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# The new Swiss postgraduate training (residency program) in neurology: Making Swiss neurologists more competitive

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**Abstract**

Following the creation of the first university chair for neurology (Zurich 1894), the Swiss Neurological Society (SNG) was founded in 1908. In 1932, neurology was recognized in Switzerland as an independent specialty and included in the medical (undergraduate) curriculum. The postgraduate training (residency program) in neurology lasted first 4 years (including 1 year of internal medicine, 0.5 years of psychiatry and 2.5 years of clinical neurology as mandatory rotations). In 1985, it grew to 5 years, and in 1996 to 6 years (including 1 year of internal medicine, 3 years of clinical neurology, and 1 year of clinical neurophysiology). Considering the results of a survey among young neurologists and "landscape changes" such as the increasing subspecialization, economic pressure, requirements for research, number of foreign doctors, and restrictions of working hours, the SNG undertook a revision which was approved in 2016. Today, the Swiss neurology postgraduate training includes 1 year of internal medicine, a "common trunk" of 3 years of general neurology (with 1 year of clinical neurophysiology including sleep), and 2 years of "fellowships" with rotations in different subspecialties and up to 12 months of research.

**Keywords**

Medical education, neurology, residency, Switzerland, training, fellowship, postgraduate, pregraduate

## Neurology as a new discipline: The international and national landscape

Neurology arose as a new medical specialty first in England and France in the second half of the 19th century.[1] First chairs of neurology were created in 1869 in Moscow (Sechenow University, A Kozhevnikov) and 1882 in Paris (JM Charcot).[2] First national neurological societies were founded in the United States (1875) and Belgium (1896); the prestigious "Neurological Society of London" (founded in 1885) and "Societé de Neurologie de Paris" (1899) became only later the national societies of the United Kingdom (1907) and France (1949), respectively.

Despite the interest in Switzerland of several clinicians for brain disorders since the 17–18th centuries (e.g. JJ Wepfer in Schaffhausen, AD Tissot in Lausanne, G Vieussuex in Geneva), neurological patients were taken care in the country by internists and psychiatrists until the end of the 19th century.

First private practices devoted to neurological patients were those of P Dubois in Bern (since 1876) and von Monakow (since 1887) and Veraguth (since 1897) in Zurich.[3,4] The first to obtain the "venia docendi" in neurology were G Burkhardt (1863) in Basel and P Dubois (1876) in Bern. The first professorships were created at the universities of Zurich in 1894 (C von Monakow, Extraordinarius and first

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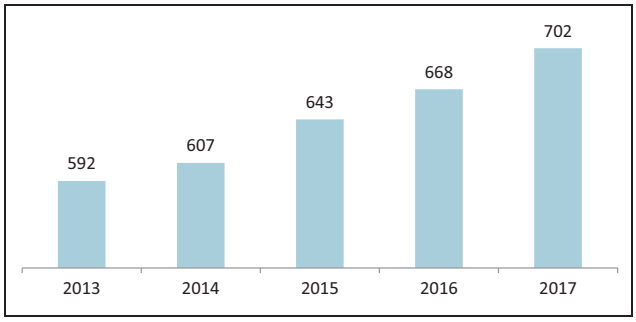


**Figure 1.** Registered neurologists in Switzerland 2013–2017.

Swiss chair in neurology, Bern in 1902 (P Dubois, Extraordinarius ad personam), Basel in 1932 (R Bing, Ordinarius ad personam), and Geneva in 1941 (De Morsier, Extraordinarius). The Swiss Neurological Society (SNG) was founded in 1908 and few years later, the outpatients clinics of von Monakow in Zurich (1913) and Bing in Basel (1916) were recognized as university institutions. It was only much later that the neurological inpatients units became independent and university neurology departments were created (1951 in Zurich, 1958 in Bern, 1961 in Geneva, and 1962 in Basel and Lausanne).

### *The growth of Swiss neurology*

At his first meeting in 1908, the SNG listed 108 members. The number increased to 144 in 1930, 166 in 1956, 295 in 1987, 420 in 2003, and 691 in 2018[5]; a marked increase linked also to the creation of the Swiss Association of Young Neurologists (SAYN), with 135 SAYN members out of 691 in 2018.[6] The increase over the 30 years parallels the progresses in neurological care and the rising need for neurologists. Between 1990 and 2017, the number of board (Swiss Medical Association: FMH) certified neurologists in Switzerland increased by 111% (54 new titles in the years 1990–1994 (11 per year) versus 114 new titles in the years 2013–2017 (23 per year)). In 2017, the number of practicing neurologists in Switzerland was 702 representing 2% of the 36,000 working physicians in the country (Figure 1).[7]

Correspondingly, the ratio of neurologists per inhabitant went from 1 neurologist for 20,162 inhabitants (4–9/100,000 inhabitants) in 2008 to 1 neurologist per 12,083 inhabitants (8.3/100,000) in 2017. For comparison, in 2006, in Europe there were an average of 6.6 neurologists/100,000 inhabitants with a range going from 0.9/100,000 (United Kingdom) to 17.4 (Georgia).[8] Several extra-European countries still have a much lower number of neurologists (e.g. 6 for a population of 30 millions in Kenya in 2003).[9]

Noteworthy, also the number of neurologists coming from other countries which had their diploma recognized/accredited by the Swiss medical board significantly increased (doubling from 2012 until 2017 to a total of 609 titles).[10]

## Undergraduate and postgraduate (residency) trainings in neurology in Europe

At the time of the first World Neurology Meeting in Bern in 1931, the only European countries having neurology as a mandatory field in the curriculum of medical students were Bulgaria, Estland, Romania, Russia, and Norway.[6] In fact, in most European countries, neurology has become only recently an independent specialty (e.g. in 1977 in Italy). As a consequence, most neurology residency programs were created only in the last 20–30 years (e.g. in 1991 in Italy).[11]

A survey of 31 (out of 41), European countries in 2006 evaluated the pre- and postgraduate training in neurology.[8] The neurological training in the curriculum of medical students was found to range from 20 to 240 h (mean: 114 h), whereas the mean duration of the neurological residency ranged from 3 to 6 years (mean: 4.8 years) with working hours going from 30 to 80 (mean: 43) per week. The differences between the different countries were considered to be important and more harmonization was felt to be needed.[12]

In the last few years, contents and length of the neurology residency training became increasingly a matter of discussion in several countries as well as at the level of international neurological associations, in parts triggered by systematic survey concerning the satisfaction and the needs of residents.[8,9,11,13–16] Strategies to motivate students and young doctors to choose neurology as future specialty are also discussed.[17,18] Few countries also developed tools to define and assess the core competences in neurology resident education.

## Undergraduate and postgraduate (residency) trainings in neurology in Switzerland (1935–2016)

Following a first unsuccessful attempt by Otto Veraguth in 1911,[19] Mieczyslaw Minkowski and the SNG board were successful in establishing neurology in 1935 as a mandatory specialty in the curriculum of medical students in Switzerland.[6] It was however only in 1967 that neurology became an examination subject at the final (federal/national) medical examination. Furthermore, neurology was in a way still assigned the status of a *de facto* "subdiscipline" of internal medicine. As such, neurology at the final oral examination was tested (until the last revision which eliminated the oral examinations) as an elective subject in alternation with other internistic subdisciplines such as rheumatology.

It was in 1932 that the Swiss Medical Association (FMH) recognized neurology as an independent specialty. The contents of the residency training in order to become a (FMH) certified neurologists were as follows: 2.5 years in neurology, 6 months in psychiatry, and 1 year of

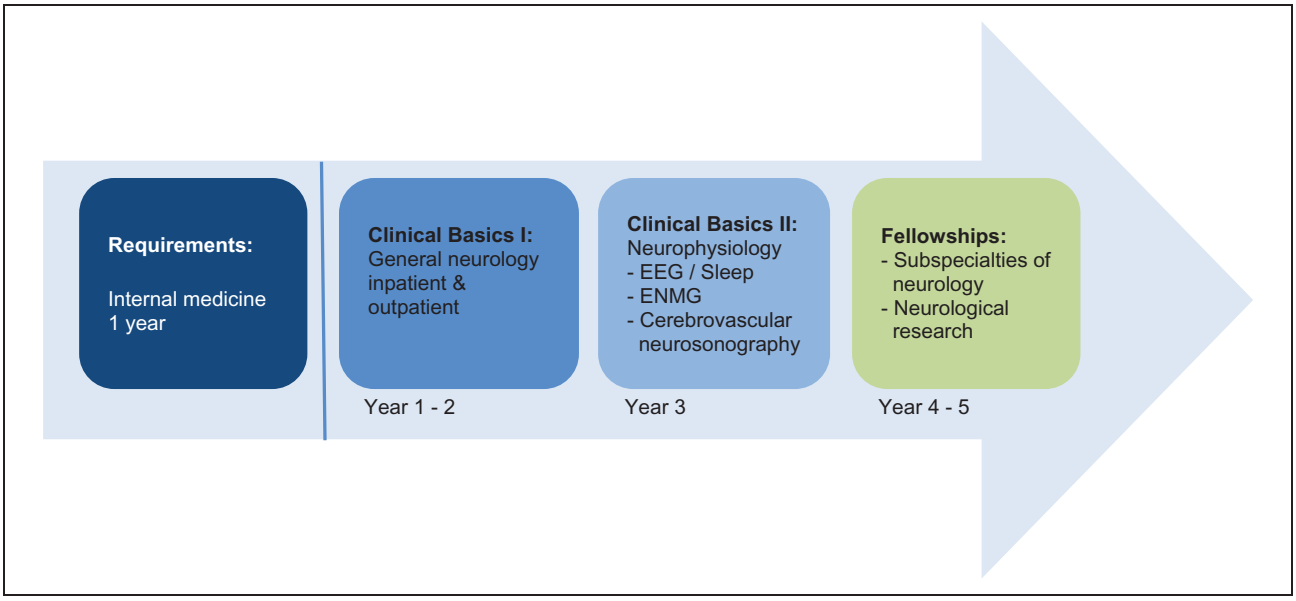


**Figure 2.** The different stages of the new Swiss postgraduate training in neurology (1 year internal medicine, 3 years "common trunk", 2 years of fellowships).

"preparatory training" ("Vorstudium", of which at least 6 months in internal medicine). In 1939, the same board approved the requirements for a joined neurology-psychiatry curriculum over 5.5 years ("Nervenarzt").

In 1978, 6 months of neurosurgery were included (under the SNG Presidency of Prof. Eric Zander, chair of neurosurgery at the University Hospital in Lausanne).

In 1985, the duration of the postgraduate training was increased to 5 years including 6 mandatory months of neurosurgery and clinical neurophysiology, respectively.

In 1996, the duration increased to 6 years to become, together with those of Austria, Finland, Slovenia, and the Netherlands, the longest in Europe.[8] It included 3 mandatory years of clinical neurology, 1 mandatory year of clinical neurophysiology, 1 optional year in a specialty/discipline related to neurology, and 1 mandatory year of internal medicine. For the first time, a rotation in neurorehabilitation was recognized.

## The 2016 neurology postgraduate training (residency) program in Switzerland

In Switzerland, as in other countries, the pressure to increase clinical productivity, the restrictions in term of working hours (more flexible working hours have been recently introduced in the United States considering the negative impact of short continuous work hours on educational and clinical outcome (without improvement in patient care)[20]), the growing number of subspecialties and importance of acute/intensive care in neurology, the increasing complexity (and requirements) of clinical research, the need for more flexible working schedules, the increased number of doctors coming from other countries (and the need for more international mobility) were among the reasons that triggered discussions around the residency program. In addition, a need to enhance the attractiveness of the training was made necessary by the increase in number of residency positions offered as compared to the number of candidates available/ interested, which over time led to the need to "attract" residents from other countries. In 2010, a survey performed among new board-certified neurologists revealed that despite its length, the Swiss residency program was not anymore considered to be competitive in the work market.

In 2011, the Swiss Neurological Society (SNG) (at that time under the presidency of one of us, Claudio Bassetti) decided to examine the situation in detail and to plan a revision of the residency program. Several critical areas were identified, including the following five points.

1. Neurophysiology

To obtain reimbursement for clinical neurophysiology examination, a neurologist needs not only to be board-certified by the SNG but also to obtain a certificate from the Swiss Society of Clinical Neurophysiology (SGKN). The requirements to obtain this certificate were the following: (i) at least 9 months spent full-time in one single specialty (EEG or ENMG or neurosonography), (ii) a minimal number of exams to perform, that is, 800 EEG or 500 ENMG or 500 neurosonographic exams, (iii) and passing a clinical neurophysiology examination, whose rules are determined by the SGKN. Of note, this SGKN examination is independent from the SNG examination needed to become board-certified neurologist. The organization of the neurology curriculum did not allow to obtain more than one certificate, EEG, ENMG, or neurosonography. By contrast, foreign neurologists coming to Switzerland

**Table 1.** The major changes of the last revision of the Swiss neurology postgraduate training (residency program).

| | Former program (valid until June 30, 2016) | New program (valid as July 1, 2016) |
|---|---|---|
| 1. Certificates in clinical neurophysiology | The minimum duration of 9 months makes it almost impossible to obtain two certificates during the 6 years of training. | The minimum duration of 6 months makes it possible to obtain two certificates during the 6-year of training. |
| 2. Sleep certificate | No possibility to obtain the sleep certificate. | The sleep certificate can be obtained during the 6-year curriculum, however, only in combination with 6 months of EEG |
| 3. Fellowship | Rotations in subspecialties are not mentioned in the program. | Subspeciality rotations are possible in the last 2 years of training. |
| 4. Research | A maximum of 6 months are recognized. | Up to 12 months are recognized. |
| 5. Sites of training | Only university and large neurological departments. Time spent in smaller neurological units are not recognized. | Rotations of up to 2 years in smaller neurological units are recognized |

automatically obtain the recognition of the three certificates in clinical neurophysiology, even if they have spent much less time than 27 months (3 × 9 months) to obtain these certificates. So, there was paradoxically a disadvantage of being a Swiss-trained neurologist in Switzerland.

2. Sleep Medicine

Despite the great advances in sleep science and medicine, education in sleep medicine was only marginally included in the residency program of neurologists and the possibility to obtain the Swiss sleep certificate (which is given by the Swiss Sleep Society) was precluded.

3. Subspecialties

The importance of neurological subspecialties (in addition to those already linked with the neurophysiological certificates, that is, stroke, epilepsy, and neuromuscular disorders) has greatly increased: Some specialized rotations are possible in some centers but not officially recognized/supported (an analogy with the fellowship programs in the United States, following a residency program of 3 years, is made).

4. Research

A maximum of 6 months of patients-oriented research could be recognized as part of the curriculum. To promote the careers of talented clinical neuroscientists, a longer period is thought to be necessary.

5. Training sites

Traditionally, neurology training could be obtained only in the five university hospitals (Basel, Bern, Geneva, Lausanne, and Zurich) and three large Cantonal hospitals (Aarau, Lugano, and St. Gallen) (so-called category A training centers). The interest of promoting short rotations in smaller neurological divisions and units (and their recognition as training centers) is considered to be advantageous.

After 5 years of discussions, debates, back-and-forth between the different societies and the Swiss Institute for Medical Education (SIWF), the SNG (at that time under the presidency of one of us, Renaud Du Pasquier) could finalize the curriculum, which was finally accepted by the FMH in 2016 (Figure 2).

In the following we list the main changes (summarized in Table 1).

1. Neurophysiology

One year of clinical neurophysiology, while still mandatory, can now be divided in two 6-month modules which have to be performed in two different neurophysiology subspecialties (EEG, sleep, ENMG, or cerebrovascular neurosonography). These two modules offer the possibility for residents to fulfill the requirements to obtain two certificates in clinical neurophysiology. In order to guarantee a sufficient experience and quality, the number of tests in the different neurophysiological domains was maintained, that is, 800 EEG, 500 ENMG, 500 neurosonographic exams. During this year of clinical neurophysiology, it is recommended to free the resident from on call duties. It remains also possible to spend the entire neurophysiological year in one subspecialty and to add a second year in the same or another subspecialty as a "fellowship" (see below).

2. Sleep medicine

Sleep medicine, while still not mandatory can now be included in the basic neurophysiology training and recognized in the curriculum. To obtain the Swiss sleep certificate, the resident must combine the sleep rotation with a 6-month rotation in EEG/epileptology.

3. Subspecialties

The curriculum starts with 2 years of general neurology (including neurological emergencies) and 1 year of clinical neurophysiology which are mandatory for everybody. The last 2 years of training are more flexible introducing (and formalizing) the possibility of rotations in specific subspecialties ("fellowships") or a more in-depth training in clinical neurophysiology (and sleep). These 6–12 months

rotations can be combined with "electives" that can be done in neurosurgery, neuroradiology, and other neurology-related disciplines.

4. Research

Patients-oriented research is now recognized in the curriculum for up to 12 months.

5. Training sites

General neurology training in a smaller neurological units and their recognition as training centers (categories B and C) is now accepted up to 12 months

## Discussion

Neurology is one of the very few medical specialties which is still growing, with great potentials but also challenges ahead.[20] This evolution, which is accompanied by (and partially due to) great advances in diagnostic but also in treatment opportunities, triggered a revision of residency programs worldwide. A change was made necessary by multiple factors including the increasing subspecialization (in 2012, about 25 neurological subspecialties of neurology were officially recognized in the United States[12]), the restrictions of working hours, the economic pressure of the hospitals, the increasing complexity of (and formal requirements for) clinical research, and the needs (and expectations) of the newer generations.

Switzerland has been one of the first countries to recognize neurology as an independent specialty and to recognize in 1935 a postgraduate training (residency) program, which lasts for 6 years (among the longest in Europe). Despite the integration of mandatory rotations in internal medicine and clinical neurophysiology, an emphasis in clinical and general neurology remained over the years a hallmark of neurology training in the country. This was made possible by favorable (although deteriorating) working conditions (including number of specialists per number of patients/beds, salary, etc.).

The last revision was particularly time- and nerve-consuming (5 years as compared to the 3 years which had been necessary for the 1996 revision (Ch. W. Hess, personal communication)) because of the different aims, which were in parts conflicting with each other or with the interests of different subspeciality groups. One goal was to change contents, while maintaining the traditional emphasis on a broad and solid education in general neurology.[21] This led to the definition of a "common trunk" of 3 years that is equal and mandatory for all residents in neurology. Another goal was to allow (but not necessarily) request a stronger diversification (and early specialization) in order to better prepare for a variety of different (academic, hospital-based, practice-based, consulting-based, etc.) neurological careers. There are now several possible rotations including those in neurological research, neuroradiology, and sleep. A third goal was to offer two neurophysiological certificates during the residency, while reducing the time by one-third and leaving the numbers of examinations needed unchanged, in order to maintain the high educational standards in clinical neurophysiology in the country.[22]

In conclusion, the authors of this article, who were involved in the revision of the training program and are daily concerned with its implementation, are convinced that the new residency program represents an attractive and valid instrument to prepare a new generation of neurologists for the challenges of their career in a rapidly changing medical landscape.

As usual, only the future can tell which choices have been correct and which ones may need to be reconsidered and adapted. The discussions about the length and contents of the training and about the best strategies (and tools) for the evaluation of postgraduate training are an ongoing process, which will take into consideration the annual surveys performed by the FMH as well as the direct feed-backs of the residents.[15,23,24]

### Authors' note

Prof. Claudio L Bassetti and Renaud Du Pasquier are both past president of the Swiss Neurological Society (SNG) and were directly involved in (and responsible for) the 2016 revision of the Swiss neurology postgraduate training (residency program). Dr Aikaterini Galimanis is the chair of the Residency Program Committee of the Neurology Department at the University Hospital in Bern.

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