

EDITORIAL

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Neuromuscular ultrasound training courses in the post COVID-19 era: Is virtual training here to stay, and should the pre-pandemic training design be revised?

The acquisition of fundamental skills in neuromuscular ultrasound (NMUS) is rapidly becoming a necessity for clinical neurophysiologists. Experts in NMUS are providing guidance on education and competency assessment,¹⁻⁴ but proficiency remains confined to a relatively small number of clinicians who are mainly concentrated in a few countries. “Previous attendance at neuromuscular ultrasound training courses/workshops” is a consensus expert criterion for competency evaluation.² A number of NMUS courses are available, often linked with professional neurology or subspecialty society meetings, but there are barriers imposed by in-person attendance and costs associated with registration that may have prevented many potential trainees from participating. Furthermore, the design of these courses, requiring supervised hands-on sessions, allows for only a limited number of registrants.

During the coronavirus disease 2019 (COVID-19) pandemic, mandatory social distancing and travel restrictions have impacted on traditional training models in healthcare, especially those relying on in-person learning, which were either stopped altogether or modified.⁵⁻⁷ However, as in any “crisis,” the search for alternatives and remedies has also created opportunities to explore new ways of conducting training that may ultimately lead to more inclusive, effective and sustainable practice.

The study by Tawfik et al. in this issue of *Muscle & Nerve*,⁸ reports the feedback of participants who attended an NMUS course conducted remotely via an online platform, and shows how the pandemic has driven an alternative approach to the existing structure of NMUS training courses. While serving as a temporary solution at the time, this approach has also shown potential to overcome some of the pitfalls of the existing training strategies in NMUS.

The authors' opening remark in the Abstract that “[h]ands-on supervised training is essential to learn diagnostic ultrasound” illustrates the pre-COVID pandemic assumption that in-person supervision is a *sine-qua-non* of neuromuscular ultrasound courses.

As a result of the COVID-19 pandemic, all scheduled hands-on courses had to be suspended. Accordingly, the Egyptian Neuromuscular Ultrasound Society converted their pre-scheduled in-person NMUS courses into virtual courses. Tawfik et al.⁸ assessed the feasibility of conducting virtual NMUS courses and the positive and

negative aspects of the virtual approach, through an analysis of post-course surveys.

The design of the on-line courses was derived from the published guidelines for NMUS training.¹ The faculty members were expert NMUS practitioners and experienced speakers and tutors from seven countries world-wide. The virtual course was held via the Zoom platform (Zoom Video Communications, San Jose, CA) with broadcast live lectures and demonstration sessions (the latter in the form of pre-recorded videos and one live-streamed session), each followed by a live question and answer session. All lectures and demonstration sessions were recorded and made available to the attendees for a period of 3 months after the event. The course was open to attendees from any country, registration was free, and the target audience multi-disciplinary. At the end of each course, the attendees were directed to an electronic anonymous survey. A total of 390 and 351 participants attended the basic and the intermediate course, respectively, from 44 countries and five continents. “More than 97% of the respondents found the two courses either extremely useful or useful. The overall impression of the events was excellent or good.”⁸ The educational value of the courses was not assessed, because the large number of registrants made it impractical to apply pre- and post-course tests. Another limitation was the low response rate to the surveys (23.8% and 44.4% of attendees of the basic and intermediate courses, respectively).

Despite its limitations, the study by Tawfik et al.⁸ has an important timely message, which is that NMUS virtual courses can be both feasible and well received. The authors concluded that virtual courses can be proposed as “useful alternatives to in-person training when in-person interaction is restricted.” This study also shows several significant advantages of a virtual course over in-person attendance:

1. The opportunity to participate is extended to a much larger number of participants. This is crucial when both teachers and learning opportunities are scarce.
2. The recruitment of teachers, trainees, and participating institutions is not geographically restricted, which may allow global coordination of teaching/learning and standardization of education and practice.
3. Video lectures can be pre-prepared, revised, and attended in one's own time and place, ie, a more flexible approach to preparing and accessing course material.

4. There is no need to travel, which has some advantages over “in-person” attendance. It offers similar opportunities to trainees from different socio-economic and cultural backgrounds by imposing less cost and time-related restrictions. It also dramatically reduces the carbon footprint impact of long-distance travel, which environmental scientists have consistently advocated for over the past decade (with little success in the healthcare sector, in particular, until the COVID-19 pandemic made this an abrupt reality).^{9,10}

Some respondents in the Tawfik et al. study⁸ requested similar courses, as well as an advanced course in the future. This is consistent with the results of surveys of other online courses and conferences in which a majority of the respondents said they enjoyed the virtual more than the in-person format and would attend future virtual events even if in-person attendance resumed.^{7,11}

All this demonstrates that the virtual approach is not necessarily an inferior alternative to the “in-person” attendance of a training course, reserved for use only when necessity dictates, but rather, is a potentially valuable method with its own merits and advantages when compared to traditional methods.

Nevertheless, it would be inappropriate to replace all “in-person” attendance with virtual courses. Rather, virtual and in-person approaches should be thought of as complementary, and combined in new course designs. The lessons learned from this and other studies during the COVID-19 pandemic provide some indications of an appropriate combination. Future courses should be organized to suit the demands of virtual attendees. Lecture recordings should be made available after the course sessions to allow for time zone differences, to permit attendees to revisit the course material, and allow for “on-demand” access. Coordination and sharing of educational resources could be organized through an international society to avoid duplication of effort and maximize the reach of the educational material.

There are a number of limitations of virtual courses. In-person attendance permits opportunities for attendees to socialize with colleagues, which enriches learning through discussions and opportunities to collaborate. This limitation may be partly overcome by arranging online socializing opportunities and breakout rooms for small group discussions. Beyond social aspects, virtual course attendance requires a relatively high-speed internet connection and access to appropriate technology, which may not be available in some settings.

The most notable limitation of virtual ultrasound courses is the lack of hands-on training. Learning ultrasound scanning techniques requires practice and experience. While ultrasound skills are typically developed through an apprenticeship model of training, similar to the development of skills in clinical neurophysiology,³ an initial period of basic skills acquisition is important and is often obtained at the time of a NMUS course. In the case of a virtual NMUS course, this will not be readily achievable. There may be a number of solutions to this problem.

The virtual participants could organize for the availability of ultrasound equipment and operators at local hands-on hubs to be

conducted in parallel with the on-line course. Supervision could be provided by a local physician proficient in ultrasound, either from another discipline (eg, musculoskeletal radiologist) or a neuromuscular physician who has already acquired adequate skills and experience at an intermediate or advanced level. This hub-based hands-on learning could be supervised remotely by course organizers, by monitoring and giving feedback on students' performances on broadcast scanning sessions. In this way, a single tutor could concurrently supervise groups in a number of locations.

Remote hands-on learning may also be achieved by the use of virtual reality simulators, which may obviate the need for local supervision although require specialized equipment. Virtual reality simulators have been shown to be superior to static resources in the development of ultrasound anatomy knowledge.¹² Simulators have been integrated into ultrasound training for the study of other body regions¹³ but have not yet been developed for NMUS.

In summary, the need for continuing education during the COVID-19 pandemic has revealed that some of the barriers and negative consequences related to in-person attendance can be overcome with approaches that take advantage of existing resources in telemedicine and are more inclusive and sustainable for current and future generations. Potentially, much more can be achieved by exploring this path further, particularly given rapid technological advances in the remote education sphere, and a greater consideration of the financial and environmental costs of global education.⁹⁻¹⁵

CONFLICT OF INTEREST

Dr. Simon receives compensation for work as Associate Editor of *Muscle & Nerve*.

ETHICS STATEMENT

We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

DATA AVAILABILITY STATEMENT

Data available on request from the authors

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