

**VIEWPOINT**

Teaching Research Methods to Young Neurologists: The Erice International Courses

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Clinical and epidemiologic research in neurology, as in any other field of medicine, relies on scientific thinking and rigorous research methods. Therefore, young neurologists seeking to develop a career in clinical research are in need of appropriate training and mentoring. Young researchers must master research methodology and learn how to apply the methods to collect and analyze original data and to address clinically relevant questions.¹ For neurologists seeking to develop their careers in one of several European countries or in North America, training may be obtained at schools of public health in which the needed expertise is offered (e.g., epidemiology, biostatistics, demography, bioinformatics, computer sciences, artificial intelligence). However, taking full-length courses or enrolling in a degree program may not be possible or relevant for some trainees. In addition, for the neurologists in most of the remaining countries and continents, access to clinical research training is problematic. To address these gaps, several international courses have been organized in the last 40 years.

SAN MINIATO, PISA PROVINCE, ITALY

The first course was organized by BS Schoenberg in 1981.² The course was held in San Miniato, Italy (Pisa province) and was entitled Advanced Course on Neuroepidemiology: Principles and Clinical Applications. Figure 1 shows the brochure. The San Miniato course was the first major international course dedicated to the emerging field of neuroepidemiology. A group of

well-recognized experts and teachers convened for a week in the small town in Italy and provided formal lectures, practical discussions, and informal interactions with a selected group of students from around the world. The course was a major stimulus for young neurologists to embark on a career in neuroepidemiology. Two of the authors (WAR and GS) were among these students.

AMERICAN ACADEMY OF NEUROLOGY

Starting in 1994, more than 10 years after the San Miniato course, the American Academy of Neurology recognized the need to provide training in clinical research methods for the attendees of their annual meeting. A full-day course was developed and was offered annually without interruption for a span of 18 years with the title: Clinical Research Methods Course. Over the years, the course was directed by Drs. SS Spenser (1994–1998), WA Rocca (one of the authors, 1999–2002), SC Johnston (2003–2006), KD Kieburtz (2007–2009), and KL Furie (2010–2011). In the 4 years spanning from 2012 to 2015, the title was changed to: Clinical Research Colloquium and Course, and the new program was directed by WA Rocca. The course was offered in many cities across the United States and Canada to hundreds of practicing neurologists and researchers from around the world.

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Figure 1. Brochure of the 1981 San Miniato course.

ERICE, TRAPANI PROVINCE, ITALY

In 2000, almost 20 years after the San Miniato course, two of the authors (GS and WAR) launched a new international course to be hosted in Erice, Italy (Trapani province). The aim was to create a unique 6-day, full-immersion experience for teachers and students. The meeting was hosted by the Ettore Majorana Foundation and Center for Scientific Culture, International School of Medical Sciences. The course was entitled International Course on Neuroepidemiology: Principles and Clinical Applications. The new course was delivered in English, and the emphasis was on international participation.

Students and teachers were lodged together in historical buildings that had been transformed into a modern convention center (a church transformed into a futuristic lecture hall and several dormitories of a convent used to house students and teachers). In Figure 2, Panels A and B show the lecture hall. The program involved formal lectures and discussions but also many opportunities for informal exchange. Breakfasts, coffee breaks, and some lunches were provided in communal dining rooms to facilitate the development of friendships and future collaborations. The dinners and some of the lunches were provided in local restaurants that had tables arranged for small-group interactions.

Some of the discussions that had begun during the formal lectures continued over coffee breaks, at the dining table, or on walks around the small town.

The program included lectures about descriptive epidemiologic methods (surveys, incidence, prevalence, and mortality), analytic epidemiologic methods (case-control and cohort studies of risk and prognostic factors), and clinical trials. The course also included lectures on genetic epidemiologic methods and on statistical methods applied to clinical research. Two of the teachers (DW Anderson and JA Rosario) were from the National Institutes of Health (USA). Dr. DW Anderson edited one of the early textbooks of neuroepidemiology.²

The program also included cultural and artistic activities. The small town of Erice is itself a living museum. In addition, a full day was dedicated to visiting archeological sites in the region (Selinunte and Segesta). Figure 2C shows students and teachers in the Greek theatre of Segesta. Again, this was a unique opportunity for informal exchange and social interaction among teachers and students. The social activities also included after-dinner gatherings for music or singing. Figure 2D shows the group of students and teachers who participated in the 2000 Erice course. Two of the authors (PR and MD) were among these students.

Over the next 20 years, the Erice course was offered approximately every two years with some irregularities, being held in 2000, 2004, 2006, 2008, 2011, 2014, 2017, and 2019. On average, each course involved approximately 40 students. Thus, approximately 300 students from countries around the world have attended the course thus far. Stimulated by the learning experience and by personal contact with the teachers, several students decided to obtain additional advanced training in neuroepidemiology and clinical research methods, and some embarked on a career involving clinical research in neurology. As a result, some of the students from a previous course were invited to return as teachers for a later course (e.g., M Pugliatti, F Martinelli-Boneschi).

The core program has remained consistent with the original 2000 course; however, new teachers and new topics have rotated over the years. The courses have been structured to include approximately 36 hours of formal teaching with five morning sessions (a block of approximately four hours) dedicated to epidemiologic and statistical methods and four afternoon sessions (approximately four hours) dedicated to the application of the methods to neurologic diseases. Over the years, experts of specific neurologic diseases were invited to provide a comprehensive review of the epidemiologic literature (e.g., the epidemiology of dementias or the epidemiology of multiple sclerosis).

All lectures included ample time for discussion among the students and the entire team of teachers. Indeed, the teachers were expected to participate in all activities of the course and to

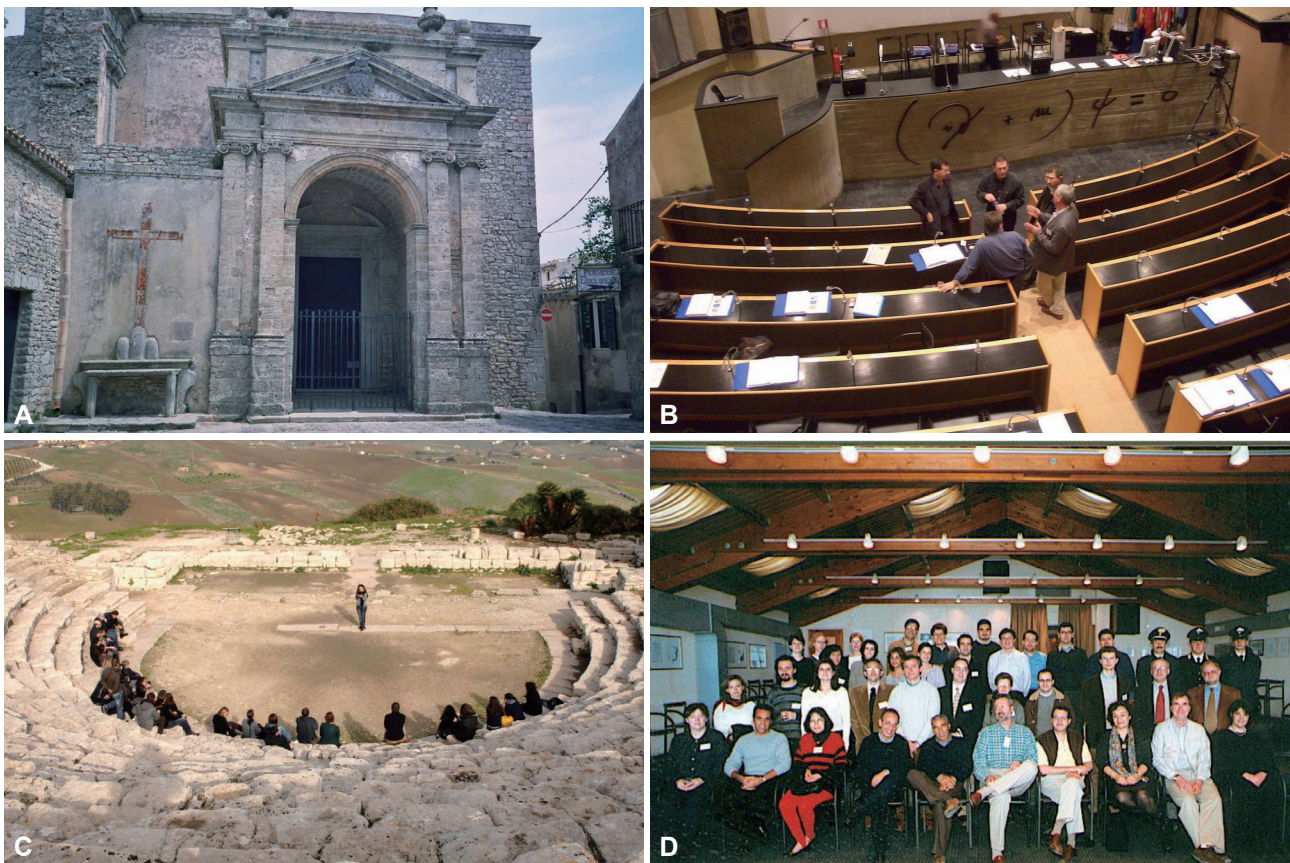


Figure 2. Photos from the 2000 Erice course. A: Front entrance of the lecture hall. B: Lecture hall with a group of teachers. C: Students and teachers at the Greek theatre of Segesta. D: Teachers and students who participated in the first, 2000 Erice course. In the front row, from left to right are LM Nelson, RL Sacco, JA Rosario, G Savettieri, the audiovisual manager, WA Rocca, DM Maraganore, L Fratiglioni, DW Anderson, and M Pugliatti.

contribute to the discussions even on days in which they were not serving as the primary instructors. In recent courses, we added two sessions dedicated to the interpretation of published scientific papers (a case-control study and a cohort study). The students were assigned two publications in advance of the course and were asked to complete an online questionnaire about the methods used in the papers. The answers were discussed publicly with participation from the entire team of teachers. Finally, in some of the methodologic lectures, the teachers engaged the students in interactive exercises.

Consistently with the idea of historical continuity, the courses have also included brief celebrations of the life and science of several major figures in the history of neuroepidemiology and neurology who have passed away (e.g., Drs. BS Schoenberg, JF Kurtzke, TL Kurland, G Dean, M Alter, L Amaducci, JN Walton, and O Sacks).

Beginning in 2014, the leadership of the course was expanded to include the other two authors (MD and PR). Finally, beginning in 2019, the leadership of the course was further expanded to include an international board comprising Drs. M D'Amelio,

P Ragonese, and G Savettieri from Palermo, Italy; G Logroscino from Bari, Italy; M Pugliatti from Ferrara, Italy; A Elbaz from Paris, France; PM Preux from Limoges, France; T Kurt from Berlin, Germany; and WA Rocca from Rochester, Minnesota (USA). In addition to the teachers already mentioned, several other teachers participated in most or all of the courses over many years. In particular, we mention Drs. WA Hauser and R Ottman from New York (USA), and Dr. FT Enders from Rochester, Minnesota (USA).

The 9th International Course is scheduled for November 23–28, 2022. For the first time in 2022, the course will be endorsed by the World Federation of Neurology. Figure 3 shows the brochure for the 2022 course.

LATIN AMERICA

Investigators and practicing neurologists from several countries of Latin America have also recognized the lack of opportunities for training young researchers in clinical research meth-



Figure 3. Brochure of the 2022 Erice course.

ods. Several short courses have been organized over the years in Peru, Chile, Uruguay, Argentina, and Brazil. Two more extensive courses were organized in Montevideo, Uruguay in 2012 and 2016 under the leadership of Dr. C Ketzoian. These activities culminated in the development of the first Latin American course involving students from several countries in Central and South America. The First Latin American Course of Neuroepidemiology was held in Panama City, Panama in 2018 under the coordination of Drs. F Gracia (Panama), C Ketzoian (Uruguay), and MO Melcon (Argentina). The course can be considered to be a continuation of the Erice courses in the Americas. Indeed, the scientific program was very similar to that of the Erice courses, and many teachers were the same. However, the course also included Latin American teachers and had a special focus on multiple sclerosis. The primary language was English, in recognition of its role as the international scientific language. A second Latin American course of neuroepidemiology is being planned for 2023 in Uruguay.

OTHER CONTINENTS

To our knowledge, teaching activities outside of Europe and the Americas have been more limited. Short courses on clinical research methods for young neurologists were offered at the Asan Medical Center in Seoul, Korea in 2012, at the 4th International Conference on Neurology and Epidemiology held in Kuala Lumpur, Malaysia in 2014, and at the 5th International

Conference on Neurology and Epidemiology held in Gold Coast, Australia in 2015. A short course was organized in Rabat, Morocco in 2016. One of the authors (WAR) has participated in these teaching activities.

The World Federation of Neurology, Specialty Group on Neuroepidemiology, which has been under the leadership of C. Ketzoian since 2019, has proposed developing methodological courses in other continents, particularly Africa and Asia. Unfortunately, the COVID-19 pandemic has made it difficult to implement these educational activities.

THE FUTURE

In the 40 years since 1981, the field of neuroepidemiology has evolved rapidly and is now recognized among practicing neurologists, researchers, public health officials, and policy-makers both in higher income countries and in lower income countries.^{3,4} However, for young neurologists and young physicians in many countries outside of North America and Europe, access to clinical research training remains problematic, even in 2022. The Erice courses have contributed to the research training of approximately 300 students from counties around the world and have played a major role in the decision of several young physicians to embark on a research career. We hope that the courses can be continued in the years to come and can be expanded to other continents.

Ethics Statement

Not applicable

Conflicts of Interest

The authors have no financial conflicts of interest.

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