





ORIGINAL ARTICLE

General neurology: Current challenges and future implications

Claudio Lino Alberto Bassetti¹  | Alice Accorroni²  | Astri Arnesen³ |
Hamidon Bin Basri⁴ | Thomas Berger⁵ | Peter Berlit⁶  | Paul Boon^{7,8} |
Augustina Charway-Felli⁹ | Jera Kruja¹⁰ | Steven Lewis¹¹ | Michael Markowski¹² |
Marco Tulio Medina¹³ | Pamela McCombe¹⁴ | Elena Moro¹⁵  | Serefnur Ozturk¹⁶ |
Phil Smith¹⁷ | Vladimira Vuletic¹⁸

Correspondence

Claudio Lino Alberto Bassetti, Neurology
Department, Inselspital, University
Hospital, University of Bern, Switzerland.
Email: claudio.bassetti@insel.ch

Abstract

Background and purpose: In the coming decades, the world will face an increasing burden of neurological disorders (ND) and an urgent need to promote brain health. These challenges contrast with an insufficient neurological workforce in most countries, as well as decreasing numbers of general neurologists and neurologists attracted to work in general neurology (GN). This white paper aims to review the current situation of GN and reflect on its future.

Methods: The European Academy of Neurology (EAN) task force (TF) met nine times between November 2021 and June 2023. During the 2023 EAN annual meeting, attendees were asked to answer five questions concerning the future of GN. The document was sent for suggestions and eventually approval to the board and the presidents of the 47 national societies of the EAN.

Results: The TF first identified four relevant current and future challenges related to GN: (i) definition, (ii) practice, (iii) education, and (iv) research. The TF then identified seven initiatives to further develop GN at both the academic and community level. Finally, the TF formulated 16 recommendations to promote GN in the future.

Conclusions: GN will remain essential in the coming decades to provide rapid, accessible, and comprehensive management of patients with ND that is affordable and cost-effective. There is also a need for research, education, and other initiatives aiming to facilitate improved working conditions, recognition, and prestige for those pursuing a career in GN.

KEYWORDS

general neurology, neurology

This is a white paper of the European Academy of Neurology (EAN) General Neurology Task Force in collaboration with representatives of American Academy of Neurology (AAN), African Federation (AFAN), Australian New Zealand Association of Neurologists (ANZAN), Asian and Oceanian Association of Neurology (AOAN), European Federation of Neurological Associations (EFNA), Pan American Federation of Neurological Societies (PAFNS), Residents and Research Fellows Section of the EAN (RRFS), and World Federation of Neurology (WFN). C. L. A. Bassetti, T. Berger, P. Berlit, P. Boon, J. Kruja, E. Moro, S. Ozturk, P. Smith, V. Vuletic: EAN. A. Accorroni: RRFS. A. Arnesen: EFNA. H. B. Basri: AOAN. A. Charway-Felli: AFAN. S. Lewis: WFN. M. Markowski: AAN. M. T. Medina: PAFNS. P. McCombe: ANZAN.

For affiliations refer to page 10.

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2024 The Authors. *European Journal of Neurology* published by John Wiley & Sons Ltd on behalf of European Academy of Neurology.

INTRODUCTION

Neurology arose as a medical specialty in the second half of the 19th century, with the first independent departments of neurology and formalized training programs established in Europe, USA, and Latin America at the turn of the 20th century [1]. In the past 50 years, the exponential development of new diagnostic and treatment approaches (“neurotherapeutics”) has led to the development of subspecialties and, in a growing number of instances, the separation of neurologists into general and specialized ones.

Neurological disorders (ND) worldwide are the leading cause of disability and the second most common cause of premature death [2]. In Europe, ND are the third leading cause of death and disability [3]. The increasing number of people with ND in the past 30 years in low- and middle-income countries reflects population growth and ageing.

Furthermore, the economic burden of ND is very high. For Europe it was estimated in 2010 to be €800 billion, exceeding that of diabetes, cardiovascular disorders, and cancer [4]. In the USA alone, ND were more recently estimated to cost US\$789 billion [5]. (Conversion from 2010 to 2023 euros is a factor of 1.5.)

In response to the high and increasing risk of disability and mortality related to ND, the World Health Organization Assembly recognized ND as a global public health priority by approving the “intersectoral global action plan on epilepsy and neurological disorders” (IGAP) [6] in May 2022. The IGAP defined five strategic objectives (i.e., development of national strategies, inclusion of ND in universal health care benefits, promotion of prevention, research, and information) that the member states should reach by 2031 to reduce the burden of ND and promote brain health [7]. In line with these goals, the European Academy of Neurology (EAN) launched in 2022 the brain health strategy “one brain, one life, one approach” [8]. More recently, Germany and Switzerland also launched national plans on brain health [9].

However, despite these programs, most countries in the world will face in the next decades three major challenges to reduce the burden of ND and enhance brain health.

(i) Overall insufficient neurological workforce. There is estimated to be 0.1 neurologists per 100,000 population in low-income countries versus 7.1 neurologists in high-income countries and 9.2 in Europe (Figure 1) [3, 5, 10]. Several countries in Asia have fewer than one neurologist per million people (Bangladesh, Cambodia, East Timor, India, Laos, Maldives, Myanmar, Nepal, North Korea, Pakistan, and Papua New Guinea) [11]. In a few regions (such as Latin America), neurologist numbers have increased in recent years [12], but the growth of the neurological workforce remains slow in Africa and other regions of the world. In addition, even in regions such as Europe and North America with overall high numbers of neurologists, there is an unequal distribution, with some areas reporting an insufficient neurological workforce [3, 13]. This shortage is exacerbated by high rates of burnout among early career neurologists [14],

increasing complexity of neurotherapeutics, and general and family physicians (practitioners) feeling less confident in managing neurological diseases.

- (ii) Ongoing (or expected) decrease in the neurological workforce including fewer general neurologists (GNs) in high-income countries. Australia expects a significant shortfall of workforce relative to the projected demand between 2020 and 2034 [15]. In the USA, the number of American Academy of Neurology (AAN) members who self-identify as GNs has fallen from 46% in 2014 to 28% in 2023 (Table 1).
- (iii) Decreasing attractiveness of general neurology (GN) for GNs (lower salaries, less academic recognition, high workload). In Turkey, for example, 70% of GNs in private practice examine 41 or more patients per day, and 40% of GNs undertake on-call duties for 10 or more days per month [16].

This white paper aims to review the current situation of GN and reflect on its future.

METHODS

The president of the EAN (C.L.A.B.) created a task force (TF) in Fall 2021 [17]. Discussions between the EAN, AAN, and World Federation of Neurology (WFN) presidents at the 2020 pan arab union of neurological societies (PAUNS) meeting in Cairo also led to the inclusion of representatives of AAN and WFN in the TF. Additional representatives of the EAN and of other societies (including all regional neurological societies) were subsequently invited to join the TF.

The TF virtually met nine times between November 2021 and June 2023 to (i) define the aim of the work; (ii) identify the main topics to be addressed; (iii) formulate recommendations for the future related to the main topics; and (iv) draft, discuss, and finalize the white paper.

During the 2023 EAN annual meeting in Budapest, attendees were asked to answer the following five questions concerning the current state and future of GN:

- (i) What is your main current clinical activity? (1=GN, 2=specialized neurology);
- (ii) What percentage of your training (residency) is spent in GN? (%);
- (iii) Is training on GN sufficient? (1=yes, 2=no, 3=no opinion);
- (iv) Should GN be promoted for the future of neurology? (1=yes, 2=no, 3=no opinion);
- (v) Are you interested to see more GN activities in future EAN congresses (1=yes, 2=no, 3=no opinion); what? (free text).

The final draft of document was sent for comments, suggestions, and eventually approval to the boards of the involved societies and the presidents of the 47 national societies of the EAN.

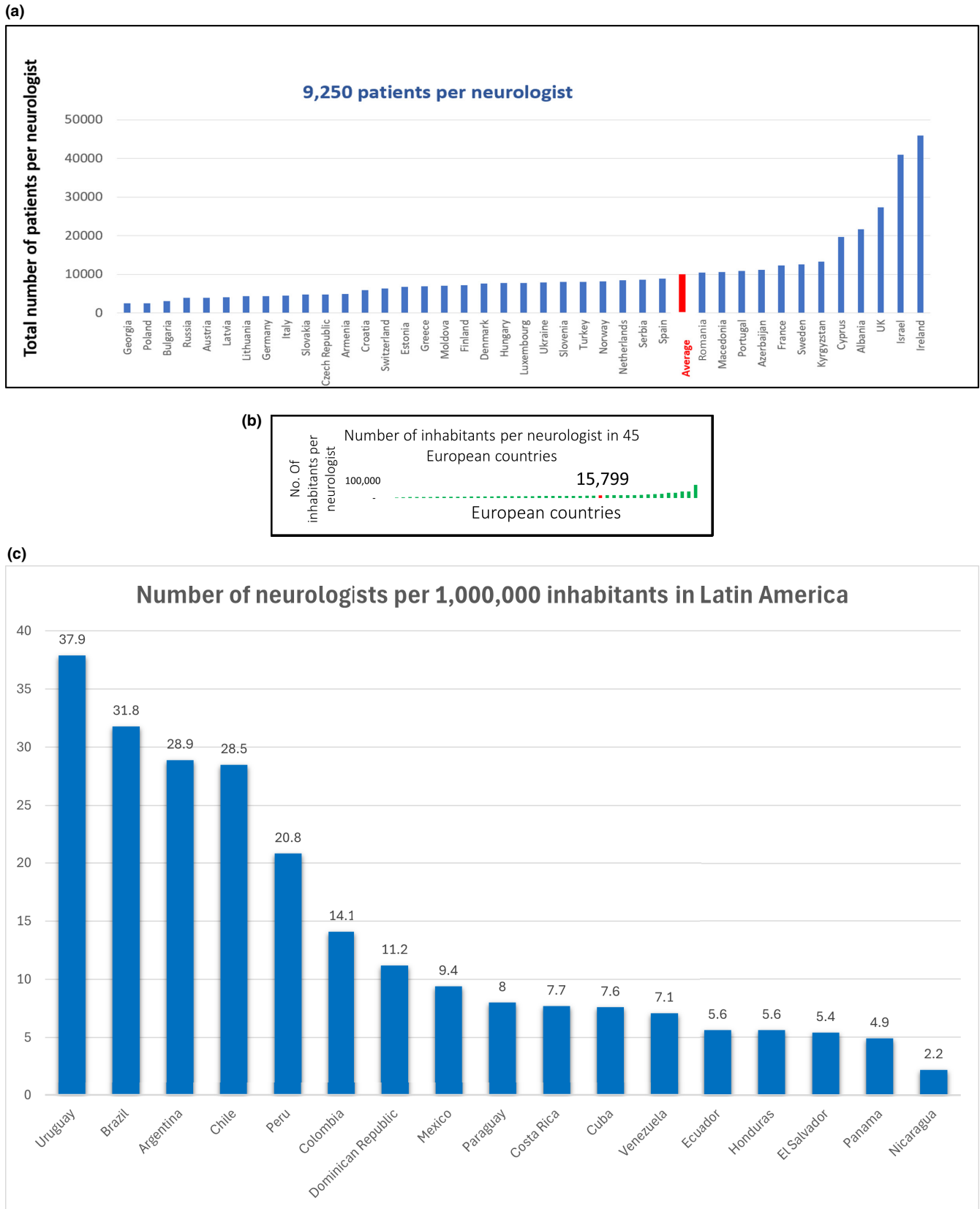


FIGURE 1 Neurological workforce (patients/neurologist) in Europe (a, b), Latin America (c), and Asia (d). The number of neurologists varies across the globe from 0.1 per 100,000 population in low-income countries to 7.1 in high-income countries and 9.2 in Europe. The number of patients per neurologist depends on the number of neurologists but also on the role of primary care physicians in the care of neurological patients. CH, China; HK, Hong Kong; IND, India; INDO, Indonesia; JP, Japan; KR, South Korea; ML, Malaysia; PH, Philippines; PK, Pakistan; SN, Singapore; TH, Thailand; TW, Taiwan; VN, Vietnam. [Correction added on 6 April 2024 after first online publication: Figure 1e title has been updated.]

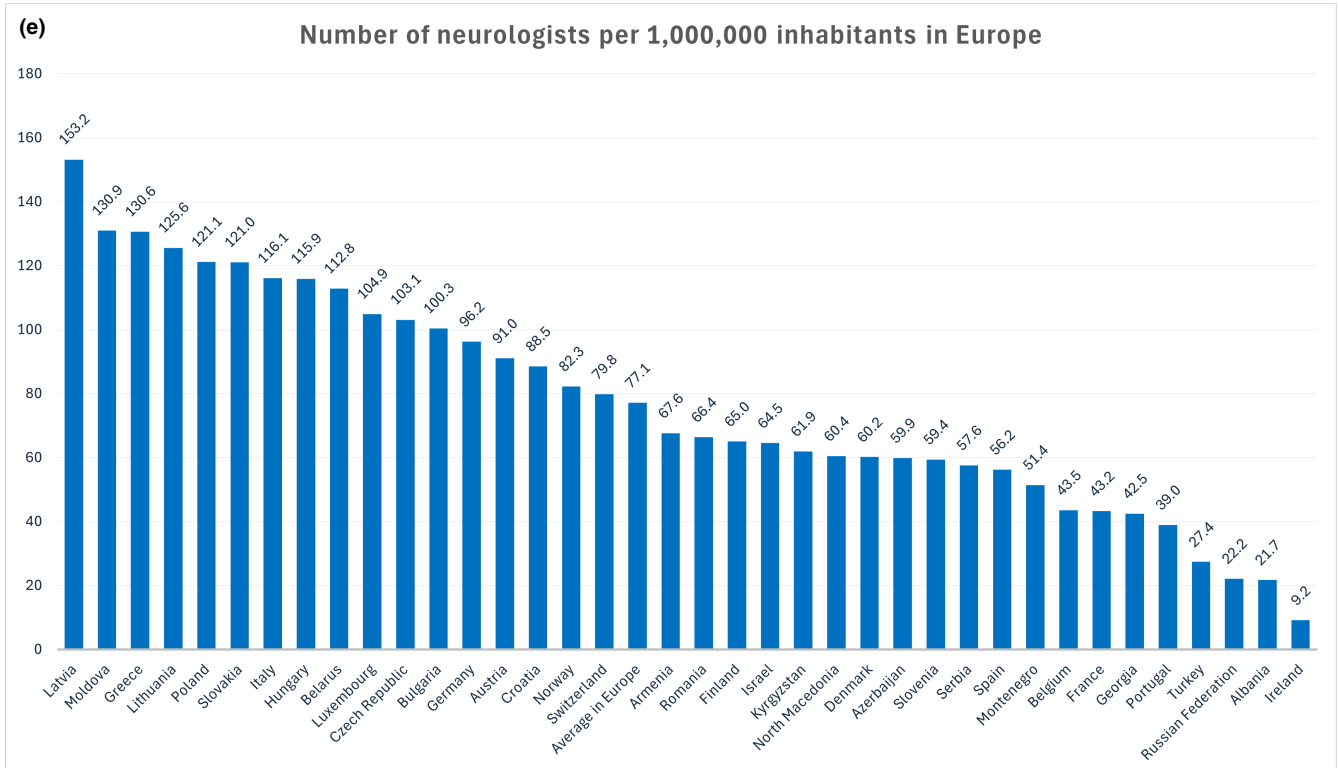
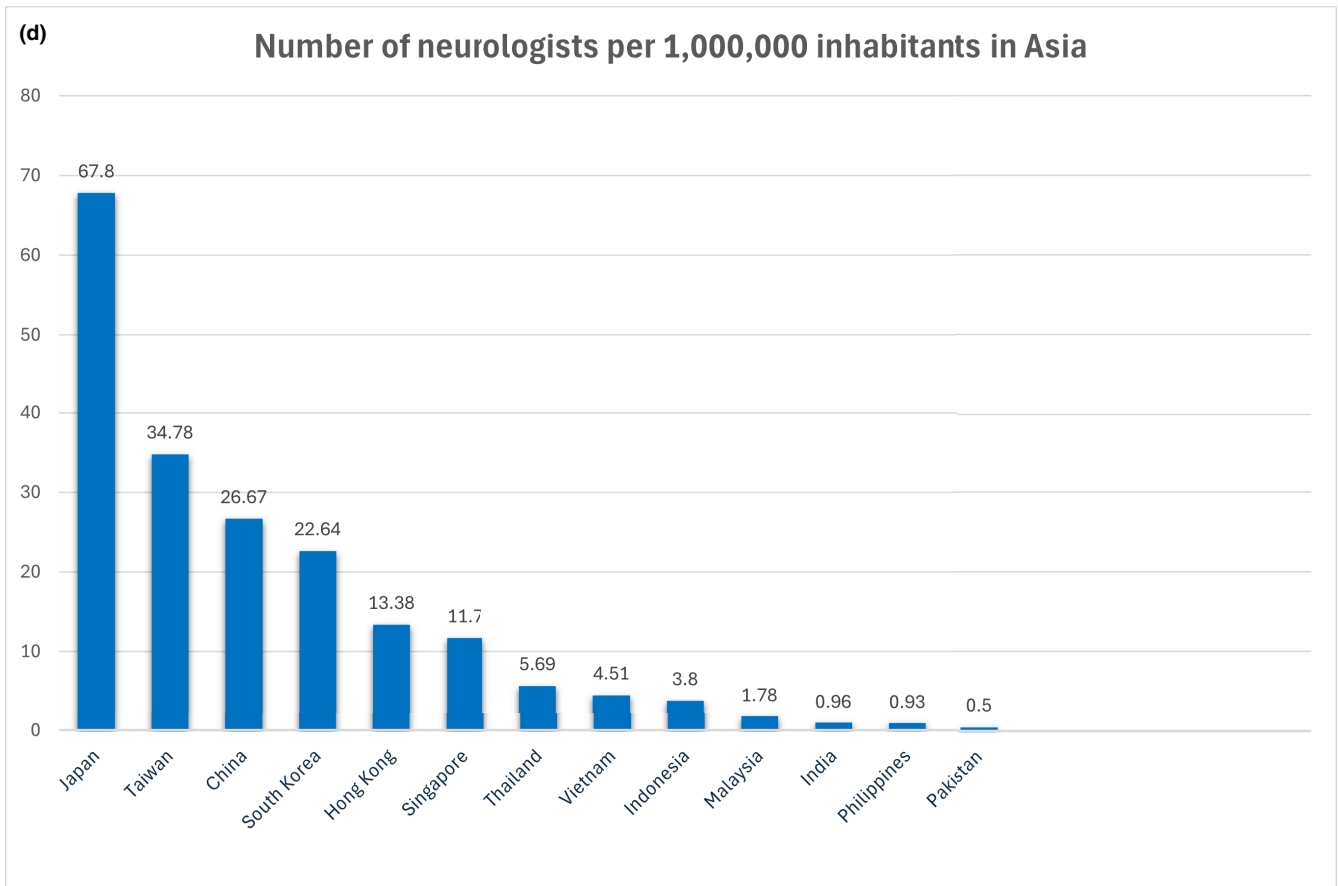


FIGURE 1 (Continued)

TABLE 1 Progressive reduction of general neurologists.

Year	%	n
2014	46	3505
2015	40	3896
2016	37	4153
2017	36	4369
2018	35	4401
2019	33	4364
2020	31	4208
2021	31	4162
2022	29	4037
2023	28	3930

Note: The table shows the percentage and absolute number of American Academy of Neurology members identifying themselves as general neurologists (2023 American Academy of Neurology Demographics Report).

Topic 1: GN today and tomorrow

Definition of GN

The term GN refers to the field of medical practice that diagnoses and manages disorders of the nervous system. Thus, it refers to the field of neurological practice that involves all symptoms, syndromes, and diseases/disorders that relate to the nervous system. (Regions of the nervous system include the brain, spinal cord, optic nerves, peripheral nerves, neuromuscular junction, and muscles. Examples of disease categories include, but are not limited to, dementia, demyelinating diseases, epilepsy, headache, movement disorders, neurologic manifestations of systemic disease, neuromuscular disease, sleep disorders, and stroke.)

Current situation

The term *general neurologist* refers to a neurologist whose main clinical practice, skills, and education involve the diagnosis, management, prevention, and rehabilitation of any disorder affecting the nervous system, as well as the promotion of brain/neurologic health. In other words, GNs do not restrict their practice to a particular subspecialty of neurology.

Recommendation

The TF believes that, although the profile, proactive recognition, and promotion of GN need revisions, the term *general neurology* should remain.

The practice of GN and other general considerations

Current situation

The results of the 2023 survey of the EAN, which was responded to by 307 congress attendees (58% females, 60% <34 years old; see above), representing less than 10% of the participants, can be summarized as follows:

- 75% of the responders identified GN as their main activity.
- 65% was the estimated percentage of time spent in GN during residency.
- 50% of the responders considered training in GN during residency sufficient.
- 89% of the responders expressed interest in more GN topics during the EAN congresses.
- 5% of the responders placed the income of GNs in the upper third of neurology.

In a 2023 survey of the AAN, 28% of the members reported GN as their main field of activity (2023 American Academy of Neurology Demographics Report; [Table 1](#)).

GN is practiced at both the community and hospital level, with large differences among countries. In Turkey, for example, 78% of neurologists (most of them GNs) work in public hospitals, whereas 16% work in private hospitals, 4% work in foundation hospitals, and 2% work in private practices [16].

High-income countries such as the USA have experienced in recent years a progressive fall in the number of GNs, particularly those working at the community level (see above), whereas in other countries the number has recently increased. The reasons for this decline in the USA include such factors as reduced numbers of graduating residents and fellows pursuing GN as a career, flexible Accreditation Council for Graduate Medical Education (ACGME) residency training requirements, the increased rates (90%) of graduating residents completing a fellowship, the reduced exposure of residents to GN during their training, the increasing age of GNs, and with the increased number of neurohospitalists (see below) and teleneurologists. Payment models probably also have an influence.

Whereas some papers on the future of neurology did not discuss the role and importance of GN [18, 19], others did [20, 21]. GNs typically offer the first contact for patients with neurological symptoms, for those who are not easily categorized, and for those with a rare disease for whom there is no specialty clinic. GNs are often also the first to see patients in emergency situations and so act as consultants for other disciplines. In several countries, GNs often also serve as experts for sick funds and retirement insurance, and even act as court-appointed experts.

The role of the neurohospitalist has emerged over the past 15 years, modeled on the internal medicine hospitalist concept [22]. Neurohospitalists are neurologists whose practice, whether academic or community-based, is primarily devoted to the care of hospitalized neurologic patients [23]. Unlike the rise in the number of neurohospitalists, there has not been an analogous emergence of neurologists whose practice is devoted to the care of general neurologic outpatients.

In a few countries, activities were launched to address the fall in numbers of GNs. In the USA, the AAN General Neurology Task Force made 23 recommendations intended to better quantify and to improve the US GN workforce within four areas: (i) reviewing the needs of the US population for GN care, (ii) GN in training programs,

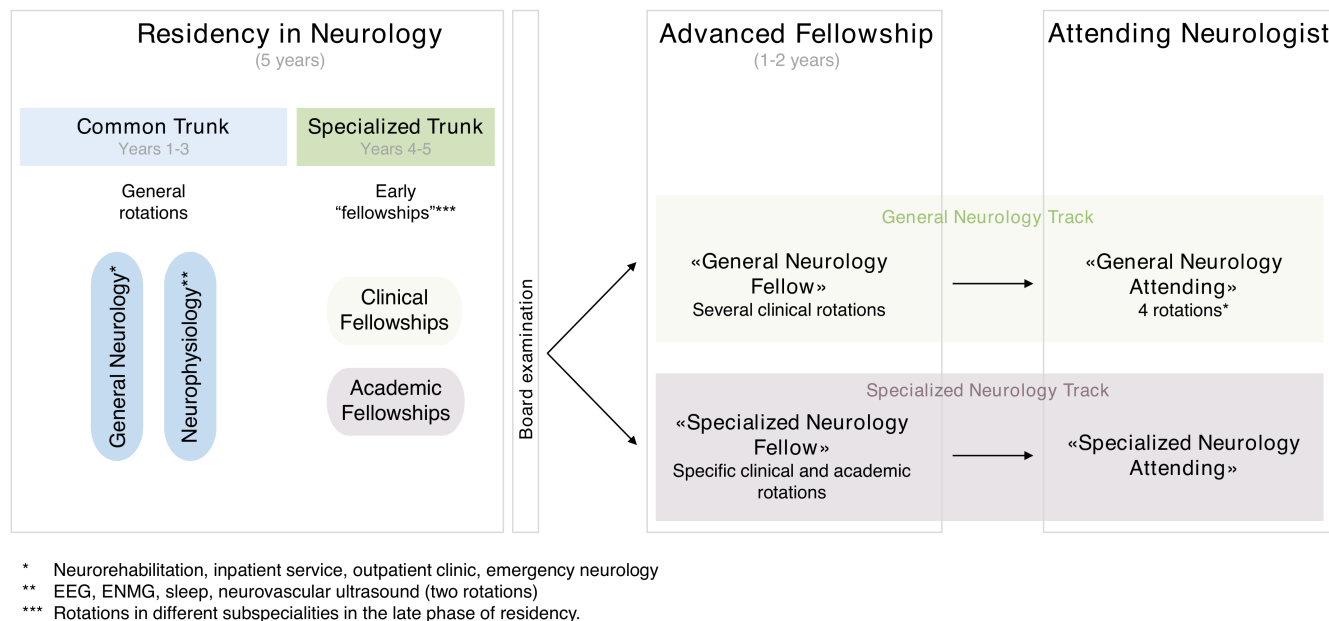


FIGURE 2 General neurology as (i) core element of the residency program, (ii) optional postresidency advanced fellowship, and (iii) academic position at the Neurology Department, Inselspital, University Hospital of Bern, Switzerland. EEG, electroencephalography; ENMG, electroneuromyography.

(iii) the GN profession, and (iv) GN involvement at the AAN. As published in the August 2020 issue of the *AAN News*, these recommendations were approved by the AAN Board of Directors.

In Europe, a few academic institutions, for example, the Neurology Department of the University Hospital in Bern, Switzerland, residency (and fellowship) programs include the option of a structured specific curriculum for GN, which follows the general training in neurology (Figure 2).

Recommendations

(i) Well-conducted surveys are needed to make recommendations to professional organizations and policymakers about the number of neurologists and GNs needed in specific regions and contexts (hospital vs. community) [24]. In Europe, such a survey could be promoted by the EAN in collaboration with national neurological societies, scientific/educational committees of the society, and the Research Fellows Section of the EAN (RRFS). (ii) Considering that even in high-income countries, neurological patients are often not seen by neurologists [13], the interaction between GPs, family physicians, and neurologists in hospitals is of paramount relevance. The details of this interaction need to be discussed and defined at the local level. In Germany, the increasing burden of ND led in 2023 to the recommendation by the German Society of Neurology for the creation of neurology wards served by GNs with 24/7 emergency services in all level-2 hospitals (≥ 600 beds). Overall, GNs should act also in the future as "goalkeepers" and for all ND in the community as well as hospitals and as liaisons between the different stakeholders. (iii) Promotion of interprofessional activities is an important task for future GNs, particularly in low- and middle-income countries.

Education/training in GN

Current situation

Today, education in medical school and postgraduate training (residency programs) in neurology are available in most countries in the world. However, the duration, types, and contents of training, and assessment methods vary greatly between countries. The requirements concerning postgraduate GN are not surprisingly also highly variable (Table 2).

After qualification as a medical doctor (or physician) in Europe, the duration of neurology training ranges between 1 and 6 years, with a different emphasis on theoretical and practical clinical skills. The number and timing of rotations in subspecialties and GN are highly variable as well [25]. Furthermore, not all European neurology residency programs offer the option to train in different settings including nonacademic hospitals, and public and private outpatient clinics [25]. In Germany, for example, the residency program starts with attending the stroke unit and on an emergency ward. After a 6-month period, residents are expected to be on call. The "requirements" for GNs include thereafter at least one more year on a GN ward before the start of rotations in subspecialties. As another example, in Austria, the 2015 revised residency program includes 9 months of a so-called general common trunk (including options of neurology, neurosurgery, neuropathology, or neuroradiology), 36 months of GN, and 27 months of subspecialty rotations. As a consequence, all board-certified neurologists in Austria are by definition GNs. As another example, in Switzerland, the 2016 revised residency program includes 1 year of internal medicine, a "common trunk" of 3 years of GN (with 1 year of clinical neurophysiology including sleep), and 2 years of "fellowships"

TABLE 2 GN in residency programs across the globe (see also text).

Country	Medical School, years	Additional nonneurological training required, years	Neurology residency, years	Training in GN, years	Type of training hospitals
Albania	6	-	4	3	UH
Armenia	6	-	3	NS	NUH, OS, PP, UH
Australia and New Zealand (ANZAN)	4-6	5	3	2-3	UH, NUH, OS
Austria	6	0.75	3	2.25	UH, NUH, OS, PP
Belarus	6	1	2	NS	UH, NUH, OS
Belgium	6	-	5	NS	UH, NUH
Bulgaria	6	0.16	4	3.8	UH, NUH
Croatia	6	-	5	NS	GN, NUH, OS, UH
Denmark	6	1	4	NS	UH, NUH
Estonia	6	-	4	1.4	UH, NUH
Finland	6	2	4	2-3	UH, NUS, OS
France	4	-	4	NS	UH, NUH
Germany	5	1	3	1	UH, NUH, OS, PP
Greece	6	1	5	3.75	UH, NUH
Honduras	7	1	3	2	UH
Hungary	6	-	2	2.5	UH, accredited NUH, OS
India	6	-	3	NS	NS
Israel	6	1	5	3.75	UH, OS
Italy	6	-	4	3-4	UH
Kyrgyzstan	6	1	2	NS	GN, NUH
Latvia	6	-	4	3	UH, NUH
Luxembourg	6	1	3	3	NUH, PP
North Macedonia	6	-	4	3-4	UH
Poland	6	1	5	3	UH, NUH, OS
Portugal	6	1	5	2	UH, NUH, OS, PP
Republic of Ireland	5	2	5	3	NUH, UH, OS
Serbia	6	-	4	NS	UH, OS
Slovakia	6	0.5	5	4.5	UH, NUN, OS
Spain	6	-	4	3	UH, NUH, OS
Switzerland	6	1	5	1-3	UH, NUH, OS
The Netherlands	6	-	6	1 in UH, 1 in NUH	UH, NUH, OS

(Continues)

TABLE 2 (Continued)

Country	Medical School, years	Additional nonneurological training required, years	Neurology residency, years	Training in GN, years	Type of training hospitals
Turkey	6	-	5	2-3	UH, NUH
Ukraine	6	-	2	NS	UH, NUH
United Kingdom	4-5	1-2	5	NS	UH, NUH, OS
United States	4	1	3	NS	UH, NUH, OS

Note: All the data/inputs provided by the members of the task force and the involved instances (including the presidents of national societies) were included.

Abbreviations: ANZAN, Australian and New Zealand Association of Neurologists; GN, general neurology; NS, not specified; NUH, nonuniversity (teaching) hospital; OS, outpatient settings; PP, private practice; UH, university hospital.

with rotations in different subspecialties and up to 12 months of research [26]. In Belgium, all graduating neurologists are recognized by the health authorities as GNs after 5 years of training with 3 years of GN and rotations in stroke, epilepsy, and intensive care units and a full year of clinical neurophysiology training.

To harmonize neurology training in Europe and to define the knowledge and skills to be acquired during residency, in line with current needs for neurological care, in 2022, the EAN finalized with the union européenne des médecins spécialistes (UEMS) an in-depth revision of the European Training Requirements in Neurology, the European Residency program [1]. This includes a first phase (year 1 and 2) for the acquisition of GN skills through exposure to neurological calls/emergencies, intensive care neurology, and the management of both inpatients and outpatients with a balanced proportion of a wide spectrum of ND, as well as the opportunity to follow up patients. The second phase (year 3 and 4) includes rotations in subspecialties ("fellowships programs"). The EAN is currently working on the definition of minimal requirements for an undergraduate curriculum in Neurology in Europe.

In the USA, neurology residency training includes 1 year of prerequisite training in internal medicine, followed by 3 years of training in neurology in a program accredited by the ACGME [27]. The ACGME program requirements state that residents must have clinical and academic experience that provides exposure to "all aspects of neurology," which includes all the major subspecialties of neurology. To attain this experience, US neurology residents must have a minimum of 18 months of clinical adult neurology rotations, including at least 6 months of inpatient experience and at least 6 months of outpatient experience. The requirements further state that faculty should be available who have "special expertise in all the disciplines related to neurology" including 21 subspecialty disciplines. Neither the ACGME training requirements, nor the neurology milestones assessed by the programs during training [28, 29], include the term GN in the documents. However, the intent is for the required longitudinal/continuity clinic to be a GN clinic. Furthermore, the process of initial board certification in Neurology by the American Board of Psychiatry and Neurology includes passing a multiple-choice examination assessing knowledge and clinical reasoning skills in the broad field of GN, regardless of any ultimate subspecialization.

In Latin America, residency programs were established or further developed (e.g., in Honduras, Mexico, Peru, Guatemala) with the support of the WFN, and typically last from 3 to 4 years [30]. Based on the experience in Honduras, members of the Education Committee of the WFN have established guidelines for neurology training in developing countries [12, 31].

In the UK, neurology training (since August 2022) involves 5 years of higher specialist training, which follows 2 years of foundation training and 3 years of internal medicine training. All specialist neurology training now includes stroke (as a subspecialty) and 1 year of general medicine (including 3 months in the final year). Everyone completing neurology training in the UK will receive dual accreditation in neurology and internal medicine. There is no option to train purely in neurology. Thus, all trainees will have a broad training in

general medicine and neurology (including GN). Most trainees will select a neurology subspecialty during their training and will be encouraged to undertake subspecialty research, but there is no specific specialty of GN.

In Australia and New Zealand, after an intern year, trainees complete 3–5 years of internal medicine (with an examination), then have 2 years of GN rotations followed by an elective year that can be done in GN or in a subspecialty fellowship.

In the Asia and Oceania regions, a survey involving 18 member countries was conducted and published in 2017. All the countries have their own neurology training program catered to their own needs. In 11 countries, prior internal medicine training is a prerequisite to the neurology training program [10].

Recommendations

(i) Training in history taking and clinical examination (“the art of neurology”) are the core skills of GN (and neurology) and will remain crucial to future generations of students, physicians, and specialists [32]. (ii) Additional competencies should include emergency neurology (where there is a broad spectrum of ND [20]) and liaison neurology (caring for patients with unclear or complex disorders, and multimorbidity [33]). (iii) Further important areas for GNs include (primary and, currently, mainly secondary [34]) prevention and the care of patients with chronic ND. (iv) Training in GN should be offered at the beginning of residency programs and might be complemented by additional rotations in GN practice settings, including nonuniversity neurology practices and services at the end of residency. (v) Continuous medical education should be offered also in GN.

Research in GN

Current situation

GN is typically not mentioned in neurology/clinical neuroscience research programs. Research on general topics such as prevention, promotion of health, health delivery, chronic care, and education is underdeveloped in neurology when compared with other fields of medicine. Not surprisingly, literature on research in GN is very limited.

Recommendations

The TF believes that patient-related research on overarching themes is a domain of great academic relevance and potential for GNs. Concrete topics could include the following: (i) research in “real life” (so-called health care research) including clinical trials and the adaption of guidelines of specialized neurologists in practice; (ii) research on unmet medical needs and quality of care in neurology [35]; (iii) public health research including prevention neurology, promotion of brain health, neuroepidemiology, and community-based studies; (iv) neurological manifestations in general medicine, neuroemergencies, neuroconsultations, and teleneurology; (v) research on complex, multimorbidity cases, and on chronic care; (vi) how to deliver education in neurology; (vii) Legal and ethical issues related to neurology; and (viii) gender and ethnicity sensitivity including diversity, equity, and inclusion in ND.

Topic 2: How to promote GN in the future

To promote GN in the near future, several initiatives are needed that require the involvement of national, regional, and world neurological societies. Also, the view of patients, their relatives, and caregivers must be considered as essential for all activities relating to the promotion of GN.

TABLE 3 Summary of 16 recommendations of the European Academy of Neurology Task Force for the future of GN and GNs.

General considerations about GN	
(i)	The concept of GN should remain
(ii)	GNs are essential to ensure a rapid, accessible, and comprehensive management of patients with ND in the community where they live
(iii)	Competencies of GNs should include emergency neurology, liaison neurology, prevention neurology, and chronic care
(iv)	GNs play a key role in the coordination of care with general practitioners and specialized neurologists
(v)	Activities across different health professions are of increasing relevance for the care of neurological patients and should involve GNs
(vi)	Well-conducted surveys are required to inform future recommendations about the number and profile of neurologists and GNs that take into account local, regional, and national contexts
Education in GN	
(vii)	History taking and clinical examination (“the art of neurology”) are among the most important core skills of GN and should remain the base of training in neurology
(viii)	Medical schools and neurological societies should provide teaching and assessment of training and competency in GN
(ix)	Training in GN should be offered at the beginning of neurology residency programs and could be complemented with rotations in practice settings at the end of residency programs, proving exposure to practice in nonuniversity neurology practices and services
(x)	Continuous medical education should also be offered in GN
Research in GN	
(xi)	Research in GN should include the following topics: <ul style="list-style-type: none"> • Health care delivery (including clinical trials) • Unmet medical needs in neurology • Quality of care in neurology • Public health (prevention, brain health, neuroepidemiology) • Neurology in general medicine • Neuroemergencies/neuroconsultations, teleneurology • Complex, multimorbidity cases, chronic care • Research about how to deliver education • Legal and ethical issues • Gender and ethnicity sensitivity
Promotion of GN	
(xii)	Role models in GN should be identified, promoted, and recognized
(xiii)	Mentorship and leadership programs should include GN
(xiv)	Academia should promote academic career opportunities in GN
(xv)	National, regional, and world societies of neurology should consider the development of joint activities and initiatives to promote GN
(xvi)	The reimbursement of GN activities should be increased

Abbreviations: GN, general neurology; GNs, general neurologists; ND, neurological disorders.

The following specific initiatives could be considered:

- (i) Role models in GN should be identified, promoted, and recognized. The Johns Hopkins School of Medicine has, for example, defined a clinical distinction pathway for academic promotion of excellent clinicians, and the AAN recently created society awards for scholarly clinical achievements.
- (ii) Mentorship and leadership programs should include GN and promote careers in GN.
- (iii) Medical schools and neurological societies should secure teaching and assessment of/and training in GN (in addition to specialized neurology). Exposure to GN in the community and primary neurological care need to be included in training programs.
- (iv) Academic institutions should promote academic career opportunities (including teaching and research pathways) in GN. The recognition of GN activities in research activities should also be improved.
- (v) The implementation of the IGAP (including the promotion of brain health) should involve a role for GNs, and awareness and education about IGAP should be part of medical and postgraduate training programs.
- (vi) The national, regional, and world societies of neurology should consider the development of joint activities and initiatives to promote GN.
- (vii) Regional and local health authorities, policymakers, and providers should evaluate the demands for care of ND, support the role of GNs, and provide reimbursement for patient care reflecting the complexity of neurological training. More generally, the reimbursement of GN activities should also be increased.

CONCLUSIONS

The EAN TF recognizes, in line with the results of the 2023 EAN and the recent AAN recommendations, an urgent need to preserve and develop GN to meet the challenges of the coming decades.

GNs are essential to ensure rapid, accessible, and comprehensive (that is interdisciplinary and coordinated) management of patients with ND. They will remain essential for the appropriate management of patients in the communities where they live, providing coordinated and shared care with general practitioners (and other health professionals) on one side, and with specialized and hospital-based neurologists on the other. By doing this, GNs can prevent an unnecessary (and expensive) fragmentation of care, which could result in patient harm, and the disintegration of neurology, as has already happened to general/internal medicine. Furthermore, GNs will have an increasing role, with other stakeholders, in promoting brain health and the prevention of ND. Finally, GNs are also expected to remain (or become) prominent in pre- and postgraduate education (e.g., teaching of clinical skills) and in (currently neglected) over-arching research topics (e.g., in the field of health care research). The specific needs (e.g., numbers, profile) of GNs will depend on regional/local needs, gaps, and resources.

To promote the positive future development of GN, at both the academic and community level, there is a requirement to improve the working conditions, the recognition, and the prestige of GN. The TF made a total of 14 recommendations (summarized in [Table 3](#)) concerning the professional profile, training requirements, and role in education and research of future generations of GNs, and suggested specific initiatives to support this evolution and transformation.

AUTHOR CONTRIBUTIONS

C. L. Bassetti: Writing – original draft; methodology; supervision; conceptualization. **A. Accorroni:** Writing – review and editing. **A. Arnesen:** Writing – review and editing. **H. B. Basri:** Writing – review and editing. **T. Berger:** Writing – review and editing. **P. Berlit:** Writing – review and editing. **P. A.J.M. Boon:** Writing – review and editing. **A. Charway-Felli:** Writing – review and editing. **J. Krupa:** Writing – review and editing. **S. Lewis:** Writing – review and editing. **M. Markowski:** Writing – review and editing. **M. T. Medina:** Writing – review and editing. **P. A. McCombe:** Writing – review and editing. **E. Moro:** Writing – review and editing. **S. Ozturk:** Writing – review and editing. **P. Smith:** Writing – review and editing. **V. Vuletic:** Writing – review and editing.

AFFILIATIONS

¹Neurology Department, Inselspital, University Hospital, University of Bern, Bern, Switzerland

²Neurology Department, Geneva University Hospital, Geneva, Switzerland

³European Federation of Neurological Associations, Brussels, Belgium

⁴Department of Neurology, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang, Malaysia

⁵Department of Neurology, Medical University of Vienna, Vienna, Austria

⁶German Society of Neurology, Berlin, Germany

⁷Department of Neurology, Ghent University Hospital, Ghent, Belgium

⁸Eindhoven University of Technology, Eindhoven, the Netherlands

⁹African Academy of Neurology, Accra, Ghana

¹⁰Department of Neurology, University Medical Center Mother Teresa, University of Medicine, Tirana, Albania

¹¹Lehigh Valley Fleming Neuroscience Institute, Allentown, Pennsylvania, USA

¹²Cape Cod Healthcare, Hyannis, Massachusetts, USA

¹³Facultad de Ciencias Medicas, National Autonomous University of Honduras, Tegucigalpa, Honduras

¹⁴Faculty of Medicine, UQ Centre for Clinical Research, University of Queensland, Herston, Queensland, Australia

¹⁵Department of Psychiatry, Neurology, and Neurological Rehabilitation, Grenoble Alpes University Hospital, Grenoble, France

¹⁶Department of Neurology, Selcuk University, Selçuklu/Konya, Turkey

¹⁷Department of Neurology, University Hospital of Wales Heath Park, Cardiff, UK

¹⁸Department of Neurology, Medical Faculty, University of Rijeka, Rijeka, Croatia

CONFLICT OF INTEREST STATEMENT

None of the authors has any conflict of interest to disclose.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ORCID

Claudio Lino Alberto Bassetti  <https://orcid.org/0000-0002-4535-0245>

Alice Accorroni  <https://orcid.org/0000-0001-8165-9816>

Peter Berlit  <https://orcid.org/0000-0002-9544-7256>

Elena Moro  <https://orcid.org/0000-0002-7968-5908>

REFERENCES

- Bassetti CLA, RS, Vodusek DB, et al. The 2022 European post-graduate (residency) program in neurology in an historical and international perspective. European training requirements for neurology (ETRN). *Eur J Neurol*. 2024;31(3):e15909. doi:10.1111/ene.15909
- Feigin A, Vos T, Nicholas E, et al. The global burden of neurological disorders: translating evidence into policy. *Lancet Neurol*. 2020;19:255-265. doi:10.1016/S1474-4422(19)30411-9
- Deuschl G, Beghi E, Fazekas F, et al. The burden of neurological diseases in Europe: an analysis for the global burden of disease study 2017. *Lancet Public Health*. 2020;5:e551-e567. doi:10.1016/S2468-2667(20)30190-0
- Gustavsson A, Svensson M, Jakobi F, et al. Cost of disorders of the brain in Europe 2010. *Eur Neuropsychopharmacol*. 2011;21:718-779. doi:10.1016/j.euroneuro.2011.08.008
- WHO. *Optimizing Brain Health across the Life Course: WHO Position Paper*. WHO; 2022.
- Editorial. A decisive year for the neurological community. *Lancet Neurol*. 2022;21:103. doi:10.1016/S1474-4422(22)00001-1
- Wjeratne T, Bassetti CLA, Grisold W, et al. Brain health for all on world brain day 2022. *Lancet Neurol*. 2022;9:772-773.
- Bassetti CLA, Endres M, Sander A, et al. The EAN brain health strategy: one brain, one life, one approach. A strategy to reduce the burden of neurological disorders and to promote the health of the brain. *Eur J Neurol*. 2022;29:2559-2566. doi:10.1111/ene.15391
- Bassetti CLA, Heldner MR, Adorjan K. The swiss brain health plan 2023-2033. *Clin Transl Neurosci*. 2023;7:38. doi:10.3390/ctn7040038
- Roxas A Jr, Mehndiratta MM, Bornstein N, et al. The professional practice and training of neurology in the Asian and Oceanian region: a cross-sectional survey by the Asian and Oceanian Association of Neurology (AOAN). *J Neurol Sci*. 2017;382:108-115.
- Tan CT. Neurology in Asia. *Neurology*. 2015;84:623-625. doi:10.1212/WNL.0000000000001224
- Medina MT, Munsat T, Portera-Sanchez A, et al. Developing a neurology training program in Honduras: a joint project of neurologists in Honduras and the world Federation of Neurology. *J Neurol Sci*. 2007;253:7-17.
- Lin CC, Callaghan BC, Burke JF, et al. Geographic variation in neurologist density and neurological care in the United States. *Neurology*. 2021;96(93):e309-e321. doi:10.1212/WNL.00000000000011276
- Di Liberto G, Baldizzi G, Carvalho V, et al. Impact of burnout on neurology residents and research fellows in Europe. *Neurol Educ*. 2022;1(1):e200035. doi:10.1212/NE200039.0000000000200035
- Simpson-Yap S, Frascoli F, Harrison L, et al. Modeling accessibility of adult neurology care in Australia, 202-2034. *BMJ Neurol Open*. 2023;5:e000407. doi:10.1136/bmjno-2023-000407
- Keskin AO, Şentürk A, Sivacı AÖ, et al. Assessment of working conditions and job satisfaction of neurology specialists. *Turk J Neurol*. 2023;29:134-142. doi:10.4274/tnd.2023.85550
- Bassetti CLA. European academy of neurology 2019-2022. *Eur J Neurol*. 2022;29:2567-2571. doi:10.1111/ene.15421
- Deuschl G. The future of neurology in Europe. *Clin Transl Neurosci*. 2017;1:1-4.
- Sacco RL. Neurology. Challenges, opportunities, and the way forward. *Neurology*. 2019;93(21):911-918.
- Bassetti C, Hughes R. Academic general neurology: any future? Yes! *Swiss Arch Neurol Psychiatry*. 2014;165:40-41.
- Klebanoff LM, Safdieh JE. Modern neurology training is failing outpatients. *JAMA Neurol*. 2023;80:333-334. doi:10.1001/jamaneurol.2022.5490
- Josephson SA, Engstrom JW, Wachter RM. Neurohospitalists: an emerging model for inpatient neurological care. *Ann Neurol*. 2008;63:135-140. doi:10.1002/ana.21355
- Probasco JC, Greene J, Harrison A, et al. Neurohospitalist practice, perspectives, and burnout. *Neurohospitalist*. 2019;9:85-92. doi:10.1177/1941874418813029
- Grau A, Maschke M, Baier B, et al. A plea for standards for staffing of physicians in neurology departments. *Akt Neurol*. 2018;45:343-348.
- Kleineberg NN, van der Meulen M, Franke C, et al. Differences in neurology residency training programmes across Europe - a survey among the residents and research fellow section of the European Academy of Neurology national representatives. *Eur J Neurol*. 2020;27:1356-1363. doi:10.1111/ene.14242
- Bassetti CL, Galimanis A, Du Pasquier R. The new swiss post-graduate training (residency program) in neurology: making swiss neurologists more competitive. *Clin Transl Neurosci*. 2018;2:2514183X1879276. doi:10.1177/2514183X18792760
- ACGME Program Requirements for Graduate Medical Education in Neurology (chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/; https://www.acgme.org/globalassets/pfassets/programrequirements/180_neurology_2022v2.pdf).
- Lewis SL, Józefowicz RF, Kilgore S, Dhand A, Edgar L. Introducing the neurology milestones. *J Grad Med Educ*. 2014;6:102-104. doi:10.4300/JGME-06-01s1-34
- Dewey JJ, Chiota-McCollum N, Barratt D, Edgar L, et al. Introducing the neurology milestones 2.0. *Neurology*. 2022;98:366-372. doi:10.1212/WNL.00000000000013312
- Medina MT, Munsat T. Neurology education in Latin America and the world Federation of Neurology. *J Neurol Sci*. 2010;298:17-20.
- Munsat T, Aarli J, Medina MT, et al. International issues: educational programs of the World Federation of Neurology. *Neurology*. 2009;72:e46-e49. doi:10.1212/01.wnl.0000344183.62422.b2
- Nicholl DJ, Appleton JP. Clinical neurology: why this still matters in the 21st century. *J Neurol Neurosurg Psychiatry*. 2015;86:229-233. doi:10.1136/jnnp-2013-306881
- Fuller GN. Improving liaison neurology services. *Pract Neurol*. 2020;6:494-498.
- Sabayan B, Isaacson R, Rost N. Opinion and special article: preventive neurology. *Neurology*. 2021;97:916-919. doi:10.1212/WNL.00000000000012554
- Kvam KA, Berner E, Gold CA. Quality improvement metrics and methods for Neurohospitalists. *Neurol Clin*. 2022;40:211-230. doi:10.1016/j.ncl.2021.08.011

How to cite this article: Bassetti CLA, Accorroni A, Arnesen A, et al. General neurology: Current challenges and future implications. *Eur J Neurol*. 2024;31:e16237. doi:10.1111/ene.16237