about its importance

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ABSTRACT

Background: Harvey Cushing and collaborators created the first society of neurosurgeons in 1920, in the United States of America, the Society of Neurological Surgeons. In 1955, the World Federation of Neurosurgical Societies (WFNS) was created in Switzerland to improve neurosurgical care globally through the scientific cooperation of members. The performance of neurosurgical associations today is fundamental to discuss diagnostic methods and therapeutic approaches, transforming modern medicine. Although most neurosurgical associations are recognized worldwide, there are some societies that are not recognized internationally due to a lack of regulatory bodies and lack of official digital channels, among other reasons. The main objective of the article is to list the neurosurgical societies and to provide a more integrated view of the interactions between neurosurgical societies in different countries.

Methods: We developed a table summarizing the countries recognized by the United Nations, the continents, capitals, name of the present societies, and social networks. We utilized "Country AND (Neurosurgery OR Neurological Surgery) AND (Society OR Association)," in English, and in the native language of the country. Our search included: PubMed, Scopus, Google, Google Scholar, and the WFNS website, without filters.

Results: We found 189 neurosurgery associations, from 131 countries and territories; 77 countries did not have their own neurosurgical societies.

Conclusion: There is a difference between the number of internationally recognized societies, and the number of societies found in this study. In the future, we should better organize neurosurgical societies in countries that have neurosurgical activity with those without such resources.

Keywords: Associations, List, Neurosurgery, Societies, Worldwide

INTRODUCTION

At the end of the 19th century, Broca introduced medicine to the brain. In the 20th century, Victor Horsely and later Harvey Cushing in 1920, created the Society of Neurological Surgeons in the United States of America.^[6,14] The "First International Congress of Neurological Surgery" was held in July 1957 in Brussels.^[9] In 1955, the World Federation of Neurosurgical Societies (WFNS) was created in Switzerland.^[3] At present, there is a long list of neurosurgical societies that the WFNS comprises: the American Association of Neurological Surgeons (AANS), the

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Asian Australasian Society of Neurological Surgeons, the Continental Association of African Neurosurgical Societies, the European Association of Neurosurgical Societies, and the Latin American Federation of Neurosurgical Societies (FLANC), in addition to 119 other national neurosurgical societies, representing more than 49,000 neurosurgeons worldwide.^[21] Here, our aim, utilizing PubMed, Scopus, and Google Scholar, was to list all as many of the present neurosurgical societies, we could identify worldwide, hoping this would foster more avenues of communication between these societies and neurosurgeons in countries without such organizations.

MATERIALS AND METHODS

There is a list of 197 countries recognized by the United Nations (UN). We listed these in alphabetical order, and searched in English the following databases regarding worldwide neurosurgical societies: PubMed, Google, Google Scholar, Scopus, and the WFNS website [Flowchart 1]. Our search was carried out from October of 2021 to January 2022, using the following formula: “Country AND (Neurosurgery OR Neurological Surgery) AND (Society OR Association).” The second step was to use the main and secondary languages

of the desired nations in Google with Google Translate to acquire the names of other neurosurgical societies and their electronic addresses [Table 1].

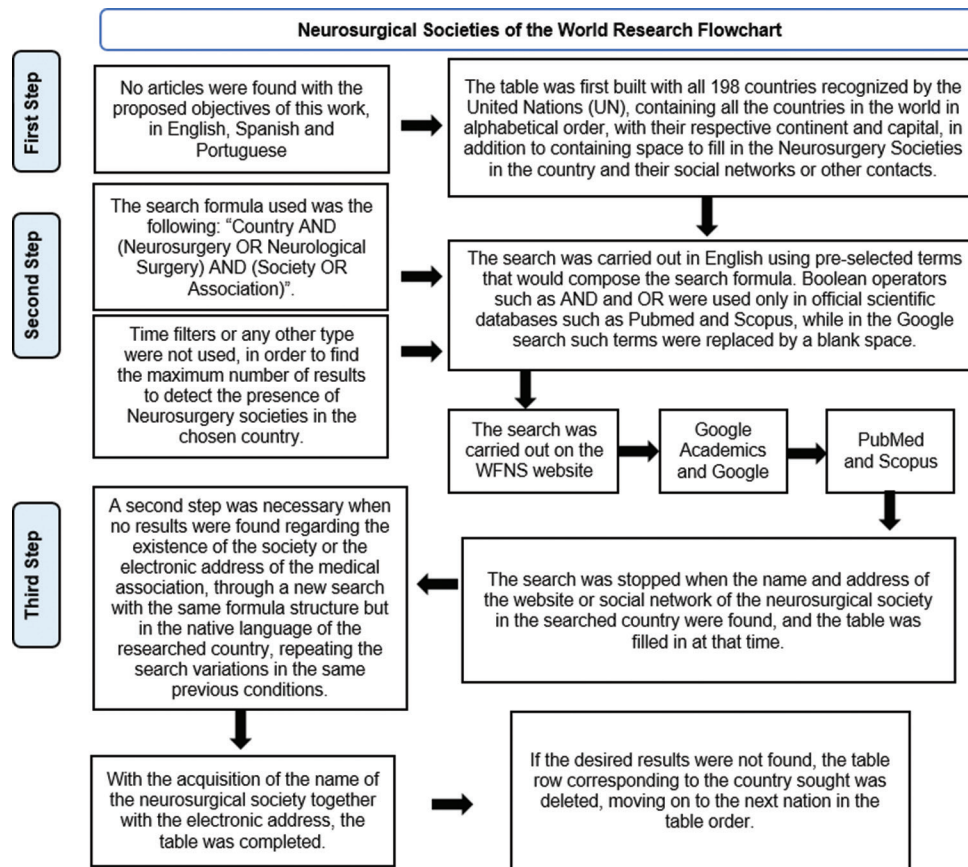
RESULTS

We identified 189 neurosurgery societies, associations, or groups worldwide, related to 131 countries or regions. Some countries had more than one association of neurological surgery (i.e., United States, Spain, Germany, and Great Britain, among others). Some countries have more than four neurosurgery societies (i.e., Germany and South Korea [four societies], Russia [five societies], Spain [eight societies], and the United States [11 societies]).

Other countries were grouped into larger regions representing different nations (i.e., the African continent with nine neurosurgical groups, or Europe). Of the 197 territories including 77 countries had no individual neurosurgery society (i.e., about 39%).^[20]

DISCUSSION

In 2018, the world had about 49,940 neurosurgeons; in 2023, that number is expected to exceed 50,000. There



Flowchart 1: Sequential flowchart of the elaborated research methodology.

Table 1: List of Neurosurgery Societies with their respective countries or regions and contacts (related website or social network).

Country	Capital	Continent	Name of the Neurosurgery Society or Association	Site or Social Network
Afghanistan	Kabul	Asia	Afghanistan Neurosurgical Society	https://www.facebook.com/groups/709139415917531 https://www.facebook.com/afna.org.af/ https://uia.org/s/or/en/1122275287
African Continent-Other Societies	-	Africa	African Federation Of Neurosurgical Societies (AFNS) Association Of Future African Neurosurgeons Association Of Neurosurgical Societies Of Africa (ANSA) Continental Association Of African Neurosurgical Societies (CAANS Continental) East African Association Of Neurological Surgeons Neurosurgical Society Of East And Central Africa Mediterranean Association Of Neurological Surgeons (MANS) Middle East Neurosurgical Society (MENS) Middle-Eastern Society Of Stereotactic And Functional Neurosurgery	https://futureafroneurosurgeons.com/ https://uia.org/s/or/en/1122275281 https://www.caans2013.org/index https://eaans.org/ https://uia.org/s/or/en/1100021747 https://mans2022.org/ https://uia.org/s/or/en/1100019748 https://www.themssfn.org/
Albania	Tirana	Europe	Albanian Society Of Neurosurgery	https://albanianneurosurgicalsociety.org/
Algeria	Algiers	Africa	Algerian Society Of Neurosurgery (SANC)	https://m.facebook.com/groups/845391918820369?locale=fr_FR
American Continent Countries	-	America	Society Of Latino-American Neurosurgeons Of USA And Canada (SLANC) Latin American Federation Of Neurosurgical Societies (FLANC) Latin American Society Of Functional Neurosurgery And Stereotaxis (SLANFE) Association Of Central American Societies of Neurosurgery (ASOCAN) Caribbean Association Of Neurological Surgeons (CANS) South Cone Society Of Neurological Surgeons	https://clan2022.com/en/welcome/ https://www.latin-neurosurgery.org/ http://www.slanfe.com/ https://uia.org/s/or/en/1100067292 http://www.caribbeanneurosurgery.com/ https://uia.org/s/or/en/1100024429
Argentina	Buenos Aires	America	Argentine Association Of Neurosurgery (Asociación Argentina De Neurocirugía, AANC)	http://www.aanc.org.ar/
Armenia	Yerevan	Asia	Armenian Neurosurgical Association	https://www.erebunimed.com/eng/doctor/282
Asian-Australasia Continents	-	Asia -Oceania	Asian-Australasian Society of Neurological Surgeons (Continental) AASNS	http://www.aasns.org/

(Contd...)

Table 1: (Continued).

Country	Capital	Continent	Name of the Neurosurgery Society or Association	Site or Social Network
Asian Countries - Indonesia, Malaysia, Philippines, Singapore, and Thailand	-	-	Asean Neurosurgical Society Asian Congress Of Neurological Surgeons - ACNS	http://www.asean-ns.org/Welcome.html https://www.facebook.com/asiancns/
Australia	Canberra	Oceania	Neurosurgical Society Of AustralasiaNSA	http://www.nsa.org.au/
Austria	Vienna	Europe	Austrian Society Of Neurosurgery (Ögnc)	http://www.neurochirurgie.ac.at/
Bangladesh	Dhaka	Asia	Bangladesh Society Of Neurosurgeons	https://www.bsnsbd.org/
Barbados	Bridgetown	America	Neurosurgery Barbados	https://et-ee.facebook.com/NeurosurgeryBarbados/
Belarus	Minsk	Europe	Republican Resarch And Clinical Center Of Neurology And Neurosurgery	https://neuro.by/index/en/scientific-departments/department-of-neurosurgery.html
Belgium	Brussels	Europe	Belgian Society Of Neurosurgery Belgian Neurosurgical Spine Society	https://www.bsn.be/ https://www.bnss.be/fr/11-bnss.html
Benin	Porto Novo	Africa	La Société Béninoise De Neurochirurgie	https://sobenchir.org/
Bolivia	Sucre	America	Sociedad Boliviana De Neurocirugia	http://sociedadbolivianadeneurocirugia.com/
Bosnia and Herzegovina	Sarajevo	Europe	The Association Of Neurosurgeons In Bosnia And Herzegovina	https://www.neurohirurgija.org/
Brazil	Brasilia	America	Brazilian Academy Of Neurosurgery (Academia Brasileira De Neurocirurgia, ABNC) Brazilian Society Of Neurosurgery (SBN)	http://www.abnc.org.br/ http://www.sbn.com.br/
Bulgaria	Sofia	Europe	Bulgarian Society Of Neurosurgery	https://neurosurgery.bg/en/
Burkina Faso	Ouagadougou	Africa	Societe Burkinabe De Neurochirurgie	https://ajns.paans.org/wp-content/uploads/218692b3.pdf
Cambodia	Phnom Penh	Asia	Cambodian Neurological Society Cambodian Society Of Neurosurgery	https://www.ilae.org/regions-and-countries/national-chapters/cambodia https://cambodianneurosurgicallsupportteam.wordpress.com/
Cameroon	Yaoundé	Africa	Société Camerounaise De Neurochirurgie (Socaneuro)	https://annuaire-medical.cm/fr/rechercher-dans-l-annuaire/toutes-les-categories/ordres-professionnels/societes-savantes-et-medicales/232-societe-camerounaise-de-neurochirurgie-socaneuro
Canada	Ottawa	America	Canadian Neurosurgical Society (CNSS, Canadian Neurological Sciences Federation)	http://www.cnsfederation.org/cnss_index.html
Chile	Santiago	America	Chilean Society Of Neurosurgery	http://www.neurocirugia.cl/
China	Beijing	Asia	Chinese Neurosurgical Society Hong Kong Neurosurgical Society	http://www.neurochina.org/ https://www.ns.org.hk/
Colombia	Bogota	America	Colombian Association Of Neurosurgery (ACNCX)	https://www.acncx.org/ https://www.facebook.com/profile.php?id=100063885800177

(Contd...)

Table 1: (Continued).

Country	Capital	Continent	Name of the Neurosurgery Society or Association	Site or Social Network
Costa Rica	San José	America	Costa Rican Association of Neurosurgeons (Asociacion Costarricense Neurocirugia)	http://www.neurocirugiacr.org/
Croatia	Zagreb	Europe	Croatian Neurosurgical Society	https://www.hnd-hlz.com/
Cyprus	Nicosia	Europe	Cyprus Neurosurgical Society	https://cyma.eu/2017/index.php/2016-06-11-07-35-41/2017-08-03-18-22-45
Cuba	Havana	America	Cuban Society Of Neurology And Neurosurgery	https://www.cubaheal.com/institute-of-neurology-and-neurosurgery-inn/
Czech Republic	Prague	Europe	Czech Neurosurgical Society	http://www.czech-neurosurgery.cz/
Democratic Republic of Congo	Kinshasa	Africa	Czech Spine Surgery Society	http://www.spine.cz/index.php/en/
Denmark	Copenhagen	Europe	Societe Congolaise De Neurochirurgie	https://www.youtube.com/channel/UCzQWYn86im04FMKDM-zUxlg
Dominican Republic	Santo Domingo	America	Danish Neurosurgical Society	https://dnks.dk/
Ecuador	Quito	America	Dominican Society of Neurosurgery And Neurology	https://www.facebook.com/SociedadDominicanaDeNeurologiaYNeurocirugia/
Egypt	Cairo	Africa	Ecuadorian Neurosurgical Society	http://www.senc.med.ec/
El Salvador	San Salvador	America	Egyptian Society of Neurological Surgeons (ESNS)	https://www.esns-eg.org/
Estonia	Tallinn	Europe	Neurosurgical Association Of El Salvador (Ances, Asociación De Neurocirugia De El Salvador)	https://neurocirugiadeelsalvador.com/quienes-somos/
Ethiopia	Addis Ababa	Africa	Estonian Society of Neurologists And Neurosurgeons	https://www.enns.ee/
Europe-other societies	Countries of Europe	Europe	Society Of Ethiopian Neurological Surgery Professionals	https://www.ethiopianeurosurgery.com/
Finland	Helsinki	Europe	Central European Neurosurgical Society (CENS) European Assoc. of Neurosurgical Societies (EANS Continental)	DOI: 10.1007/s00701-004-0471-5 https://www.azet.sk/firma/54104/stredoeuropska-neurochirurgicka-spolocnost/
France	Paris	Europe	Southeast Europe Neurosurgical Society (SEENS) European Society For Stereotactic And Functional Neurosurgery	https://www.eans.org/ http://www.seens.eu/ http://www.essfn.org/
French Speaking Countries	-	-	Finnish Neurosurgical Society (FNS)	https://www.snky.fi/
Georgia	Tbilisi	Asia	French Society Of Neurosurgery (SFNC)	https://www.sfneurochirurgie.fr/fr/
Germany	Berlin	Europe	French-Speaking Society of Neurosurgery (SNCLF)	https://www.snclf.fr/
			Georgia Association of Neurosurgeons	http://htmc-neuro.ge/
			Georgia Association Of Child Neurologists And Neurosurgeons	https://childneurology.ge/
			German Academy Of Neurosurgery (GANS, DANC) German Society Of Neurosurgery (DGNC) German Society For Spine Surgery (DGW) Skull-Base Surgery German Society	http://www.danc.de/ http://www.dgnc.de/ https://www.dwg.org/ https://dgsb.de/

(Contd...)

Table 1: (Continued).

Country	Capital	Continent	Name of the Neurosurgery Society or Association	Site or Social Network
Ghana	Accra	Africa	Ghana Academy Of Neurosurgeons (GANS)	DOI: 10.1055/s-0042-1750358 https://www.medpages.info/sf/index.php?page=person&personcode=147578
Greece	Athens	Europe	Hellenic Neurosurgical Society	http://www.enxe.gr/
Guatemala	Guatemala City	America	Asociacion Guatemalteca De Neurocirugia	https://www.dunsguide.com/es/company/a51bdfe27e9a4c24de48419639447c4f/asociacion-guatemalteca-de-cirugia-neurologica-agcn
Gulf	-	Asia	Gulf Neurosurgical Society	https://uia.org/s/or/en/1122275231
Haiti	Port-au-Prince	America	Haiti Neurosurgery Initiative	https://www.haitineurosurgery.org/
Honduras	Tegucigalpa	America	Neurosurgical Society Of Honduras (SHNG)	https://www.facebook.com/Neurohonduras/
Hungary	Budapest	Europe	Hungarian Neurosurgical Society	http://www.neurosurgery.org.hu/info.aspx?sp=1 http://neurosurgery.org.hu/ http://www.neurosocietyindia.com/
India	New Delhi	Asia	Neurosurgical Section Of The Neurological Society Of India (NSI)	
Indonesia	Jakarta	Asia	Indonesian Neurosurgical Society (Perspepsi)	http://www.ins.or.id/
Iran	Tehran	Asia	Neurosurgical Society Of Iran	https://www.irneso.com/
Iraq	Baghdad	Asia	Iraqi Association Of Neurosurgery	https://www.facebook.com/groups/iraquineurosurgeons/
Israel	Jerusalem	Asia	Israel Neurosurgical Society	https://www.israelneurosurgery.com/
Italy	Rome	Europe	Italian Society Of Neurosurgery (SINCH)	http://www.sinch.it/
Ivory Coast	Yamoussoukro	Africa	Ivorian Society Of Neurosurgery	https://nch2022ivoire.org/
Japan	Tokyo	Asia	Japan Neurosurgical Society	https://jns-official.jp/
			Japanese Congress Of Neurological Surgeons	https://www.jcns-online.jp/en/
Jordan	Amman	Asia	Society of Jordanian Neurological Surgeons	http://www.sjns-jo.org/
			Brain And Nerves Association	http://www.civilsociety-jo.net/ar/organization/572 https://www.facebook.com/NeurosurgeryJUH/
Kazakhstan	Astana	Asia	Kazakh Association Of Neurosurgeons	http://www.nsi.kz http://neurosurgeons.kz/
Korea, North	Pyongyang	Asia	Korean Neurosurgical Association, DPRK	https://doi.org/10.1016/j.wneu.2015.03.020
Korea, South	Seoul	Asia	Korean Neurosurgical Society (KNS) Korean Society Of Spinal Neurosurgery Korean Academy Of Neurological Surgeons (KANS) Korean Society Of Ultrasound for Neurosurgery	http://www.neurosurgery.or.kr/ https://www.neurospine.or.kr/ http://medicine.korea.ac.kr/en/web/www/-111?p_p_id=Bbs_WAR_bbsportlet&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column-1&p_p_col_pos=1&p_p_col_count=2&_Bbs_WAR_bbsportlet_curPage=43&_Bbs_WAR_bbsportlet_action=view_message&_Bbs_WAR_bbsportlet_messageId=2324 http://www.kanus.or.kr/ https://shskuk.rks-gov.net/Navbar/SubMenuContent/klinikaNeurokirurgije
Kosovo	Pristina	Europe	Kosova Neurosurgical Society	http://www.kma.org.kw/en-US/AssociationsDetails.aspx?id=1031
Kuwait	Kuwait City	Asia	Kuwait Society Of Neurological Surgeons (KSNS)	http://www.kma.org.kw/en-US/AssociationsDetails.aspx?id=1031
Kyrgyzstan	Bishkek	Asia	Kyrgyz Neurosurgical Society	kyrgyzneurosurgery@mail.ru
Latvia	Riga	Europe	Latvian Society Of Neurological Surgeons	https://www.neirokirurgija.lv https://medicine.lv/infolapa/?c=latvijas-neirokirurgu-biedriba

(Contd...)

Table 1: (Continued).

Country	Capital	Continent	Name of the Neurosurgery Society or Association	Site or Social Network
Lebanon	Beirut	Asia	Lebanese Society Of Neurosurgery (La Societe Libanaise De Neurochirurgie)	https://www.facebook.com/lsneurosurg/ ; https://medicarp.com/ar/companies/302/details/Lebanese%20Society%20of%20Neurological%20Surgery
Libya	Tripoli	Africa	World Association Of Lebanese Neurosurgeons (WALN)	http://www.waln.org/
Lithuania	Vilnius	Europe	Libyan Assoc. Of Psychiatry Neurology And Neurosurgery Lithuanian Neurosurgical Society	https://lsns.org.ly/ https://www.neurosurgicalsociety.lt https://www.medicina.lt/ru/imones/Lietuvos-neurochirurg%C5%B3-draugija/2025002 https://lt.wikipedia.org/wiki/Lietuvos_neurochirurg%C5%B3_draugija https://hnjm.mg/
Malagasy	Antananarivo	Africa	Malagasy Society Of Neurological Surgery	
Malaysia	Kuala Lumpur	Asia	Neurosurgical Association Of Malaysia	https://www.nam.org.my/
Mauritania	Nouakchott	Africa	Mauritanienne Society Of Neurosurgery	-
Mexico	Mexico City	America	Mexican Society Of Neurological Surgery	https://www.smcn.org.mx/
Moldova	Chisinau	Europe	Association Of Neurosurgeons Of Moldova	https://inn.md/
Mongolia	Ulaanbaatar	Asia	Mongolian Neurosurgical Society	https://www.facebook.com/MongolianNeurosurgicalSociety/
Morocco	Rabat	Africa	Moroccan Society Of Neurosurgery	http://www.neurochirurgiemaroc.ma/
Myanmar	Naypyidaw	Asia	Myanmar Neurosurgical Society	https://www.facebook.com/groups/1407236689406651/
Nepal	Kathmandu	Asia	Nepalese Society Of Neurosurgeons (NESON)	http://www.neson.org.np/ https://www.facebook.com/nepalesesocietyofneurosurgeons/ https://www.nvvn.org/
Netherlands	Amsterdam	Europe	Netherlands Society For Neurosurgery (NVVN)	
New Zealand	Wellington	Oceania	New Zealand Neurosurgical Society	https://www.nsa.org.au/
Nicaragua	Managua	America	Latin Amaerican Federation Of Neurosurgical Societies (FLANC)	https://flancneurocirugia.org/
Nigeria	Abuja	Africa	Nigerian Academy Of Neurological Surgeons (NANS) Nigerian Society Of Neurological Sciences	https://nansorg.com/ https://nsnsconference.com/
North Macedonia	Skopje	Europe	Macedonian Society Of Neurosurgeons	-
Norway	Oslo	Europe	Norwegian Neurosurgical Society	https://www.ous-research.no/langmoen/ https://www.ntnu.edu/nns/norwegian-neuroscience-society https://www.ous-research.no/home/langmoen/Norw%20Neurosurg%20Assoc/9396 https://www.paksn.org/
Pakistan	Islamabad	Asia	Pakistan Society Of Neurosurgeons	
Palestine	East Jerusalem	Asia	Palestinian Neurosurgical Society	-

(Contd...)

Table 1: (Continued).

Country	Capital	Continent	Name of the Neurosurgery Society or Association	Site or Social Network
Pan-Arab	-	Asia	Pan Arab Neurosurgical Society	https://www.facebook.com/PANARABNEAUROSURGERY/ https://panarabconference2022.com/ http://spnn.com.pa/web/
Panama	Panama City	America	Panamanian Society Of Neurosurgery And Neurology	
Paraguay	Asunción	America	Sociedad Paraguaya De Neurocirugia	https://es-la.facebook.com/neurocirugiapy/
Peru	Lima	America	Sociedad Peruana De Neurocirugia	https://sociedadperuananc.wixsite.com/spnc https://neurocirugia.org.pe/inicio/ https://afninc.org/
Philippines	Manila	Asia	Academy Of Filipino Neurosurgeons	
Poland	Warsaw	Europe	Polish Society Of Neurosurgeons	https://neurochirurgia-polska.org/
Portugal	Lisbon	Europe	Portuguese Neurosurgery Society	https://www.spnc.pt/en/
Qatar	Doha	Asia	Qatar Society For Neurological And Spine Surgery	https://www.hamad.qa/EN/All-Events/NRC/Pages/welcome-message-chairman.aspx https://rsn.ro/
Romania	Bucharest	Europe	Romanian Society Of Neurosurgery	
Russia	Moscow	Europe	Siberian Association Of Neurosurgeons Federal Neurosurgical Center Association Of Neurosurgeons Of Russia Russian Society Of Specialists In Head And Neck Tumors National Neuromodulation Society Of Russia	https://sibneuro.org/en/ https://neuronsk.ru/en/?SHOWALL_1=1 https://ruans.org/ https://hnonco.ru/about.html https://nnsr.com.ru/about/
Saudi Arabia	Riyadh	Asia	Saudi Association Of Neurological Surgery (SANS)	https://www.sans.org.sa/
Scandinavian Countries	-	Europe	Scandinavian Neurosurgical Society	http://snsweb.org/Scandinavian_Neurosurgical_Society/Welcome.html
Senegal	Dakar	Africa	Senegalese Society Of Neurosurgery	https://m.facebook.com/people/Soci%C3%A9t%C3%A9-S%C3%A9n%C3%A9galaise-de-Neurochirurgie-SSNC/100067608818283/ http://snss.rs/ http://cnssingapore.blogspot.com/
Serbia	Belgrade	Europe	Serbian Neurosurgical Society	
Singapore	Singapore City	Asia	Clinical Neuroscience Society Of Singapore	
Slovakia	Bratislava	Europe	Slovak Neurosurgical Society (SNCHS)	http://www.neurosurgery.sk/
Somalia	Mogadishu	Africa	Somali Society Of Neurological Sciences	https://www.ssneuroscience.org/
South Africa	Pretoria	Africa	The Society Of Neurosurgeons Of South Africa (SNSA)	http://www.snsa.co.za/
South Sudan	Juba	Africa	Sudan Association Of Neurosurgeons	https://www.facebook.com/sudanneurosurgeons/
Spain	Madrid	Europe	Spanish Society Of Neurosurgery Sociedad Andaluza De Neurocirugía Sociedad Aragonesa De Neurocirugía Sociedad Castellano-Leonesa De Neurocirugía Sociedad Catalana De Neurocirugía Sociedad Gallega De Neurocirugía Sociedad De Neurocirugía De Levante De Las Comunidades Autónomas De Valencia Y De Murcia Sociedad Madrileña De Neurocirugía	https://senec.es/ https://soanne.es/ https://www.comz.org/ https://sociedad-aragonesa-neurocirugia.org/ http://sclnc.org/ http://scnc.cat/ http://sogane.org/ https://neurocirugialevante.org/ http://www.soncam.es/

(Contd...)

Table 1: (Continued).

Country	Capital	Continent	Name of the Neurosurgery Society or Association	Site or Social Network
Sri Lanka	Sri Jayawardenapura Kotte	Asia	Neurosurgeons Association of Sri Lanka	https://m.facebook.com/profile.php?id=100068783840228&ref=py_c&_rdr
Sudan	Khartoum	Africa	Sudan Association of Neurosurgeons	https://www.facebook.com/sudanneurosurgeons/
Sweden	Stockholm	Europe	Swedish Neurosurgical Society	http://www.swedishneurosurgicalsociety.se/
Switzerland	Bern	Europe	Swiss Society Of Neurosurgery	https://www.swissneurosurgery.ch/Home
Syria	Damascus	Asia	Syrian Society Of Neurological Surgery	http://www.neurosyria.org/
Taiwan	Taipei	Asia	Taiwan Neurosurgical Society Taiwan Neurosurgical Spine Society	http://www.neurosurgery.org.tw/ http://www.tnss.org.tw/
Tanzania	Dodoma	Africa	Tanzania Neurosurgery Project	https://weillcornellbrainandspine.org/programs/tanzania-neurosurgery-project
Thailand	Bangkok	Asia	The Royal College Of Neurological Surgeons Of Thailand	https://www.neurosurgery.org.tw/ http://www.neuro.or.th/
Tunisia	Tunis	Africa	Tunisian Society Of Neurological Surgery	https://pt-br.facebook.com/STNCh/shouissa@yahoo.com
Turkey	Ankara	Asia	Turkish Society Of Neurosurgery	https://turknorosisurji.org.tr/
Uganda	Kampala	Africa	The Neurosurgical Society Of Uganda	https://www.facebook.com/neurosocietyug/ neurosocietyug@gmail.com https://twitter.com/neurosocietyug
Ukraine	Kiev	Europe	Ukrainian Association Of Neurosurgeons	https://www.facebook.com/1993UAN/ https://www.uaneuro.com/
United Arab Emirates	Abu Dhabi	Asia	Emirates Society Of Neurological Surgeons	http://esns.ae/
United Kingdom	London	Europe	The Society Of British Neurological Surgeons British Neurosurgical Trainees' Association British Skull Base Society	https://www.sbns.org.uk/ http://e1v1m1.co.uk/
United states	Washington D.C.	America	American Association of Neurological Surgeons American Association Of South Asian Neurosurgeons Georgian Neurosurgical Society The Society Of Neurological Surgeons American Board Of Neurological Surgery American Academy Of Neurological Surgery Neurosurgical Society Of America (NSA) The Society Of University Neurosurgeons (SUN) American Society Of Pediatric Neurosurgeons North American Skull Base Society American Society For Stereotactic And Functional Neurosurgery	https://www.aans.org/ http://aasan1.org/ http://www.ganeurosurgical.org/ https://www.societyofneurosurgeons.org/ https://abns.org/ https://www.americanacademyns.org/Default.aspx https://www.neurosurgicalsociety.org/ http://societyofuniversityneurosurgeons.com/SUN/Home.html https://www.aspn.org/ https://www.nasbs.org/ http://www.assfn.org/1

(Contd...)

Table 1: (Continued).

Country	Capital	Continent	Name of the Neurosurgery Society or Association	Site or Social Network
Uruguay	Montevideo	America	Uruguayan Society Of Neurosurgery (SUNC)	https://www.sunc.com.uy/
Uzbekistan	Tashkent	Asia	Uzbekistan Society Of Neurosurgery	http://www.neuro.uz/en
Venezuela	Caracas	America	Venezuelan Society Of Neurosurgery	https://neurocirugiavenezuela.com/
Vietnam	Hanoi	Asia	Vietnamese Neurosurgical Society VNS	http://neurosurgery.vn/
World	-	-	World Federation Of Neurosurgical Societies World Society For Stereotactic And Functional Neurosurgery International Society For Pediatric Neurosurgery (ISPN)	http://www.wfns.org/ https://www.wssf.org/ https://www.ispneurosurgery.org/
Yemen	Sana'a	Asia	Yemen Neurosurgical Society	neurosurgeryemen@gmail.com https://www.facebook.com/TTYNSC/
Zimbabwe	Harare	Africa	Zimbabwe Association Of Neurological Surgeons	https://www.zans.co.zw/
Countries without Neurosurgery Societies (n=77)	Andorra, Angola, Antigua and Barbuda, Azerbaijan, Bahrain, Belize, Benin, Bhutan, Botswana, Brunei, Burundi, Cape Verde, Central African Republic, Chad, Comoros, Djibouti, Dominica, East Timor, Equatorial Guinea, Eritrea, Eswatini, Fiji, Gabon, Gambia, Grenada, Guinea, Guinea-Bissau, Guyana, Iceland, Ireland, Jamaica, Kenya, Kiribati, Laos, Lesotho, Liberia, Liechtenstein, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Mauritius, Micronesia, Monaco, Montenegro, Mozambique, Namibia, Nauru, Oman, Palau, Panama, Papua, New Guinea, Republic of the Congo, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, São Tomé and Príncipe, Seychelles, Sierra Leone, Solomon Islands, Suriname, Tajikistan, Togo, Tonga, Trinidad and Tobago, Turkmenistan, Tuvalu, Vanuatu, Vatican City, Zambia			

are 189 neurosurgery societies, associations or groups around the world, involving 131 countries or regions.^[15] The World Federation of Societies of Neurosurgery has 130 members as affiliates. There are also various societies on the African continent and in the United States of America.^[21] There are about 60 neurosurgical associations that are not internationally recognized (i.e., not listed in WFNS portal). This is because some nations have few neurosurgeons, while others are grouped into larger regions (i.e., Europe, Africa, and Central America). Some were found in external links that were outdated (i.e., Neurosurgical Society of Uganda, Estonian Society of Neurologists and Neurosurgeons, and Cameroon Society of Neurosurgery). Other societies were difficult to trace due to their subspecialties (i.e., largely pediatrics, spinal, functional, oncological, and vascular neurosurgical societies).

Distribution of neurosurgeons worldwide

We observed that China, the with the largest population in the world, (i.e., 1.45 billion inhabitants: human development index [HDI] of 0.764), has about 11,000 neurosurgeons (i.e.), followed by India (i.e. 1.4 billion: HDI of 0.633), with

approximately 1800 neurosurgeons.^[4,11,17,22] The United States is in 3rd place (i.e., population of 333 million, HDI of 0.921), with approximately 3500 neurosurgeons.^[16] Notably, the goal of the American College of Surgeons and American Association of Neurological Surgeons is one neurosurgeon/100,000 inhabitants (i.e., also observing a disproportion for their distribution).^[19]

Indonesia, the fourth most populous country in the world has 370 neurosurgeons for a population of 275 million, HDI 0.777,^[8] followed by Pakistan, with 229 million inhabitants and about 100 to 300 neurosurgeons in the country, with an HDI of 0.544.^[1] Nigeria has 216 million people and about 70 to 100 neurosurgeons, HDI of 0.535,^[18,7] followed by Brazil, with a population of 214 million and approximately 4145 neurosurgeons, with an HDI of 0.754.^[2]

Bangladesh has a population of 167 million, with 154 neurosurgeons, with an HDI of 0.661,^[12] followed by Russia, with 145 million inhabitants and about 2487 neurosurgeons, with an HDI of 0.829.^[13] Finally, the 10th most populous country in the world, Mexico, with 126 million inhabitants, has only about 1146 neurosurgeons, with an HDI of 0.758.^[10] Of interest, the FLANC documented a ratio of 1.4 neurosurgeons

for every 100,000 inhabitants. Interestingly, Japan, the 11th most populous country (i.e., 124 million inhabitants), has about 7495 neurosurgeons (i.e., largest number in world; HDI of 0.925).^[15] However, they specialize in other areas of clinical neuroscience, so fewer are practicing neurosurgery.

Higher development index correlates with more neurosurgeons

Based on an analysis of the ten most populous countries in the world, countries with a higher concentration of neurosurgeons tend to have higher HDI values. Alternatively, countries with lower HDI tend to have a smaller number of neurosurgeons. Therefore, it has been observed that there is a tendency in most countries that directly correlates a greater number of neurosurgical societies with the number of neurosurgeons. There is also a greater variety of subspecialized societies [Table 1].

77 countries without official neurosurgical associations/societies

There are 77 countries without official associations or neurosurgical societies; this includes: Guinea-Bissau, Guyana, Jamaica, Iceland, Monaco, the Vatican, and others [Table 1]. The African and European continents bring together different countries that often lead to larger neurosurgical societies that are also influenced by socioeconomic conditions. Finally, some limitations of this article were the difficulty of finding countries that do not have a significant neurosurgical activity. There is also the hypothesis that some societies may be active, but it was not possible for them to be traced, because they are not listed in the research bases used, such as Google, Google Scholar, Scopus, and PubMed, as well related to the difficulty of translating the search terms in local languages.

CONCLUSION

There should be better global standardization and improved official communication between neurosurgical societies worldwide (i.e., websites or social networks). Certainly, the integration and interaction between the multiple neurosurgical societies are critical to the exchange of information between neurosurgeons performing approximately 13.8 million cases/year (i.e., with 80% being done in low/medium income countries). Thus, we cannot emphasize enough the importance of better educating neurosurgical colleagues across the globe as to how deliver better neurosurgical care.^[5]

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

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