

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Journal of the Neurological Sciences

journal homepage: www.elsevier.com/locate/jns

Editorial

Innovation in resident education – Description of the Neurology International Residents Videoconference and Exchange (NIRVE) program

ARTICLE INFO

Keywords

Neurology
Education
Residents
Global health
Telemedicine
Exchange

ABSTRACT

There is considerable heterogeneity in residency education around the world. The Neurology International Residents Videoconference and Exchange (NIRVE) program aims to deliver neurology educational content to residents across different resource settings and countries through a monthly videoconferencing platform. Its purpose is to fill gaps in didactic teaching, increase exposure to a variety of cases including various practices and delivery of neurology in multiple countries, as well as integrate global health content into neurology education. NIRVE also facilitates resident exchanges among participating sites. In this descriptive article, we report NIRVE's structure and its cumulative productivity. Since its creation, NIRVE has held more than 90 videoconference rounds and has connected 16 sites in North America, South America, Europe, Asia and Africa. We describe challenges encountered since the inception of the program eleven years ago. NIRVE also fosters a culture of long-term international connection and collaboration. During global disease outbreaks, such as the current COVID-19 pandemic, videoconference rounds serve as a sustainable alternative means to deliver education. Future goals include increasing the number of sites involved, including a focus on Africa and Asia, and fostering resident-led advocacy projects.

1. Introduction

Neurology coverage is heterogenous around the world and ranges from 3 to 7 neurologists per 100,000 persons in high-income countries to 0.03–0.1 per 100,000 persons in low-income countries, some of which have no neurologist at all [1]. Similarly, neurology education is heterogenous. A World Federation of Neurology questionnaire reported considerable differences in neurology residencies around the world, including access to education resources, rotation structures, and weekly hours of service [2]. Detailed data about neurology postgraduate training world-wide are lacking. In a study of neurology programs in European countries, only 22 out of 31 countries had a formal structured training program and 19 had structured teaching [3]. The average didactic training time was 7 h per week, ranging from 1 h per week in Belgium to 24 h in Georgia [3].

Videoconference case-based rounds are a new effective way to deliver education across distances and may represent a sustainable solution to international resident education. They have proven to be of particular value during this COVID 19 pandemic to enforce social distancing locally and to facilitate rapid sharing of medical experience across countries. Although 30–50% of neurology programs in North America allow international clinical and research exchanges, the majority of residents lack exposure to the practice of neurology abroad [4].

In this article, we describe the Neurology International Residents Videoconference and Exchange (NIRVE) program. NIRVE was created in 2009 by Dr. Dalia Rotstein, then a University of Toronto neurology

resident, and currently the faculty lead for NIRVE at University of Toronto, the coordinating site. The program was designed in collaboration with Dr. Morris Freedman, based on the model of the international behavioral neurology videoconference rounds coordinated by Baycrest Health Sciences in Toronto, Canada and the Division of Neurology, University of Toronto in Toronto, Canada [5,6,7].

2. Goals and structure of the NIRVE program

NIRVE's primary goal is to provide monthly videoconference rounds that include a discussion of one full clinical case and one case focused on imaging. Rounds are led by neurology residents and targeted at residents, although many staff also attend. They take place every first Thursday of the month at 8 a.m. Eastern Time for 1 h; the time was chosen to facilitate participation in Europe, Africa, and Asia where rounds fall at the end of the working day. The first part is called "Main Case" (30 min) and features a clinical case with content on anatomy, localization, differential diagnosis, investigations and management of neurological diseases. The second part of the round is called "Image Challenge" (15 min) where the emphasis is on radiological differential diagnoses.

We use a cloud-based videoconferencing platform called Zoom® which allows sites to join at no additional cost. The site that coordinates the rounds (St. Michael's Hospital, University of Toronto, Canada) pays an annual Zoom software license fee.

NIRVE coordinators from Toronto work on a monthly basis with

<https://doi.org/10.1016/j.jns.2020.117222>

Received 18 June 2020; Received in revised form 12 October 2020; Accepted 6 November 2020

Available online 8 November 2020

0022-510X/© 2020 Elsevier B.V. All rights reserved.

faculty and resident leaders at each site to coordinate rounds and refine the presentation of cases. This allows residents to develop their leadership and communication skills on international platforms.

NIRVE's secondary goal is to facilitate resident exchanges between participating sites. These allow residents to appreciate differences in neurology healthcare delivery across countries and build international collaborative relationships. Residents participate and assist in local neurology lectures at the visit exchange site. They also attend rounds and resident teaching sessions. Residents visit local neurology facilities across the city they visit. In doing so, they are exposed to residency and clinical experiences in a partner country, and to a broader range of neurological diseases and management strategies.

3. Productivity, outreach and content from 2009 to 2019

We collected information from prior NIRVE coordinators (rotating every 2 years), the NIRVE faculty lead (DR), prior NIRVE publications and documents since 2013.

3.1. Videoconference platform

Since 2009, NIRVE has held more than 90 videoconference rounds. In the last year, an average of 5–10 partner sites connected at every round. Each round gathered 30–50 trainees and 4–10 attendings. Since 2009, NIRVE has connected 16 sites from 10 different countries in North America, South America, Europe and Africa. Each site presented 0 to 3 clinical cases per year.

A random sample of 72 case rounds from October 2009 until December 2019 was collected and categorized into neurological sub-topics. The most common topics were inflammatory and infectious neurological diseases. Other topics covered included stroke, cognitive neurology, genetic disorders, epilepsy, neuromuscular, neuropsychiatry, global health and movement disorders. Cases are anonymized by removing patient names and other identifiers from the presentations. Rounds are designed for educational purposes only and are attended by health care professionals including trainees and attending staff.

3.2. Resident exchanges

NIRVE facilitated 4 international exchanges since 2009. Toronto (Canada) and St. Petersburg (Russia) each hosted two exchanges of 1-week duration. Three to five residents participated in each exchange. Typical activities included visiting the local neurology department and facilities as well as participating in neurology lectures, grand rounds and resident teaching organized in the host city. Meeting colleagues in person rather than virtually only, provided a unique opportunity to solidify friendships and connections between residents. This facilitated the organization of future in-person clinical exchanges for some participants, for example between Santiago, Chile and Toronto, Canada. It also facilitated collaboration between residents on academic works [8]. Participants reported that this activity allowed for new understanding in similarities and differences across medical facilities, healthcare systems, structure of the neurology departments and divisions as well as structure of teaching between countries. Exchange residents were not involved in clinical care given the short exchange duration and language barriers.

4. Challenges

4.1. Barriers to participation

One of the main reasons some sites could not continue to participate in the past was the high cost associated with the use of legacy hardware-based videoconferencing systems at their home institution. To alleviate this burden, NIRVE transitioned from a traditional legacy hardware-based videoconferencing system to Zoom®, a cloud-based videoconferencing platform. Its advantages include improved audio and video

quality, free access for partner sites, ability to connect from a variety of devices (desktop, laptop, tablet or smartphone) with no sign up required unless needed as an option, and an integrated chat system. Another reason for site dropout was scheduling conflicts, often because another teaching session was held at the same time. To address this, NIRVE was integrated whenever possible within the annual teaching schedule of the respective institution as part of its “regular program.” Another strategy is recording each videoconference rounds. We are in the process of creating a secure website to post the recorded rounds, so that they will be available to the sites that are not able to attend, as well as to trainees whose institutions are not part of NIRVE.

4.2. Language barrier and value of real-time online polls

Rounds are held in English and are interactive. Audience participation is encouraged when discussing the differential diagnosis, investigation and treatment plan, and the interpretation of the neuroimaging. Since 2009, the audience had been interacting with the speaker and providing inputs through verbal participation. We however encountered a varying level of participation, mainly due to language barrier. To address this, we created in 2019 real-time online polls implemented within the presentations. This allowed the audience to either raise their hands to speak or use their cellphone; which increased participation and allowed speakers to have real time feedback throughout their presentations.

5. Education through videoconference and relevance during the covid-19 pandemic

COVID-19 has been associated with unique challenges and has fostered rapid innovations in medical education. Didactic lectures, clinical rounds and conferences have been rapidly transitioned to videoconferencing systems which quickly became the core means of educational activities for many residents [9]. Recently, the American Academy of Neurology created a neurology lecture series featuring board certified faculty members from across the country [10]. Proficiency with telemedicine and tele-education is however heterogeneous across training programs [11]. Abati et al. report the challenges and negative impact of COVID-19 on neurology training and highlighted the need for an international collaboration and shared solution to overcome this issue [12]. To our knowledge, no previously published educational initiative “by the residents, for residents” gathers neurology trainees from all continents on a monthly basis. NIRVE, with its eleven-year history, also fosters a culture of long-term international collaboration and is unique by its shared aspect of teaching and longevity. NIRVE is a more egalitarian model that fosters independence and mutual respect. During the pandemic, NIRVE has facilitated the exchange of COVID-19 related articles and modification in day-to-day practices, for example regarding personal protective equipment and modification of code strokes practices.

6. Future endeavors

Future endeavors will include survey-based studies to better understand the structure of the participants' respective neurology training programs and therefore the gap that needs to be filled. NIRVE has connected with the Residents and Young Neurologists branch of World Federation of Neurology through the World Congress of Neurology and will pursue active efforts to reach to other neurology programs from various countries. Moreover, NIRVE rounds include individuals from different cultural backgrounds. Culture, religion, beliefs and language are several factors that influence the practice of healthcare and health-related outcomes. Studies looking at these questions are facilitated by NIRVE by providing a unique platform of collaborations between young resident physicians from across the world. This may raise awareness around cultural competence and its role in medical education in the era

of increasingly diverse societies. In the times of COVID-19, and with medical education transitioning to a web-based system, creating a common repository of online articles or resources for residents is one of many initiatives NIRVE will facilitate.

7. Conclusion

NIRVE, an international videoconferencing educational program coordinated by the University of Toronto, is run by residents for residents. There is significant heterogeneity in neurology residency education worldwide. The goals of NIRVE are to fill gaps in neurology education across a variety of resource settings, offer exposure to a greater diversity of clinical content, and provide global health content in the neurology residency curriculum. NIRVE has included 16 sites in 10 different countries. Future goals include recruiting underrepresented regions in Africa, Middle East, and Asia; encouraging greater participation through various media tools like real-time polling; facilitating academic collaborations across sites; and enabling resident-led advocacy projects. Most training programs lack a global health component, and on-the-ground international efforts can be expensive and challenging to organize. Videoconference rounds provide an inexpensive platform to encourage international discussion on a variety of neurology topics and facilitate dialogue about the different management practices of neurological conditions in resource-limited settings. During global disease outbreaks, such as the current COVID-19 pandemic, videoconference rounds are a sustainable alternative means to deliver education. Breadth of clinical exposure is vital for all neurology trainees, so it is important to create collaborative learning opportunities that encourage medical education and recognize the value of shared experiences.

Funding statement

Morris Freedman received support from the Saul A. Silverman Family Foundation as a Canada International Scientific Exchange Program and Morris Kerzner Memorial Fund.

Authors disclosures

PG: None.

DR: Dr. Rotstein received research support from the Multiple Sclerosis Society of Canada, Consortium of Multiple Sclerosis Centers (CMSC) and Roche Canada. Dr. Rotstein served as a speaker or consultant for Alexion, Biogen, EMD Serono, Novartis, Roche and Sanofi Aventis.

MK: None.

DC: None.

XM: None in relation to the topic.

MF: Dr. Freedman is listed on a provisional patent related to methods and kits for differential diagnosis of Alzheimer's disease vs fronto-temporal dementia using blood biomarkers.

SS: None.

Acknowledgements

We would like to thank Dr. Lauren Hopping and Dr. Mariam Al-Hussona for their leadership during the COVID-19 pandemic and for organizing the special COVID-19 NIRVE edition.

References

- [1] A.L. Berkowitz, Neurology education in resource-limited settings, *Neurology* 82 (2014) 1463–1464.
- [2] A. Steck, W. Struhal, S.M. Sergay, W. Grisold, The global perspective on neurology training: the world Federation of Neurology survey, *J. Neurol. Sci.* 334 (2013) 30–47.
- [3] W. Struhal, J. Sellner, V. Lisnic, L. Vecsei, E. Muller, W. Grisold, Neurology residency training in Europe—the current situation, *Eur. J. Neurol.* 18 (2011) e36–e40.
- [4] A. Deb, M. Fischer, A. DePold Hohler, Education Research: a framework for global health curricula for neurology trainees, *Neurology* 91 (2018) 528–532.
- [5] M.J. Lim Fat, J.P. Tsai, T. Patterson, M. Kinach, M. Freedman, NIRVE: A Tale of Five Continents, Available at: <https://worldneurologyonline.com/article/nirve-a-tale-of-five-continents/>, 2013.
- [6] Baycrest, International Behavioural Neurology Videoconference Rounds [online], Available at: <https://elearning.baycrest.org/login/index.php>. Accessed March 29th, 2020.
- [7] M.J. Lim Fat, M. Vyas, J. Tsai, M. Kinach, T. Patterson, M. Freedman, Neurology international residents videoconference and exchange (NIRVE), *Neurology* P4 (2014) 299.
- [8] J.F. Idiaquez, D. Rocha, I. Acosta, P. Gros, Use of ICTs in medical education. NIRVE experience (Neurology International Residents Videoconference and Exchange) in Chile, in: *Sciences AMJoM*, ed. Latin American Conference on Residency Education, 2019.
- [9] R.T. Muir, P. Gros, R. Ure, et al., Modification to neurology residency training: The Toronto neurology COVID-19 pandemic experience, *Neurol.* (2020), <https://doi.org/10.1212/CPJ.0000000000000894>.
- [10] D.J. Weber, D.V.F. Albert, B.R. Aravamuthan, M.E. Bernson-Leung, D. Bhatti, T. A. Milligan, Training in neurology: rapid implementation of cross-institutional neurology resident education in the time of COVID-19, *Neurology* 95 (19) (2020) 883–886.
- [11] A.M. Zha, L.S. Chung, S.S. Song, J.J. Majersik, A.L. Jagolino-Cole, Training in neurology: adoption of resident teleneurology training in the wake of COVID-19: telemedicine crash course, *Neurology* 95 (2020) 404–407.
- [12] E. Abati, G. Costamagna, Education research: impact of SARS-CoV-2 pandemic on neurology trainees in Italy: a resident-driven survey, *Neurology* (2020), <https://doi.org/10.1212/WNL.0000000000010878>.

Priti Gros^{a,b,*}, Dalia Rotstein^{a,b}, Mark Kinach^c, David K. Chan^{a,b}, Xavier Montalban^{a,b}, Morris Freedman^{a,d,e}, Sanskriti Sasikumar^{a,b}

^a Division of Neurology, University of Toronto, Toronto, Canada

^b Division of Neurology, St Michael's Hospital, Toronto, Canada

^c Telemedicine Program, St. Michael's Hospital, Toronto, Canada

^d Division of Neurology, Mt. Sinai Hospital, Canada

^e Division of Neurology and Rotman Research Institute, Baycrest Health Sciences, Toronto, Canada

* Corresponding author at: Division of Neurology, University of Toronto, Toronto, Canada.

E-mail address: priti.gros@unityhealth.to (P. Gros).