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WORLD NEUROLOGY

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Neurological Manifestations of Zika Virus Infection: What Neurologists Need to Know

BY AVINDRA NATH, MD, AND JAMES SEJVAR, MD

In recent years, there has been an emergence of several major viral infections with devastating neurological consequences, including West Nile virus, dengue, chikungunya, enterovirus D68, Ebola and now Zika virus. Increased global travel and climate change, leading to changing patterns of vector distribution and behavior are among the major reasons for the emergence of these infections. Zika virus is the most recent epidemic that is having devastating effects on human populations in affected regions, and is rapidly spreading across the South American continent.

Avindra Nath, MD

James Sejvar, MD

Epidemiology

Zika virus was first identified from a primate in 1947 in the Zika forest of Uganda. [1] The first human cases occurred in Africa and then in Southeast Asia in the 1960s.[2,3] During the intervening years, Zika virus was associated with isolated cases or small outbreaks mainly in Africa. In 2007, there was an outbreak in Yap, the Federated States of Micronesia, where nearly three-quarters of the population was infected. [4, 5] This represented the largest outbreak of Zika virus infection to that point. In 2013, there was an epidemic in French Polynesia, which was associated with a reported increase in cases of the autoimmune peripheral nerve disorder Guillain-Barre syndrome, although a causal association between Zika virus and Guillain-Barre syndrome was never established.

Female *Aedes aegypti* mosquito

In December 2014, Zika virus was first detected in Brazil. Although it is unknown how it was introduced into Brazil, some hypothesize that a traveler attending the 2014 football/soccer World Cup introduced the virus. The outbreak in Brazil was fast moving and large. Tens of thousands of people became ill, and likely millions of people were infected. Similar to French Polynesia, shortly after the beginning of the Zika virus outbreak, clinicians began reporting larger-than-expected numbers of Guillain-Barre syndrome. Many of these people had

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Neurological Board Certification in Europe

BY JAN B.M. KUKS

Young neurologists can rise to the challenge in Denmark on May 27, 2016. On that day, the 8th European Board Examination in Neurology will take place in Copenhagen.

Medical specialties in Europe are working together with the European Union of Medical Specialists (UEMS) (www.uems.eu), an organization containing 43 specialist-sections, one of these being the European Board of Neurology (EBN). Setting standards for training and practice is among the organization's key activities. Therefore, the EBN is involved in developing harmonized models for the high-level training of the next generation of neurologists, in order to improve standards of clinical practice and, hence, patient care throughout Europe.

Jan B.M. Kuks

To achieve this, the EBN set up a core curriculum for the training of young neurologists, and — as testing drives learning — a board exam is provided as well.

Professor Wolfgang Grisold, now WFN secretary general, was the founder of this process and organized the first EBN examination in 2009. The 8th examination will take place at the site of the European Academy of Neurology (EAN) Congress. This illustrates the close cooperation between the UEMS Board of Neurology and the Academy of Neurology in Europe, an alliance without which a European training program for Neurologists would not exist.

Education in these times is not only for transferring knowledge, but is also directed toward achieving other competencies.

As in earlier days, the ability to retrieve knowledge from memory may be essential for clinical practice. But don't we all use electronic devices in our clinics and on our ward rounds to find up-to-date knowledge as soon as possible

see **NEUROLOGICAL BOARD**, *page 11*

WORLD NEUROLOGY

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FROM THE EDITORS

BY STEVEN L. LEWIS, MD, EDITOR, AND WALTER STRUHAL, MD, CO-EDITOR

STEVEN L. LEWIS

WALTER STRUHAL

We are pleased and honored to be taking on the editorship of *World Neurology*, the official newsletter of the World Federation of Neurology (WFN). We would like to thank President Raad Shakir and the officers and trustees of the WFN, as well as the members of WFN's Publication Committee, for entrusting us with this responsibility. We also wish to give our sincere thanks to Dr. Donald Silberberg for his outstanding editorial leadership of *World Neurology* for the last three years, as well as for providing the two of us with the benefit and generosity of his ongoing guidance and knowledge as we take on this position, and for having done the work alone that is now deemed necessary for two people to perform.

We have planned a number of new initiatives for the readers of *World Neurology*, including contributions from authorities on breaking neurological topics that affect neurologist readers worldwide, such as the article in this issue about the Zika virus epidemic from Avi Nath, MD, and James Sejvar, MD. We also plan to develop new sections and columns over the coming issues to cover such entities as global neurological training and many other topics of interest to all neurologists worldwide.

Our plans for *World Neurology* include offering additional content formats (e.g., video). We will tighten the interconnection with WFN´s online footage and are currently working on implementing social media into *World Neurology*. This new feature will provide a convenient way to interact with other readers and discuss our articles.

We look forward to continuing to make *World Neurology* a trusted and sought-after resource for news and information of interest to all neurologists throughout the globe. We are also happy to field any suggestions from readers about ways to continue to make this publication evolve and be as valuable as possible for all neurologists worldwide. •

Trainee Report on WFN Austrian Neurological Society Department Visit Program

BY HANNA DEMISSIE BELAY, MD

First, I have the deepest appreciation and gratitude to the World Federation of Neurology and Austrian Neurological Society for endorsing the African Initiative and introducing and supporting the department visit program. I would like to thank Professor Wolfgang Grisold and Professor Eduard Auff for their kind welcome and for hosting me at the Medical University of Vienna in October 2015. I wish to express my sincere thanks to Professor Fritz Zimprich, who was my mentor and made my stay incredibly productive and interesting. I would also like to thank Tanjia Weinhart for effectively arranging my stay from the very beginning up to the end. I thank profusely all the hospital staff of AKH Wien for their kind help and cooperation throughout my stay.

I started my visit in the department of neurology with an introduction and warm welcome from all the staff and the head of the department. I started my training on the neurology ward, where, initially, I was overwhelmed by the size and complexity of the hospital. The department of neurology, alone, occupied two floors for inpatient services and another floor for outpatient services.

I spent my first week in inpatient services on the neuromuscular ward and later in the neurorehabilation unit. I was able to follow acute management of neuromuscular disorders and rare cases, including anti-NMDA receptor encephalitis, which I saw for the first time. I spent a day with the occupational therapists, speech therapists, physiotherapists and other members of the team. I was impressed to see how intense and well coordinated the rehabilitation process was. It further strengthened my conviction that rehabilitation is of utmost importance in the management of many neurological patients. During this time, I was introduced to techniques that I may also apply at my home department. I have decided to try establishing a neurorehabilitation unit in one of the hospitals affiliated with our university. Since my visit, I joined Addis Ababa University in Ethiopia as a faculty member. If successful, it will be the first of its kind in the country.

Among the highlights of my stay was the third week in which I spent in the epilepsy monitoring unit. I observed invasive electrode implantation, and I was lucky enough to attend awake epilepsy surgery. Witnessing something you have had only the chance to read about before was amazing. During the rest of the time, I attended the epilepsy clinic and followed a number of complex epilepsy cases.

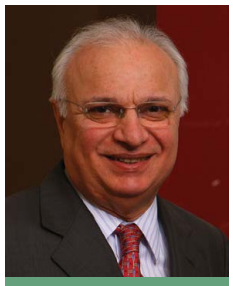
I spent half days of week three on the electrophysiology units (NCS, EMG, EP and ultrasound). I was impressed to see how useful ultrasound examination could be in the evaluation of many neurological diseases. I plan to collaborate with our colleagues in the department of radiology to eventually establish a similar service at

see **TRAINEE REPORT**, *page 7*

Pictured, left to right: Professor Reinhold Schmidt, president of the Austrian Society of Neurology; Dr. Hanna Demissie Belay, assistant professor, department of neurology at Addis Ababa University, Ethiopa; Dr. Kalpesh Jivan (South Africa) and Professor Wolfgang Grisold, WFN secretary general.

PRESIDENT'S COLUMN

Is there a place for a general neurologist? The time has come for us to have a fresh look at our specialty and decide whether we need to modify how we train and practice. In most parts of the world, the answer to the question is simple: We need to continue to train general neurologists to cover a huge need. There are so few of us, that we cannot afford the "luxury" of subspecialization. However, in a minority of countries, the field has expanded to the degree that subspecialists are the norm. The issue is that, in such a diverse situation, for the vast majority of the world population, we are only providing basic neurological care. Do we have to accept the less optimal situation, or should we push hard for subspecialization to happen worldwide?



RAAD SHAKIR

There is no doubt that in many parts of the world, the idea of a general neurologist is fast receding. The argument is that the enormous change in practice and the need to be able to deal with complicated issues is far beyond the capability of a generalist.

The explosions in genetics and imaging have led to the need for an in depth knowledge of a rapidly changing field. The generalist can decide on the primary clinical presentation and then what direct management is necessary. However, there will come a point where his or her abilities will not be sufficient to advise further.

If we take the example of acute neurological care: How many neurologists are capable of administering tPA in acute ischemic stroke or feel able to do so? The technology has been available for nearly two decades, and up till now, few centers, even in the developed world, are able fully to provide the required treatment not only in tPA provision but also more specialized intravascular thrombectomy. It is true that we need a highly sophisticated technical support from interventional radiology to neurosurgery. But the fact remains; there should be on-the-ground expertise far beyond the training and confidence of a general neurologist.

The field is now so complicated that a generalist feels uncomfortable in dealing and advising, for instance, on the use of disease-modifying therapy for MS. The plethora of licensed drugs makes it very difficult to advise on the suitability of certain long-term expensive medications. Moreover, side effects of disease-modifying drugs require care at special centers with neurologists and specialist nurses to look after the needs of patients.

Moving to other common conditions, such as epilepsy, we are all trained in the diagnosis of epilepsy, despite the complexity of seizure semiology. However, it is also true that in many cases, there are inevitable errors in diagnosis leading to erroneous management. Therefore, it is important that specialist epilepsy services are available for referral of the difficult, of the poorly controlled or for those needing surgical intervention. This means we need to train specialists in the field of epilepsy to provide accurate and appropriate care.

The world of movement disorders has really moved on. We are now in a new era of deciding on correct diagnosis and then advising on management. The field is even more complex with the availability of surgical interventions. It is true that a general neurologist is fully able to make a correct diagnosis of rather complicated Parkinsonism syndromes, but when it comes to decisions on the suitability for deep brain stimulation or Duodopa therapy, then expertise in the field is mandatory. This makes the need for specialist referral centers necessary if we are to offer full treatment packages to patients.

The diagnosis and management of genetically derived disorders is another major area for the specialist. The generalist is in many cases able to decide on the clinical phenotype, but that will need a further in-depth look at the genetics and will require a neurogeneticist to give advice on mode of inheritance and progression following appropriate DNA analysis. This is not an area to venture into without full training in clinical genetics, especially if there are predictive tests in healthy carriers and the implications of that on life and childbearing in future generations. The most important issue perhaps is the increasing possibility of the availability of stem cell and genetic modifications in combating many neurological conditions.

Many CME programs are aimed at updating the neurologist in dealing with the conditions faced in daily practice. If we look at the programs of the major international, regional and national neurological congresses, we see that specialists in various fields impart their knowledge and advice to general neurologists. This has led to a plethora of guidelines, with which neurologists are being bombarded, and, at times, it is very difficult to apply the most up-to-date pathways to every problem faced. These guidelines are aimed at practitioners in general, but in most parts of the world the contained technologies are, by and large, not available and therefore the supposed "best practice" is not applicable. This means that many neurologists looking after huge populations, however diligent they may be in keeping abreast of the latest guidelines, are totally unable to follow them and subsequently, their patients are disadvantaged.

Logically, it follows that postgraduate teaching material and guidelines have to take into account the fact that not all that is most up to date is applicable in all situations. The requirement of obtaining enough annual CME is only effective if it is targeted to the individuals concerned. The general neurology societies and continental associations have to produce guidelines which are for the general neurologist, and which may well be different in a way to those targeting the specialists in the field. This is rather difficult and may lead to confusion and errors.

Unfortunately, in many parts of the world, there is little opportunity for patients to see the neurologist of their choice. This is very common in both resource rich and poor countries. The healthcare systems in many, if not the majority of resource rich settings, provide neurological care in an anonymous way, and the patient referred with a specific problem may be seen by a general neurologist or by someone with a different special interest. In the grand scheme of things, this does not matter as neurologists know their field and can ask for advice as and when required.

However, in resource poor settings, the way in which patients are seen by neurologists varies considerably. Some neurologists sit in crowded outpatient clinics, where tens of patients wait in line, and where it is only possible to give each of them only a minuscule amount of time. In some settings, this is compensated for by the availability of inpatient beds, and what may seem like a complicated problem in the crowded outpatient setting can be admitted for a more detailed evaluation and more thorough investigation.

In other settings, neurology is by and large an outpatient service, with large, short-stay and smaller long-term inpatient facilities that vary according to locality and country. Looking after long-term disabled patients is dependent on the availability of ancillary services. Neurological rehabilitation is a separate specialty, which is totally dependent on the close collaboration with physiotherapists, occupational therapists, speech and language therapists, neuropsychologists and neurology nurse practitioners. Without that, delivery of a comprehensive package of care is not really complete. This approach may not satisfy the expectations of patients who, in the age of the smartphone, have access to the latest advances and will demand care, which may not be possible in their settings. This may well be useful for neurologists, as it will create pressure on health authorities to provide financial and manpower support to achieve better results. This is why it is crucial to work with patients' groups to push for change at all levels.

Now we have to come to the crux of the matter: Do we now have a two-tier neurological practice, or is it a continuum of evolving care starting with the general neurologist and narrowing expertise to the highly skilled specialist? Moreover, how do international bodies like the WFN, as well as regional and national organizations, influence and promote the evolution? Alternatively, should we decide that the deficiencies we face are so enormous that they are insurmountable and we have to get on with improving what we have and let slow evolution take its course? There is probably some truth in the latter view as the financial cost across the world is so vast, that we have to keep plugging away with our programs and slowly increase the number of neurologists in resource poor settings, eventually leading to specialization in our field and reducing the huge treatment gap that now exists.

To answer the question raised in the first paragraph, for the time being, it is a clear, yes there is a place for a general neurologist. •

Apply for Junior Traveling Fellowships

BY STEVEN L. LEWIS AND WOLFGANG GRISOLD

This year, the WFN will again offer Junior Traveling Fellowships for young neurologists representing countries classified by the World Bank as low or lower middle income to attend approved international meetings. The deadline for applications is March 15.

In total, there will be 30 awards. Applicants should hold a post not above that of an associate professor and be no older than 45 years of age. Candidates are asked to send the name and dates of the meeting they wish to attend, a CV and bibliography. Applicants must also send a letter of recommendation from the head of his or her department and an estimate of expenses, to a maximum of $1,440. No excess will be granted.

Applicants must actively participate in the meeting they attend (presentation, poster, etc.). WFN also encourages applicants to submit an abstract and attach a copy of the abstract to the application.

WFN's Education Committee will review all applications and announce the awards soon thereafter.

Dr. Lewis is chair, and Dr. Grisold is co–chair of WFN's Education Committee.

Report on the 2015 St. Petersburg, Russia, Clinical Neurophysiology and Neurorehabilitation Meeting

BY VLADISLAV VOITENKOV, MD, PHD

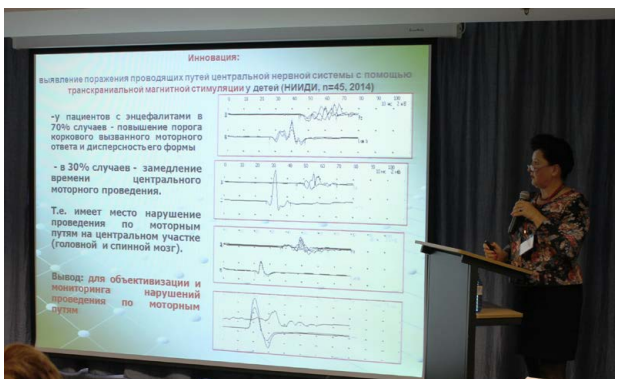
The large scientific meeting, Clinical Neurophysiology and Neurophysiology, was held by the Scientific Research Institute of Children's Infections in St. Petersburg, Russia, November 26-27, 2015. Held at the Mosckovskye Vorota Congress Center in St. Petersburg, the event attracted 395 participants.

The scientific program was dedicated to general problems of neurophysiology in Russia, Commonwealth of Independent States countries and the European Union, and to certain methods in neurophysiology and neurorehabilitation. The congress hosted plenary lectures and 10 symposiums in all. Plenary lectures included such themes as modern aspects of meningitis and encephalitis treatment and diagnosis in pediatrics, presented by Professor N. Skripchenko of the Scientific Research Institute of Children's Infections, recent discoveries in the field of transcranial magnetic stimulation (TMS), including TMS-MRI fusion techniques, presented by Dr. B. Neggers, University Medical Center Utrecht Brain Center, the Netherlands, and the role and place of electrophysiology in modern medicine, presented by Professor L. Sumsky, Neurology Center, Moscow.

Symposia themes were vast and issues included scientific and clinical aspects of electromyography, electroencephalography, neurorehabilitation, ultrasonography of the brain, muscles and peripheral nerves, neuro-orthopedics, electrophysiology and audiology, neurorehabilitation and nurses' education. Special interest was dedicated to the TMS symposium, which gathered more than 100 participants and 12 speakers, including Professor J. Mally of the Institute for Neurorehabilitation in Sopron, Hungary. He presented material on TMS as a diagnostic and therapeutic tool. Professor N. Nazarenko of the Diagnostic Center for Altay Region, Barnaul, Russia presented data on TMS investigation in tick-borne encephalitis and many others.

Dr. Voitenkov during EMG symposium

Dr. Neggers during TMS-MRI fusion workshop



Professor Skripchenko on TMS findings in encephalitis in children

Professor Mally on non-invasive brain stimulation.

The previous congress, which took place in 2015 was dedicated to more general topics and had a more classic design. This year's event was more inclusive of the newest techniques, approaches and more advanced methods.

At the meeting, 126 speakers presented their data on the topics. Symposia included talks from leading Russian and international speakers, as well as presentations from early career researchers whose material has had a significant impact in their fields. Delegates for the congress gathered from Russia, Ukraine, Belorussia, Germany, Austria, the Netherlands and Hungary. Russian delegates came from more than 90 locations, including the Far East and Arctic Northern provinces of the country.

The meeting garnered positive and warm feedback from the delegates and speakers. The organizing committee is now deep into the planning of the next event, which will take place in St. Petersburg at the end of November 2016. •

Vladislav Voitenkov, MD, PhD, is executive secretary of the Clinical Neurophysiology and Neurophysiology conference, Scientific and Research Institute of Children's Infections, Federal Medical-Biological Agency of Russia.

The First Arab African Teleneurology Conference: A Treat and Teach Initiative

BY TAMER EMARA, MOHAMED SHERIF AL-KOTB, MAYAR NAWARA, HANI FAROUK A. MOHAMED, AND AHMED ELBOKL

The Problem

Although ancient Egyptians were the first to describe the brain, the services that are provided to patients with disorders of the brain and the number of trained neurologists in Arab and African countries is at best centralized in large cities and at worst nonexistent.

This occurs despite the argument that the burden of neurologic disorders in the developing world is higher than that in developed countries. In one study from Ethiopia, it was estimated that neurology cases constitute 20-25 percent of ER admissions. Stroke is the No. 1 cause of disability in the world. According to World Health Organization (WHO) records, stroke occurs 20 years earlier in developing countries when compared to developed ones, and only 3 percent of disabled individuals get rehabilitation services. Similarly, 90 percent of epilepsy cases occur in the developing world. [1,2]

The combined Arab and African population is 1.5 billion, around 23 percent of the world population. With current improvements in vaccination programs and water sanitation, the mean age of the population is increasing, and it is estimated that by 2030, the burden of noncommunicable disorders will be higher than communicable disorders in Africa.

The Situation in Egypt

The number of trained neurologists is steadily growing. Specialized neurology services for stroke, epilepsy, headache, neurorehabilitation, and neuromuscular disorders, among others, are starting and successfully growing. These services can be found in Cairo and to a lesser extent

in Alexandria and Assiut. Apart from this, the mere presence of a trained neurologist is an exception. It is a common scenario to find a community of 1 million to 3 million inhabitants who are served by one to two neurology consultants, who may be living in another place and shuttling back and forth. The brain drain happens from these areas to Cairo, in addition to other countries.

The Situation in Africa

Neurology education in many sub-Saharan African countries is almost nonexistent. Around 90 percent of African universities do not have master degrees or other forms of formal training modules in

see TELENEUROLOGY, page 12

Successful Training in Neurology in Latin America

BY RICARDO NITRINI, MD

When I was invited to give the presentation "Successful Training in Neurology in Latin America" at the 2015 World Congress of Neurology in Santiago, Chile, I tried to answer the question, "What is the best way to train a neurologist in Latin America?"

To analyze the current situation, I emailed Latin American leaders in neurology, seeking information on graduate courses of medicine, residency programs and the number of neurologists in their countries. Most of my suggestions are based on more than 40 years of experience in clinical practice as a neurologist and in teaching neurology in a Latin American country. So, they are not scientifically proven assertions and should be regarded as a specialist's opinion.

Ricardo Nitrini, MD

Ricardo Nitrini, MD (back row, center), faculty and residents from the University of São Paulo, Brazil, gather for a photo.

First, a well-trained Latin American neurologist should be able to provide the best treatment for patients with neurological diseases, teach all medical doctors to treat and recognize the most common neurological diseases that should be referred to neurologists, and research methods of the prevention, diagnosis and treatment of neurological diseases, mainly those that are more frequent in Latin American countries.

First step: Neurology in the Medical School

We need to attract the best medical students to be neurologists.[1] To accomplish this, it's important to fight "neurophobia" during the graduate course. Two main actions are important for this purpose – avoiding teaching excessive techniques of neurological examination in a short period of time and changing the old idea that neurology is great for diagnosis, but not for treatment. Neurologists can do much for their patients and will do much more in the near future.

Most Latin American medical schools do not have neurology departments. The information I received from seven Latin American countries showed that there were only 42 such departments in 307 medical schools, and the teaching of clinical neurology has been delivered by both neurologists and other medical doctors in the large majority of these schools. Thus, it's important for medical schools to establish neurology departments and deliver instruction through trained neurologists.

The formation of Neurologists in Latin America

Most European countries require a four-year minimum of postgraduate training in neurology.[2,3] This contrasts with postgraduate training in neurology in Latin American countries (minimum two years in Brazil and three years in the majority). In the U.S., residency programs are three years long (preceded by a year of internal medicine training).[4]

To obtain more successful training, we need to have longer residency programs (at least three years dedicated to clinical neurology) to incorporate the expanding field of neurological practice. We may also stimulate residents to undertake short-term elective training in other Latin American centers and abroad.

Research

It is essential to improve research on the prevention, diagnosis and treatment of neurological diseases in Latin America, particularly those more prevalent in Latin American countries. Neurologists should be trained during graduate and residency programs on basic aspects of medical research to be able to interpret results and conclusions of papers, and should learn how to submit and publish manuscripts in indexed journals.

More Well-trained Neurologists

The Neurology Atlas (WHO 2004) showed that the median number of neurologists per 100,000 in population varies widely across regions, from 0.03 in Africa to 4.84 in Europe. In the Americas, this figure was 0.89, but there was no specific data from Latin American countries.[5] Information I received from 11 Latin American countries showed that this number ranges from 0.3 to 3.7, with a median of 0.9. The appropriate number of neurologists in the population depends upon the structure of a country's health care system.[4] In low-income countries, such as Latin American countries, there are large inequities across regions. In Brazil, for instance, the number of neurologists ranges from less than five in five of the 26 states to more than 200 in four states.[6]

We need more neurologists, but, as is frequent in several regions of the world, there are more applicants than positions for residency training in neurology.[3]

Conclusions

We need to attract the best medical students to become clinical neurologists, to extend the residency program time, to teach basic aspects of research on clinical neurology during residency programs, and to increase the positions for residency programs in neurology in order to increase the number of well-trained neurologists. To reach this objective, we should develop combined actions of local neurological societies and public health authorities, and also to increase cooperation between Latin American countries and with developed countries.

Acknowledgements

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Ricardo Nitrini, MD, is professor and chairman of neurology, University of São Paulo Medical School, São Paulo, Brazil.

Mark Your Calendars 2016

XXV European Stroke Conference
April 13-15, 2016
Venice, Italy

9th World Congress for Neurorehabilitation
May 10-13, 2016
Philadelphia, Pennsylvania

2nd Congress of the European Academy of Neurology
May 28-31, 2016
Copenhagen, Denmark

5th International Conference — Advances in Clinical Neuroimmunology
June 17-18, 2016
Warsaw, Poland

21st Meeting of the International Society for the History of the Neurosciences
July 11-16, 2016
Maastricht, Netherlands

6th International Conference on Transcranial Brain Stimulation 2016
September 7-10, 2016
Göttingen, Germany

12th European Congress on Epileptology (ECE)
September 11-15, 2016
Prague, Czech Republic

5th European Headache and Migraine Trust International Congress
Sept. 15-18, 2016
Glasgow, United Kingdom

Franklin and Ingenhousz on Cranial Electrotherapy

BY BART LUTTERS AND PETER J. KOEHLER

Electroconvulsive therapy (ECT) is considered a highly effective treatment for drug-resistant depression. The discovery of ECT has generally been attributed to the Italian psychiatrist Ugo Cerletti (1877-1963), who, in April 1938, managed to induce seizures by applying electricity directly to the head of a schizophrenic patient. Even though Cerletti's achievement has greatly contributed to the widespread implementation of cranial electrotherapy, the first reports on this seemingly hostile procedure date back even earlier.

Portrait of Jan Ingenhousz (1730-1799)

The notion that cranial electrotherapy may provide a useful therapy for melancholic patients can be traced back to a letter written by the Dutch scientist Jan Ingenhousz (1730-1799) in 1783. In his letter, Ingenhousz told his correspondent, none other than Benjamin Franklin (1705-1790), of an electric accident that he had recently endured. While Ingenhousz had attempted to reconstruct a thunderstorm in his laboratory, a powerful shock accidently struck his head:

The yarr [Leyden jar] by which I was struck contained about 32 pints. It was nearly fully charged when I recived the explosion from the conductor supported by that jarr. The flash enter'd the corner of my hat. Then, it entered my forehead and passed thro the left hand, in which I held the chaine communicating with the outward coating of the yarr. I neither saw, heared nor [sensed?] the explosion by which I was struck down. I lost all my senses, memory, understanding and even sound judgment.

My first sensation was a peine [pain] on the forehead. The first object I saw was the post of a door. I combined the two ideas together and thought I had hurt my head against the horizontal piece of timber supported by the pos[ts?], which was impossib[le] as the door was wide and high. After having answered unadequately to some questio[ns] which were asked me by the people in the room, I determined to go home … yet I was more than two minutes considering whether, to go hom[e] I must go to the right or the left hand.

Having found my lodgings, and consider[ing] that my memory was become very weak, I thought it prudent to put down in writing th[e] history of the case. I placed the paper before me, dipt the pen in the ink, but when I applyed it to the paper, I found I had entirely forgotten the art of writing and reading and did not know more what to doe with the pen, than a savage, who never knew there was such an art found out. (Papers of Benjamin Franklin, n.d., Vol. 40, Unit 209. Interpreted by Stanley Finger)

In deficient English, Ingenhousz clearly describes a case of retrograde amnesia, a common consequence of head injury, which would be more thoroughly described by Benjamin Brodie (1817-1880) in 1857. This amnestic phenomenon was familiar to Franklin, who had previously suffered an electric blow to the head himself:

I had a Paralytick Patient in my Chamber, who's Friends brought him to receive some Electric Shocks. I made them join Hands so as to receive the Shock at the same time, and I charg'd two large Jars to give it. By the Number of those People, I was oblig'd to quit my usual Standing, and plac'd myself inadvertently under an Iron Hook which hung from the Ceiling down to within two Inches of my Head, and communicated by a Wire with the outside of the Jars. I attempted to discharge them, and in fact did so; but I did not perceive it, tho' the charge went thro' me, and not through the Persons I entended it for. I neither saw the Flash, heard the Report, nor felt the Stroke. When my Senses returned, I found myself on the Floor. I got up, not knowing how that had happened. I then again attempted to discharge the Jars; but one of the Company told me they were already discharg'd, which I could not at first believe, but on Trial found it true. They told me they had not felt it, but they saw I was knock'd down by it, which had greatly surprised them. On recollecting myself, and examining my Situation, I found the Case clear.

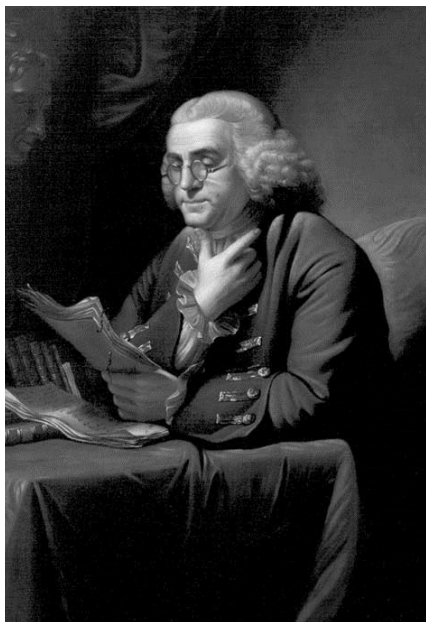
Just like Ingenhousz, Franklin had not been able to recall the electric accident. Despite monumental blows to their heads, neither of the two men reported any permanent damage. On the contrary, as appears from Ingenhousz' continuing account, he experienced something quite astonishing the morning after his accident:

My mental faculties were at that time [the next morning] not only returned, but I felt the most lively joyce in finding, as I thought at the time, my judgment infinitely more acute. It did seem to me I saw much clearer the difficulties of everything, and what did formerly seem to me difficult to comprehend, was now become of an easy Solution. I found moreover a liveliness in my whole frame, which I never had observed before.

Franklin was fascinated by the story of his Dutch correspondent. Ingenhousz had not only survived the accident, but had experienced a considerable improvement in his mood following the accident. Even though Franklin himself had not noticed any perks of his electric mishap, both men agreed that cranial electrotherapy could potentially provide an effective therapy for melancholic patients. Consequently, they both set out to persuade various "mad-doctors" in London and Paris to expose the heads of their melancholic patients to cranial electricity.

In 1787, four years after Ingenhousz' letter to Franklin, John Birch (1745-1815), an English surgeon and electrotherapist, proclaimed the healing of a melancholic porter and a suicidal singer by means of cranial electrotherapy. Birch's achievements were soon followed by similar reports from Giovani Aldini (1762-1834) and T. Gale. Even though none of these physicians made any reference to Franklin or Ingenhousz, given the chronology of events, it seems plausible that the two prominent scientists inspired them.

It is time to include Jan Ingenhousz and Benjamin Franklin in the ECT story. Ingenhousz, a talented physician-scientist best known for his discovery of photosynthesis, was the first to report the positive effects of cranial electricity and to advise the procedure for the treatment of melancholic patients. Franklin, already widely celebrated for his electric research, owns his share in the conception of cranial electrotherapy, as well. Finally, even though Cerletti was probably the first to induce seizures by means of cranial electricity, the early cranial electrotherapists Birch, Aldini and Gale deserve credit for pioneering cranial electrotherapy. •



Portrait of Benjamin Franklin (1705-1790) by Charles Willson Peale (1772)

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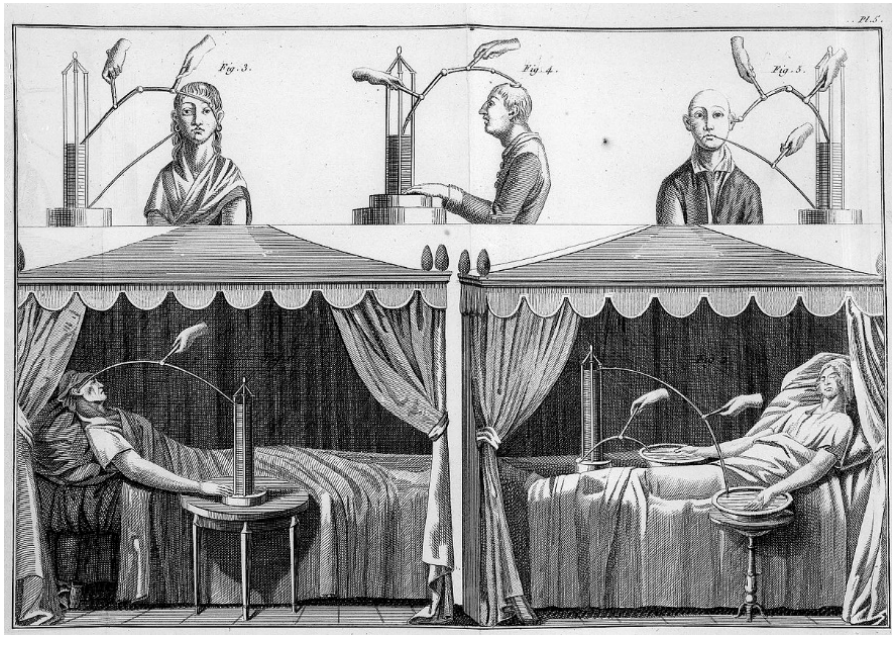

Illustrations of melancholic patients treated with cranial electrotherapy by Giovanni Aldini (1762-1834)

TRAINEE REPORT

continued from page 2

my home institution. I spent a few days with the neuro-interventionalist, where I observed certain procedures not practiced within our department.

I spent time at different specialty clinics and learned much from everyone involved. By week four, I attended different specialty clinics, such as the neuromuscular unit, as well as the multiple sclerosis, epilepsy, headache, vertigo and Parkinson's disease clinics. Each unit was a stimulating experience. At the vertigo clinic, for the first time, I could see electronystagmography being performed on a patient. During a night shift, I learned how to evaluate and confirm brain death.

I was invited to give a talk on the practice of neurology in Ethiopia. I got to talk about my country, the burden of neurological disease in our setting, how neurology is being practiced, which neurological disorders are common and how we manage them. The audience was attentive, and the post-talk discussion was very lively. It allowed me to share my experiences and describe working conditions on "the other side of the world."

I also had the privilege to visit another hospital, Kaiser Franz Josef Spital and attend a tumor board session, guided by Professor Wolfgang Grisold. I found it to be interesting, and it can easily be adapted to a set up like ours.

My stay in Vienna was not only formally educational, but it also gave me the opportunity to meet neurologists from Austria and share experiences.

My weekends were always full, and Vienna fascinated me with its timeless beauty, culture and artistic attractions. It felt like heaven to walk in the park of Schönbrunn during a windy day in October. I was impressed with the antiquely furnished imperial apartment, the Sissi Museum and the silver collection of the Hofburg Palace. I was also speechless to see all the paintings by pioneering expressionists, such as Klimt, Schiele and Kokoschka at the beautiful palace of the Belvedere. I attended an Edvard Munch exhibition hosted by the Albertina Museum. It was also in Vienna that I attended my first opera.

> "During this visit, I witnessed that neurology or neuroscience is a fast-growing field, and each of us from different parts of the world can contribute a lot."

During this visit, I witnessed that neurology or neuroscience is a fast-growing field, and each of us from different parts of the world can contribute a lot. I had only slight difficulties with the language barrier, and even then someone was always beside me to help. People were kind enough to try their best to communicate in English. Even though the duration of the stay seemed short, it is enough to meet the goal of the observership program. However, I believe the program to be so important that I suggest the number of young neurologists sponsored should be increased.

As a recommendation, I think the WFN can also think about exchange programs, whereby neurologists from developed countries pay a visit to African institutes and we can share our experiences. It is my hope that this program will continue and flourish in the future. It is encouraging and inspiring to young neurologists. It will also open a door for future collaborations and joint research projects.

In general, I can say with confidence that this program is successfully fulfilling its goal of fostering global neurological education. •

Dr. Demissie Belay is an assistant professor in the department of neurology at Addis Ababa University in Ethiopa.

Editor's Update and Selected Articles from the *Journal of the Neurological Sciences*

BY JOHN D. ENGLAND, MD
EDITOR-IN-CHIEF

The *Journal of the Neurological Sciences* will soon feature a section devoted to global neurology. We have seen a significant increase in the number of high quality submissions from around the world, and many of these address important issues in regions beyond the traditional high-income countries. In this new section, we will profile original research, topical reviews and commentaries that address important regional and global neurological topics. We extend a special invitation to individuals who are working in or collaborating with neurologists or scientists in lower or middle-income countries. Dr. Donald Silberberg will edit the global neurology section. Dr. Silberberg is ideally suited to edit this section. He is currently emeritus professor of neurology, and he served as chair of neurology (1982-1994) and senior associate dean for international programs (1994-2004) at the University of Pennsylvania Perelman School of Medicine. He is an associate editor for the *Journal of the Neurological Sciences* and is the retiring editor for *World Neurology*. Dr. Silberberg is dedicated to improving neurological care in developing countries. His expertise in the global community is a great asset to the World Federation of Neurology and the *Journal of the Neurological Sciences*. Authors who wish to submit manuscripts for this new section should use the Elsevier Editorial System and follow the instructions for authors.

John D. England

In our ongoing attempt to enhance accessibility of *JNS* articles to members of the World Federation of Neurology (WFN), we have selected two more "free-access" articles, which are profiled in this issue of World Neurology.

1) Ivana Vodopivec, et al. provides a glimpse of the heterogeneity of patients with Susac syndrome. Susac syndrome is a rare disease, which is usually characterized by a triad of encephalopathy, visual disturbances and hearing loss attributed to a pauci-inflammatory vasculopathy of the brain, eye and inner ear. However, at initial presentation, none of the five patients in this case series demonstrated the complete triad, and diagnosis was difficult and delayed. The authors provide two important conclusions: a) Microinfarcts were noted on MRI diffusion weighted imaging (DWI) of the brain, as well as branch retinal artery occlusions and vessel wall hyperfluorescence on fluorescein angiography in all patients with acute encephalopathy, and b) glucocorticoid and IVIg treatments were insufficient in halting the disease in patients with severe encephalopathy. Additional immunosuppressive treatment was required.
   1) Vodopivec, N. Venna, J.F. Rizzo III, S. Prasad, Clinical features, diagnostic findings, and treatment of Susac syndrome: A case series, J.Neurol.Sci. 357 (2015) 50-57.
2) Kristin Galetta and Don Gilden provide a well-written and comprehensive review of varicella zoster virus (VZV). This article covers the history, protean clinical presentations, prevention/vaccination and future directions for research. I believe that this article is a must read for any clinical neurologist. K.M. Galetta, D. Gilden, Zeroing in on zoster: A tale of many disorders produced by one virus, J. Neurol. Sci. 358 (2015) 38-45. •

John D. England, MD, is editor-in-chief of the *Journal of the Neurological Sciences*.

The Norwegian Year of the Brain

BY ANNE HEGE AAMODT, ESPEN DIETRICHS, AND HANNE FLINSTAD HARBO

After an invitation from the European Brain Council, we arranged the Norwegian Year of the Brain in 2015 (YotB2015) – 20 years after the first Year of the Brain in Norway. The Norwegian Neurological Association, the Norwegian Brain Council and Nansen Neuroscience Network coordinated YotB2015 and took the initiative to organize different events and activities. The main goals of YotB2015 were to increase the focus on knowledge and research on brain diseases that would lead to improved prevention, treatment and patient care.

Upon establishing a national committee in 2014, we exchanged ideas and distributed tasks to stimulate the arrangement of events, media reach and interest-based political work. Many neurological departments, patient organizations, professional organizations and research networks announced the Norwegian Year of the Brain, scheduling activities and events around the country.

The formal opening ceremony was held in February 2015 in the Assembly Hall at the University of Oslo. State Secretary Anne Grethe Erlandsen from the Ministry of Health and Care Service opened the meeting before President Raad Shakir of the WFN, Mary Baker, past president of the European Brain Council, and several Norwegian health leaders, neuroscientists and patients held their lectures and talks.

Through the year, more than 60 meetings open to the public were held around the country, including lectures and discussions on different perspectives on neuroscience at hospitals, cultural centres and libraries. In Molde, Norway, YotB2015 meetings were part of an international literature festival. And in Oslo, several large meetings on various neuro-related topics were held, including "Literature and the Brain," "Music and the Brain" and "Food and the Brain." In addition, there were multiple professional meetings to market the YotB2015 logo, including the 27th National Neurological Congress, the Spring Meeting in the Norwegian Neurological Association, meetings within the Norwegian Academy of Science and Letters and the 1st National Meeting on Endovascular Intervention in Acute Stroke. YotB2015 was also marketed in a stroke campaign. A popular science book about the brain was published by the Norwegian delegate to the WFN, Espen Dietrichs, one of the initiators of both YotB1995 and YotB2015.

During the YotB2015, many neurological topics and challenges were presented in mass media with numerous interviews on TV, radio and newspapers. Information on coming events was continuously updated on the website of the Norwegian Neurological Association and the Norwegian Brain Council. Information was also conveyed through social media platforms, Twitter and Facebook. During the fall, the Norwegian Brain Council also arranged a Facebook campaign called "With a Heart for the Brain," which generated more than 1 million likes.

Erlandsen led December's closing ceremony. The Director of the National Health Directorate and Nobel laureate Edvard Moser held inspiring lectures on the impact of neuroscience and brain disorders. In addition, so-called "brain music" that was specially composed for the Nobel Prize Award Ceremony in 2014 by two music professors at the Norwegian University of Science and Technology, was presented live for the first time during the closing ceremony.

We have been working continuously to strengthen the priority area of brain diseases and neuroscience. The Year of the Brain and the neuro field were discussed in the Norwegian Parliament during 2015. We have also had an audience at the health minister and discussed the focus on brain disorders. The Norwegian Brain Council also received a separate post in the fiscal budget for 2016. During the closing ceremony, the state secretary declared that the Ministry of Health and Care Service will make a status report for brain disorders. A few days later, the Health Committee in the Norwegian Parliament underscored the need for a national plan on brain health in Norway.

Anne Hege Aamodt (left) and Hanne F. Harbo introducing the program at the closing ceremony for the Norwegian YotB2015

Professor Espen Dietrichs, Norwegian delegate to the WFN presenting one of many lectures during the Norwegian YotB2015.

YotB2015 meeting about treatment of neurological disorders, Oslo University Hospital.

The Norwegian YotB2015 has resulted in increased interest and knowledge on neurological disorders. Our message that one in three will experience brain disorders and that the neuro field needs to be prioritized stronger has sparked interest. We have achieved political understanding for brain disorders as a focus area and will work further with this issue. We will follow up the announced status report, which should result in a National Brain Plan. •

From left to right: Brain musicians Kristoffer Lo, John Pål Inderberg and Henning Sommerro; Director of the National Health Directorate Bjørn Guldvog; State Secretary Anne Grethe Erlandsen from the Ministry of Health and Care Service and the Nobel Laureate Edvard Moser together with Hanne Harbo from the Norwegian Brain Council. (Photo courtesy: Norwegian Brain Council.)

Ragnar Stien, one of the initiators of the Norwegian YotB in both 1995 and 2015, and the audience in Domus Academica at the University of Oslo at the meeting "The Literature and the Brain."

From left to right: Anne Hege Aamodt, president of Norwegian Neurological Association; Olga Bobrovnikova, renowned pianist battling MS and European Brain Council ambassador; Raad Shakir, WFN president; and Hanne F. Harbo, head of the Norwegian Brain Council. (Photo courtesy: Lise Johannessen Norwegian Medical Society.)

Anne Hege Aamodt is president of the Norwegian Neurological Association, Espen Dietrichs, is a Norwegian delegate to the WFN and Hanne Flinstad Harbo is a leader of the Norwegian Brain Council.

ZIKA VIRUS

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reported a febrile rash illness compatible with Zika in the days or weeks before their weakness onset. In addition, clinicians in Brazil noted a 20-fold increase in microcephaly in 2015, compared to previous years, with microcephalic babies born approximately eight to nine months after the first recognition of Zika virus. Some of the infants' mothers reported a rash illness compatible with Zika virus infection while pregnant, leading to the suspicion that the microcephaly was somehow associated with Zika virus infection.

Nearly 90 percent of the cases of microcephaly occurred in the northeastern region of the country,[6, 7] areas experiencing some of the heaviest burdens of Zika virus infection as well. French Polynesian health authorities reported an unusual increase in central nervous system malformations in babies born during a Zika virus outbreak on the islands from 2014 to 2015.[6] The infection has now spread across most of South America and Mexico. To date, few cases have been reported in the United States among travelers returning from Zika virus-affected regions.[8, 9]

Virology and Pathophysiology

Zika virus is a positive-sense, single-stranded RNA virus (genome 10.7 K nucleotides) belonging to the flaviviridae family, which includes dengue, yellow fever, Japanese encephalitis, St. Louis encephalitis and West Nile virus. It has the ability to cross the placenta and cause developmental brain abnormalities in children, suggesting that the virus likely infects neural stem cells. The severity of brain malformations may be related to the stage of fetal development at the time of infection. Microcephaly would be the most common manifestation, but if infection were to occur in earlier stages of fetal development, anencephaly or lissencephaly may occur.

The pathophysiology of ascending paralysis and myelitis in adults is unknown. However, mice injected with the virus can develop paralysis, suggesting direct invasion by the virus, although an immune-mediated, post-viral syndrome is also possible. It remains unknown if once infected and recovered if an individual develops long-term immunity or not, and if recurrent infections or relapses can occur. Questions regarding long-term viral persistence in tissue reservoirs also remain unanswered.

see **ZIKA VIRUS**, *page 9*

ZIKA VIRUS

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Transmission

The virus is transmitted by the *Aedes* species of mosquitoes [10], in particular *Aedes aegypti*, the vector involved with transmission of dengue, a closely related flavivirus. Additionally, experimental evidence suggests the virus can be transmitted by Asian tiger mosquitoes (*Aedes albopictus*) [11, 12], which can survive in cold temperatures. Most arboviruses have an intermediary host or "reservoir." For West Nile virus, birds, particularly corvids, serve as these reservoirs. For Venezuelan, Western and Eastern equine encephalitis viruses, horses serve this role, and for Japanese encephalitis virus, it is primarily pigs. However, the transmission of Zika virus generally occurs directly between humans and mosquitos. There is some evidence that human-to-human transmission may occur through sexual intercourse, and the virus has also been detected in saliva, so the potential for oral transmission also exists. The virus has been isolated from the amniotic fluid of pregnant women and blood and tissues of newborns, suggesting materno-fetal transmission.[13] So far, an intermediary host has not been identified.

Clinical manifestations

The majority of Zika virus infections — 80 percent — are clinically asymptomatic.[4] Among persons who develop symptoms, Zika virus infection is generally considered to be mild, causing fever, rash and body aches. Some may develop conjunctivitis. Symptoms usually last one week.

The full spectrum of neurological complications from this viral infection remains unknown. The epidemiological association between microcephaly and the infection seems strong. In Brazil, annual reported rates of microcephaly would generally be somewhere around 150 cases per year. Reportedly, between October 2015 and January 2016, more than 3,500 babies were born with the condition. CT brain scans show evidence of widespread calcification. Other malformations, such as anencephaly and lissencephaly, might also occur. It remains uncertain if other organs may be involved in addition to the brain. However, the differential diagnosis of microcephaly is broad. Hence, when presented with a patient with microcephaly, it remains important to consider other common causes, such as genetic, craniostenosis, and infections, such as toxoplasmosis, rubella, varicella zoster virus and cytomegalovirus. Intrauterine cerebral anoxia, exposure to drugs, alcohol and other toxins, malnutrition and metabolic disorders such as phenylketonuria can also cause microcephaly. Patients with microcephaly often have developmental delay, difficulty with gait and balance, mental retardation, seizures and hyperactivity.

Guillain-Barre syndrome appears to be a recurring possible complication of Zika virus infection. Following the introduction of Zika virus into French Polynesia, clinicians began reporting larger-than-expected numbers of Guillain-Barre syndrome cases on the island.[14] Following the introduction of Zika virus to Brazil in December 2014, again, reports surfaced of large numbers of Guillain-Barre syndrome cases. In Brazil, few cases of Guillain-Barre syndrome had laboratory confirmation of Zika virus, but currently the primary method of diagnostic testing is through the detection of viral RNA through polymerase chain reaction. In Guillain-Barre syndrome, by the time the clinical features of limb weakness develop, it is unlikely that there would still be circulating virus, and, as such, detection of viral RNA would not be expected. Less commonly, some patients have been thought to have a myelitis or polio-like manifestations. Currently, it is unclear if these are all related or if indeed both spinal cord and peripheral nerves can be involved. Thus, in Brazil, epidemiologic evidence and the close temporo-spatial clustering of both Guillain-Barre syndrome and Zika virus cases provides intriguing circumstantial evidence for an association.

In other cases in which the virus was newly introduced, reported increases of Guillain-Barre syndrome cases have invariably appeared, including in Colombia, Venezuela and, more recently, El Salvador, which reported 46 Guillain-Barre syndrome cases in a five-week period from December 2015 to early January 2016. That is nearly three times more than the country would normally see in that timeframe. Laboratory substantiation of an association between Zika virus and Guillain-Barre syndrome has proved challenging, however. As noted, by the time of onset of weakness, the virus would be expected to be cleared from the body, and molecular techniques to identify the virus or viral RNA would not be expected to be positive. Detection of Zika virus-specific antibodies would provide evidence of current or prior infection. However, that method also has its challenges. Dengue virus is a closely related flavivirus to Zika, and invariably co-circulates in all areas currently associated with Zika virus. However, dengue virus infection has also rarely been associated with Guillain-Barre syndrome, and laboratory testing by serology is challenging due to the substantial cross-reactivity of antibodies between Zika virus and dengue virus.

Since these viruses are carried by the same mosquito vector and co-circulate at the same times of the year, it can be challenging to differentiate between infection with the two viruses.[15] Development of a robust serologic assay that can reliably differentiate Zika virus from dengue and other closely related flaviviruses will be crucial in order to provide laboratory evidence of Zika-associated Guillain-Barre syndrome, as well as other late complications of Zika virus. Currently, the nature of the neuropathy is not known, as results of electrodiagnostics to determine the clinical sub-type of Guillain-Barre syndrome possibly associated with Zika virus has been rarely reported. It would be important to know if it is axonal or demyelinating and if it is immune mediated. This could affect treatment and prognosis. Recovery from demyelinating neuropathies is generally better than those due to axonal injury. Isolated reports suggest that the neuropathy may be demyelinating and may respond to treatment with intravenous immunoglobulin.[14]

Laboratory Diagnosis

Viremia occurs only during the first few days of the illness, but if blood samples are obtained during that time, virus can be detected by polymerase chain reaction.[16] Following this phase, IgM antibodies can be demonstrated by ELISA or Western blot analysis. Previous epidemics have noted that there is cross reactivity between antibodies to Zika and other arboviruses such as dengue.[5] The Centers for Disease Control and Prevention (CDC) has issued guidelines for the testing of infants born with possible Zika virus infection.[17]

Treatment and Prevention

Currently, there is no effective treatment or vaccine against the virus. Hence, prevention is key with control of mosquito populations and prevention of mosquito bites. Travel advisories have been issued for pregnant women not to travel to areas experiencing Zika virus outbreaks. For individuals who suffer from the neurological consequences of the infection, long-term supportive and symptomatic treatment is key. The socio-economic impact of the infection, particularly if the association between Zika virus and microcephaly holds true, will likely be huge and felt for decades. While the large number of cases of microcephaly is tragic, whatever the eventual cause turns out to be, it will result in large numbers of children with developmental disorders and begs for the need to train personnel in a wide variety of health disciplines, including neurology, rehabilitation, specialized nursing, social services, etc., to care for and treat this population. Ongoing surveillance for Zika virus in the Americas and elsewhere, to monitor its continued spread, as well as documentation of infection among travelers returning from affected areas will be critical. Development of more robust serologic assays that can differentiate Zika virus from other closely related flaviviruses will be an important tool to substantiate an association between Zika virus and devastating neurologic conditions, such as Guillain-Barre syndrome and microcephaly. Ultimately, the long-term epidemiologic pattern of Zika virus will be important to monitor. •

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Neurology International Residents Videoconference and Exchange (NIRVE) Connects Neurology Residents Around the World

BY MEAH MINGYANG GAO, MD; RUSSELL RASQUINHA, MD, MASC; MANAV V. VYAS, MBBS, MSC; MARY JANE LIM FAT, MD; YURI KIRYANOV, MD; CLECIO GODEIRO, MD, PHD; FERNANDO MORGADINHO COELHO, MD, PHD; DALIA ROTSTEIN, MD, MPH, FRCPC; TIM PATTERSON; AND MORRIS FREEDMAN, MD, FRCPC

The 2013 WFN neurology training survey highlighted great variability in neurology training programs across the world.[1] Neurology trainees are interested in international clinical experiences, but are often constrained by limited flexible time as well as financial, educational or logistical support.[2] With the advent of modern technology, 95 percent of current international neurology trainees have reliable Internet access.[1] Video-conferenced medical rounds are a new and proven way to supplement medical education across distances and may represent a sustainable solution to global peer learning.[3,4]

The Neurology International Residents Videoconference and Exchange (NIRVE) is a resident initiative sponsored by the Peter A. Silverman Global e-Health Program, the Canada International Scientific Exchange Program (CISEPO) and the Baycrest Center for Geriatric Care in Toronto. In 2009, Dr. Dalia Rotstein, a former neurology resident and now faculty member at the University of Toronto, established NIRVE with the vision to connect neurology residents across various geographical sites. NIRVE was modeled on the International Behavioral Neurology Videoconference Rounds.[5]

NIRVE was designed to develop leadership skills and create opportunities for residents at all levels to participate in medical education and peer learning, raise awareness of global health concepts in neurology, increase resident advocacy of global health issues, enhance international and national collaboration among neurology residents and act as a gateway for organizing on-site exchanges.

The participating international sites on a rotating basis host the rounds every first Thursday morning of the month. Residents from the host site present a neurology case through videoconferencing technologies, and neurology resident moderators encourage the audience to actively engage in discussions and exchange opinions in real time.

Since its inception, NIRVE has continued to grow and expand. Neurology residents, fellows and faculty from Toronto with international contacts or affiliations initially recruited partner sites. For example, Olga Finlayson, a former University of Toronto neurology resident, helped establish a lasting collaboration and later clinical exchange with the First State Pavlov University in St. Petersburg, Russia. Our current partner sites include Natal, Brazil; São Paulo, Brazil; Grenoble, France; Jos, Nigeria; and Ufa, Russia. Participation is free and any site in the world with videoconference technology is welcome to join NIRVE as an equal partner.

Methods

The rounds start at 8 a.m. Eastern time, with a 30-minute case presentation and a 15-minute "image challenge" focused on a radiological or pathological diagnosis, with accompanying neuro-images. The rounds include sufficient time to engage residents in discussions involving diagnostic steps and therapeutic management across the different international sites. The current video-conferencing equipment (H.323/SIP connection protocol) is free within Ontario. International sites connect through a video conference MCU or bridge (Resolve Collaboration) at an hourly rate of slightly more than $35 per site (sponsored by the Peter A. Silverman Global e-Health Program, CISEPO and Baycrest Center for Geriatric Care).[5] As of 2015, webcasting with password protection has been implemented using the Ontario Telemedicine Network, allowing any resident with Internet to connect to our rounds.[6]

As a resident-led initiative, NIRVE values all input from its participants and actively seeks feedback to further improve the program and curriculum to cater to participant needs. In 2015, a formal survey was distributed to all NIRVE participants and site directors from 2014-2015. The questionnaire consisted of four parts: demographic information, questions on the main case presentation, questions on the image challenge and exchange participation. The survey assessed both qualitative and quantitative responses from the participants and was administered using Survey Monkey®.

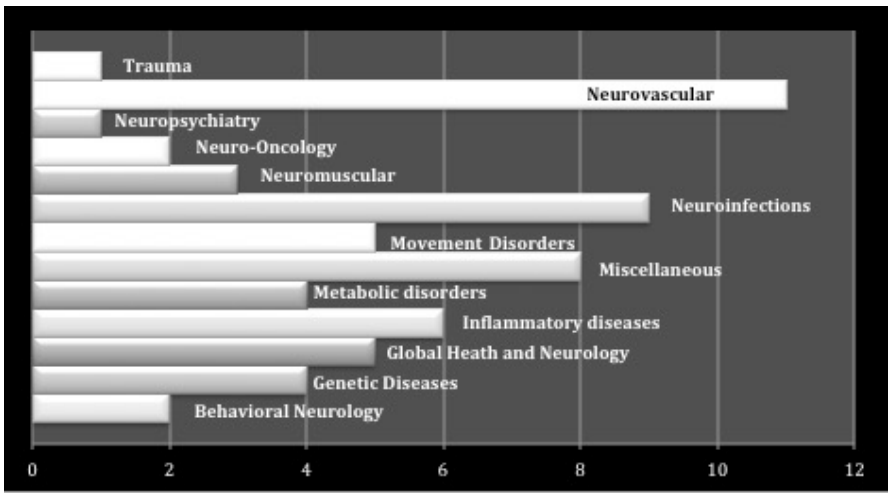

Figure 1. 61 distinct round topics (main case and image challenge) at 45 NIRVE rounds

Questions	% Yes Main case	% Yes Imaging challenge
Were these rounds relevant to your level of training?	91.6%	88.0%
Do these rounds add to your existing knowledge?	95.8%	96.0%
Do these rounds align with your interests?	87.5%	96.0%

Table 1. Results for educational value of NIRVE rounds in 2015 (N = 25)

Results

More than 100 trainees from 10 different sites have attended NIRVE rounds since its inception. Figure 1 shows the categories and number of presentations in each category that have been covered at the NIRVE rounds, with neurovascular and neuroinfectious diseases being the two most common.

Twenty-seven, or 60 percent, of the 45 trainees across four different sites participated in the survey. The average age of these trainees between the ages of 24 to 53 was 29.4 years, and 16, or 60 percent of trainees, were females. While most were neurology residents at different levels of training, two sub-specialty fellows, one postdoctoral fellow and two PhD students also participated in the survey. Slightly more than 66 percent of trainees identified languages other than English as the language of instruction in their medical training. Of the 25 residents surveyed, 91.6 percent thought that the rounds were relevant to their level of training, 95.8 percent identified that the rounds contributed to their existing knowledge and 87.5 percent agreed that the topics align with their academic interests (Table 1). Seventy-two percent of trainees were interested in presenting at the rounds in the future, and 80 percent indicated an interest in participating in a future clinical exchange program. Most trainees identified the case discussions as the most beneficial aspect of the rounds and suggestions were made to increase emphasis on global health topics and comparing and contrasting practices across the world.

Discussion

There are considerable variations in the occurrence and management of neurological conditions across the world. As neurology trainees prepare for their future careers in an increasingly globalized world, providing early exposure to a variety of cases and management strategies can be challenging. NIRVE provides an opportunity to fill this gap while fostering a platform for potential collaborations.

Over the past years, NIRVE has encountered considerable challenges limiting its expansion. The difference in time zones across countries, various costs associated with room rental and equipment purchase for some international sites, and English as the main language for the rounds have limited the number of trainees we have been able to engage. Looking to the future, creating a bigger role for webcasting, and password-protected archived webcasts could be a more cost-effective strategy to expand our reach. However, increased connectivity may come at the price of reduced real-time interaction. Finally, an

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A screenshot of NIRVE rounds in September 2015 — First round for the new cycle (2015-16) where all sites introduce themselves. Top left: Slides being presented at the NIRVE rounds from Toronto. Top right: Trainees and staff at Ufa, Russia; and below, trainees and staff at St Petersburg, Russia. Bottom left: Natal, Brazil, and São Paulo, Brazil.

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on-site clinical exchange is planned for May 2016 in Toronto, including participants from Brazil, Canada and Russia.

Conclusion

Despite challenges including technological, logistical and language-related constraints, NIRVE rounds continue to supplement resident learning across different geographical, political and cultural backgrounds. We welcome residents and fellows from other programs to contact us at nirve.utoronto@gmail.com for more information about NIRVE or to participate in NIRVE. We are happy to provide further information on some technical requirements and further details. •

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Meah Mingyang Gao, Russell Rasquina, Manav V. Vyas, Mary Jane Lim Fat and Dalia Rotstein are with the division of neurology, department of medicine, University of Toronto. Yuri Kiryanov is with the department of neurology, First Saint-Petersburg Pavlov State Medical University, St Petersburg, Russia. Clecio Godeiro is with the department of neurology, Universidade Federal do Rio Grande do Norte, Natal, Brazil. Fernando Morgadinho Coelho is with the department of neurology, Universidade Federal De São Paulo, São Paulo, Brazil. Tim Patterson is with the department of telehealth, Baycrest, Toronto, Canada. Morris Freedman is with the department of medicine, division of neurology, Baycrest Health Sciences, Mt. Sinai Hospital, and University of Toronto; Sam and Ida Ross Memory Clinic, Baycrest; Rotman Research Institute, Baycrest, Toronto, Canada.

NEUROLOGICAL BOARD

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for practicing evidence-based medicine and to offer our patients the latest achievements in our field? Is there any specialist in neurology who does not regularly want to have the opportunity for a peek inside an anatomical atlas, a handbook of neurophysiology or whatever textbook, before making a decision in clinical practice?

Successful candidates of the 7th EBN Exam in Berlin June 19, 2015 displaying their certificates

So, today, we can't restrict ourselves to information known by heart. We should be able to combine it with recent facts and developments. The ability to handle knowledge will become more and more important. This is the reason we offer our candidates the opportunity to take their own favorite textbooks (and in the future, electronic devices) to the examination to solve higher-order, open-book questions derived from real life, as they do in real life. Beside the great textbooks, guidelines and electronic courses from the EAN are the basis for the questions provided.

This isn't all. Further competencies important for being a good specialist are described in several systems, such as in the CanMEDs roles (www.royalcollege.ca). In this system, a neurologist should not just be a medical expert, and the EBN exam should not be confined to testing neurological knowledge. Testing abilities in other CanMEDs roles like communicator, health advocate, professional and scholar comprise another and more essential part of the EBN examination.

How should we test these abilities within the other competencies? Does this need just another couple of multiple choice questions? We feel that this cannot be achieved by written computer examinations. For example, public health or global health issues (being a heath advocate) have their national emphases, and ethical points of view vary in different countries. Thus, there is no absolute truth to be tested. A face-to-face discussion is more suitable than making a choice in the closed format of a multiple-choice question for testing these competencies. Therefore we invite our candidates to prepare themselves properly for a discussion by writing essays for an oral examination. Being a scholar demands the ability to make one's own vision clear and to dive into a problem to be solved in a scientific way. Therefore we ask our candidates to make a critical appraisal of a topic of their own choice to be presented for an oral discussion.

So taking a European Board Exam for Neurology is not being dependent on having a lucky day; it can be prepared for in advance, and candidates can develop abilities over a long period of time to be successful.

The validity of the examination needs the input of the scientific experts at the European Academy of Neurology. The reliability of the outcome depends on the number and quality of the participating candidates. A statistical evaluation to eliminate "bad questions" only can be realized in a group of sufficient size. Establishing a passing score can be determined by specialists prior to the test. However, modification of such a score may be necessary after getting data from a sufficient number of adequate participants.

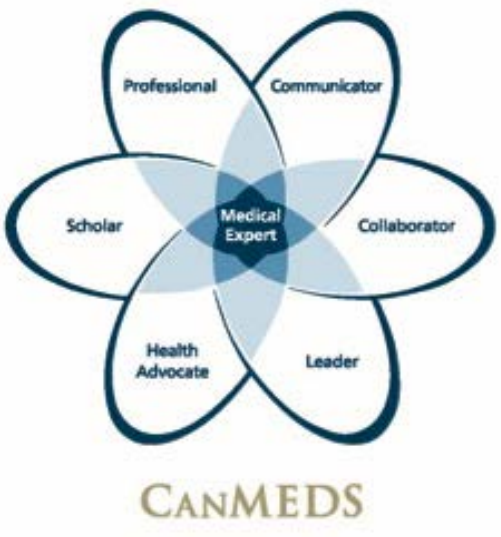
We are happy to see the number of participants grow each year. The exam becomes attractive to more candidates from inside, but also from outside Europe — many of whom want to take the exam to increase the possibility of moving between European countries or to test their abilities on a European level. In this respect, Turkey, Belgium and Italy now take a leading role by sponsoring their young neurologists to take the EBN exam, in addition to their national exit exams.

Unfortunately, by now, board exams do not yet have a legal value in Europe, and this restrains many young neurologists from taking the examination. With increasing interest in Europe and the cooperation between European countries, we are likely to establish a goal of a European exam to be taken as an exit test in order to work as a neurologist in the European continent in the near future. Striving for such a pretentious goal forces us to look at the American board exams for neurology to try to reach their high quality level, while keeping the European flavor in our own tests.

More information about the EBN Examination can be found on our website: www.uems-neuroboard.org. We would be delighted to welcome you there. •

Jan B.M. Kuks is professor of clinical neurology and medical education, University Medical Centre Groningen, Netherlands, and chair of the Examination Committee European Board of Neurology.

Candidates taking the written test on the 7th EBN Exam in Berlin.



TELENEUROLOGY

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neurology. Most of the trained neurologists get their training abroad. Many leave their countries because there are no posts for neurologists in the university or the ministry of health. The number of trained neurologists in many countries can be counted on two hands. For instance, only 11 countries in Africa have more than 10 neurologists per country, five countries in Africa have only five to 10 neurologists per country, and 23 countries in Africa have one to four neurologists per country.

In countries with good neurology training programs, well-established neurology services can only be found in central cities, and patients have to travel for hundreds of miles to find a good neurology service.

We Had a Plan

The Treat and Teach Initiative

For the aforementioned reasons, Ain Shams University has been endorsing an initiative called Treat and Teach, which is designed to develop short- and intermediate-term strategies to reduce the gap in the number of trained neurologists and the deficiency of neurology education programs in Africa. We are trying to complement the current efforts to improve neurology education in Africa with an initiative that has a mix of online education and on-site clinical training, while working on establishing medical services that may include a stroke unit, memory clinic, neurorehabilitation units, or a neurology department. Master degrees will be given from Ain Shams University, Cairo, and work will be done to establish local master degrees in rural centers. This could lead to national neuroscience services run by local providers.

The Conference

To promote this initiative, Ain Shams University organized the First Arab African Teleneurology Conference: A Treat and Teach Initiative. Held in the League of Arab States January 19–20, 2016, the conference was designed for medical and non-medical stakeholders. Representatives of Ain Shams University, the League of Arab States, Egyptian ministries of health, foreign affairs and communications, Egyptian military hospitals, the American Telemedicine Association and WHO joined the discussions, in addition to 247 attendees representing 12 countries and 13 universities.

Discussions Focused On

1. The high prevalence of neurologic disorders, their impact on the community in terms of mortality and morbidity, and the importance of time-to-start management and clinical expertise to manage these sophisticated cases.
2. The clear deficiency in trained neurologists in rural parts of Arab countries and in most African countries.
3. The increasing numbers of trained neurologists and specialized neurology services in large cities, such as Cairo, the challenge to use these experiences in rural areas and avoid the brain drain problem, and the importance of establishing stronger inter-African communications to bridge geographical barriers.
4. Presentations from international experts in the field illustrating experiences from the Mayo Clinic, Harvard, California and the U.K.; experiences from Egypt and Sudan were also presented.
5. The great potential and readiness for change in many sub-Saharan countries. Africa is a young continent, with an average age of 17 to 20 years old. Africa will have the largest workforce in the world in the next 25 years, and seven out of 10 of the fastest growing economies in the world are sub-Saharan African countries. Government spending on health care worldwide is the highest in Africa (18.4 percent). The number of Internet users in Africa multiplied 70 times from 2000 to 2010.
6. As a proof of concept, four speakers invited from the U.S. used telecommunication technologies to give live interactive sessions showing scientific information and giving second opinions about selected cases.

A round table discussion worked on the action plan of launching the Treat and Teach Initiative. There were six objectives for this round table discussion:

1. Governance and planning
2. Human resources
3. Technology
4. Sustainability
5. Regulations
6. Research

Results and Recommendations of the Meeting

1. Ain Shams University has agreed to start the first teleneurology unit in Egypt. Ain Shams has signed several agreements with Egyptian hospitals and African universities to start a proof of concept phase of hospital-to-hospital acute care teleneurology service that would be complemented with bilateral mobility to facilitate service development in remote areas. Similar agreements with inter-

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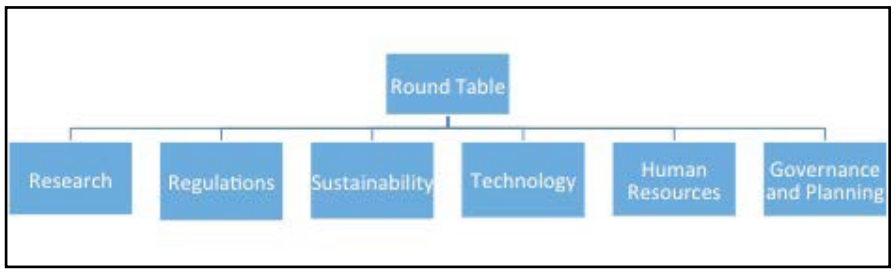

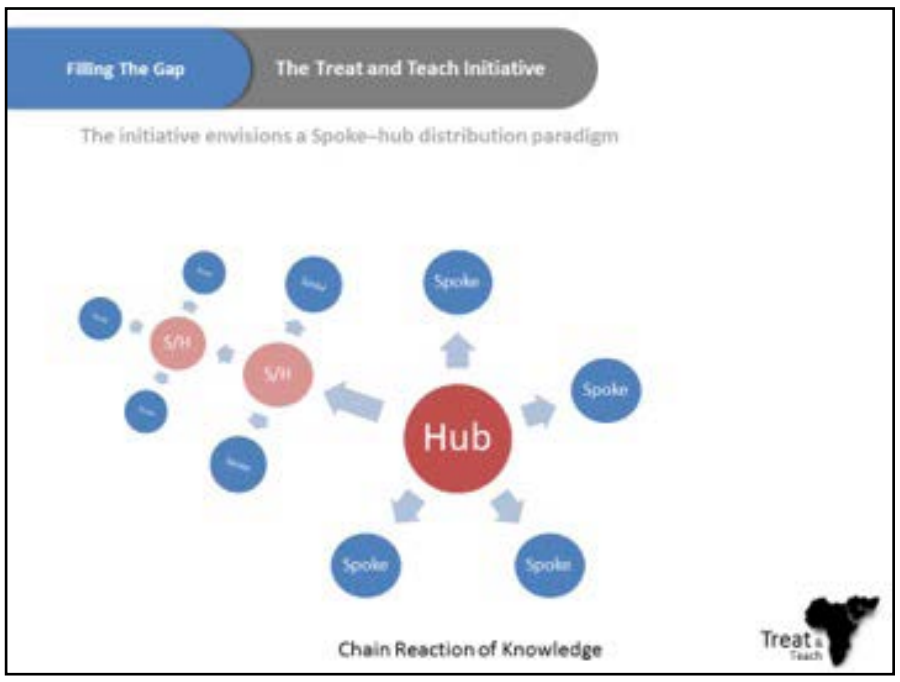

From left to right: Dr. Jean Jabbour, a WHO representative and one of the guests of honor, greets Laila Negm, honorary meeting chairman. Gathered in back, from left to right: Professor Mahmoud Elmetieni, dean of the faculty of medicine, Ain Shams University; Professor Bahaa Zidan, head of Elgalaa Military Medical Compound and a guest of honor; and Professor Magd Zakaria, meeting chairman and head of the neurology department, Ain Shams University.

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national centers of excellence are also underway.

2. Additionally, Ain Shams University, WHO, Egyptian ministries of health and foreign affairs, military forces, and the Arab League are currently collaborating to establish an Arab African center of excellence for neurology, neurosurgery and teleneurology, which would serve as a regional center of excellence to support best medical practices and education. The management of this center should provide a self-sustained investment model that would facilitate public-private partnerships. Ain Shams University is currently preparing an initial proposal for this project. A copy of this project will be delivered to the Egyptian government and another copy to the meeting of Arab Ministers of Health meeting.

Conclusions: The Happy End

1. It is of utmost importance to nurture local neurology leaders by giving them the right mix of scientific and management skills, in addition to logistically supporting their starting neurology programs.
2. Although we think highly of new telecommunication technologies as a way to bypass geographical barriers, we are aware of its limitations. Neurology, as all other medical specialties, requires direct face-to-face interactions with mentors and patients alike, thus the essential role of bilateral mobility in the Treat and Teach Initiative.
3. Sustainability is always a key issue in developing services. It is estimated that 90 percent of telemedicine projects stop after a few years. The role of education, in addition to telemedicine practice, is essential to ensure the sustainability of this project. Thinking of the spoke as a "hub in evolution" is mandatory in our view to promote the growth and progress of the best medical care to this large population of the world. The other important guarantee for sustainability is the integration of telemedicine practice in everyday work.
4. Work should be done to establish centers of excellence that are strategically located and connected to peripheral hubs in a model that allows growth, dissemination of knowledge and sustainability. This lies within a health care system that offers support to everyone in the community. The self-sustained investment model and the idea of promoting local neurology champs would ideally offer physicians working in remote areas more self-actualization values, in addition to a decent financial revenue that can help reverse the brain leak of trained clinicians.
5. The research programs of these centers should be targeted toward the actual needs of this part of the world, developing the concepts and finding new solutions for better health care delivery. The real change would be to gain the ability to produce knowledge. •

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Tamer Emara is an associate professor of neurology and head of the teleneurology unit, Ain Shams University, Cairo. Mohamed Sherif Al-Kotb is an associate professor of materials science and head of the projects and development unit, Ain Shams University. Mayar Nawara is a resident of neurology and psychiatry and coordinator of the teleneurology unit, Ain Shams University. Hani Farouk A. Mohamed is the EHealth regional focal point for the World Health Organization - Eastern Mediterranean Regional Office (WHO/EMRO). Ahmed Elbokl is a lecturer of neurology and coordinator of the teleneurology unit, Ain Shams University.

Meeting roundtable participants include, from left to right: Tamer Emara, the meeting's scientific coordinator, associate professor of neurology and the head of the teleneurology unit, Ain Shams University, Cairo; Professor Hani Aref, neurology department, Ain Shams University; Professor Magd Zakaria, meeting chairman and head of the neurology department, Ain Shams University; and Moderator Amr Abd Elmoneim, assistant professor of neurology, Ain Shams University.