

A Curriculum for Clinical Neuroepidemiology and Evidence-based Neurology

1. Introduction and Justification

The American Academy of Neurology (AAN) has begun to place a much greater strategic emphasis on demonstrating the value of the neurologist in enhancing patient outcomes and on methodologies to track the benefit of treatment by neurologists for the purpose of quality improvement. The AAN, through its Quality Standards Subcommittee and Therapeutics and Technology Assessment Subcommittee, produces evidence-based practice parameters, and technology assessments, respectively. The AAN, at its 1999 meeting in Toronto, sponsored two lively, relevant forums: The Educational Colloquium 99: Evidence Based Education, and the 1999 Guidelines and Outcomes Open House. The clear message from these well attended sessions is that evidence-based medicine should become an integral part of post-graduate education for neurologists. Thus, educational opportunities for both neurology residents and for fellowship training should be developed and implemented in this area. The Section on Neuroepidemiology would thus propose a full two-year curriculum for fellowship training that would allow the development of research and teaching leaders in the field of Clinical Neuroepidemiology and Evidence-based Neurology. While the emphasis in this document is on fellowship training, a less detailed curriculum, similar to that presented here, could be integrated into Neurology resident training on a more routine basis.

2. Goals and Objectives

This effort is intended to:

- a. Stimulate the development of resources aimed at training neurologists in the field of Clinical Neuroepidemiology and Evidence-based Neurology.
- b. Develop a comprehensive two-year educational curriculum sufficient to train research and education leaders in the field of Clinical Neuroepidemiology and Evidence-based Neurology.
- c. Determine the types of academic institutions and resource environments most likely to be successful in training such research and education leaders.
- d. Develop standards/certification requirements for the programs/individuals wishing to pursue fellowship programs.
- e. Develop case modules from the comprehensive curriculum sufficient to apply to neurology resident education in routine training environments.

3. Definitions

Classic neuro-epidemiology has primarily involved the study of the population distribution of neurologic diseases, and of studies of causation of these diseases. The emphasis of classical epidemiology has been on primary prevention. Clinical neuroepidemiology would be defined as the application of scientific methods to the clinical practice of neurology, with a focus on diagnosis, treatment, and prognosis. The emphasis of clinical neuroepidemiology would be on secondary and tertiary prevention, that is, on improving the outcome of patient screening and treatment. A comprehensive curriculum would therefore encompass elements of both classic as well as clinical neuroepidemiology.

4. Content of Subjects to be Taught

The following is an outline of four core courses that would be taken over the first four trimesters of a 2-year post-doctoral curriculum. In addition to these courses, a one year sequence of biostatistics courses would be taken in an affiliated Department of Biostatistics. The content of the core courses would likely require interdepartmental collaboration (e.g., between Neurology, Epidemiology, Biostatistics, and Health Services). Further work should be done to explore the attainment of a Masters Degree (Public Health, Health Services, etc.), rather than certification alone from this two-year course of fellowship training. Finally, it would be expected that a methodologically-oriented research project in one of the core areas of endeavor would be completed by the end of Year 2.

CORE COURSE I: Clinical Epidemiology and Trial Methodology

Diagnostic and Screening Tests

(I) Evaluation of diagnostic tests (sensitivity, specificity, ROC curves, etc.)

(II) Screening tests

Natural History of Disease

(I) Prognostic studies

Clinical Trials

(I) Design: randomized, blinded trial, other designs (factorial design, randomized block, etc.)

(II) Conduct: Inclusion/exclusion criteria, choice of comparison groups, randomization of subjects

(III) Conduct: Baseline evaluation, outcome measurements, quality-of-life measurements

(IV) Conduct: Applying the intervention, assuring compliance, achieving complete follow-up

(V) Logistics: Drug development (phase I, II and III trials, IND/NDA development)

(VI) Analysis: Intention-to-treat analyses, interim analyses

Analytic Methods

- Estimating sample size and power
- Statistical analysis of trial data

CORE COURSE II: Epidemiologic Methods

- Measures of disease frequency
- Risk measures, measures of effect, attributable risk
- Causal inference
- Assessment of effect modification (interaction)
- Observational study designs
- Cohort design (retrospective, prospective)
- Cross-sectional
- Case-control, nested case-control
- Nested case-control
- Case-cohort
- Sample size and power estimation for observational designs
- Survey sampling methods
- Sources of study bias (I): selection bias, nonresponse bias, blinding (masking)
- Sources of study bias (II): confounding (methods for assessing/controlling
 - Such as matching, stratification)
- Sources of study bias (III): measurement error

Statistical Analysis of Observational Data

CORE COURSE III: Health Services Research

- Outcomes Research
- Quality of Care Research
- Cost-effectiveness Analysis
- Statistical Analysis of Health Services Data
- Evidence-based Medicine
- Best Evidence Synthesis
- Formal Consensus Development
- Development and Evaluation of Treatment Guidelines
- Quality Improvement Methods
- Technology Assessment
- Quality Indicators and Performance Measurement
- Use of new technologies for literature search, evaluation and resource accession

CORE COURSE IV: Conduct of Clinical Research

Measurement

- (I) Theory, measurement scales, effects of measurement effort on power and validity
- (II) Development and evaluation of health outcome instruments, questionnaire design
- (III) Validity and reliability testing
- (IV) Qualitative methods

Data Management and Computing

- (I) Data collection methods/sources of error
- (II) Quality control, methods for reducing measurement error
- (III) Guide to statistics and database software
- (IV) Database management (structures, design, reporting and query operations)
- (V) Using the internet

Communication in Clinical Research

- (I) Grant preparation (e.g., protocol development) and funding
- (II) Abstracts, posters and slide presentations
- (III) Journal article preparation, authorship issues
- (IV) Critical appraisal of the scientific literature

Ethical Issues in the Conduct of Research

- (I) Ethical issues in the treatment of human subjects, federal guidelines
- (II) Institutional review boards, informed consent
- (III) Legal issues (intellectual property, patenting, conflict of interest)

5. Prerequisites for the Trainee

- a. Completion of an ACGME-accredited Neurology residency
- b. Board eligible or certified in Neurology by the American Board of Psychiatry and Neurology (ABPN)

6. Personnel and Qualifications Needed for the Training

- a. *Qualified Program Director*—The program director should have formal training in one of the Core areas, and an appointment in both Neurology and at least one other relevant department (Epidemiology, Biostatistics, Health Services, etc.).
- b. *Other Qualified Faculty*—A liaison faculty person from each of the core contributing departments should be assigned as required.

7. Facilities Needed for the Training

In general, this is not a clinically-based fellowship. Therefore, minimum requirements for patient contact are not a requisite part of the program.

In order to fulfill the extensive curricular and research goals of the fellowship, it is likely that this program will be conducted through a collaboration between a school of medicine and a school of public health, or through a school of medicine alone with resources sufficient to meet curricular needs.

For the research requirement of the fellowship, appropriate research resources should be available in the institution (e.g., General Clinical Research Center, other existing fellowship program in evidence-based medicine, etc.).

8. Setup for the Training

a. The training program should be administratively housed in either a Department of Neurology accredited by the ACGME, or in liaison with a Department of Epidemiology, Biostatistics, or Health Services Research.

b. The Program Director shall have overall responsibility for the conduct and oversight of the program. The Program Director shall have completed the equivalent of at least a Masters Degree in a related subject area (Public Health, Epidemiology, Health Services Research). In addition, particularly in the case of pursuit of a Masters Degree, a graduate education advisory committee shall be assembled. In addition, the Program Director shall be responsible for:

- Recruitment and appointment of qualified candidates
- Demonstration of all affiliation agreements in writing by departments participating in Core Courses or research.
- Providing a record of satisfactory completion of the fellowship, including transcripts of all Core courses, and demonstration of competence in conducting research in one of the core areas.
- Maintenance of all training records, and coordination with Graduate Education Offices sufficient for record maintenance.

9. Methods of Training

Most of the training related to the Core Courses would occur in a didactic forum in a School of Graduate Education or a School of Medicine. Specific mentoring related to the Year 2 research project would also be required. In addition, participation with pertinent AAN subcommittees (QSS, TTA, IO) would provide each trainee with the opportunity to produce one practice parameter/technology assessment or other relevant product during their 2-year fellowship. Finally, each fellow would actively participate in relevant interdepartmental conferences.

10. Timetable for Training

Training would generally require a full time, 2-year program, or an equivalent part time program as arranged by the candidate and Program Director. To the extent possible, flexibility in this area, and possible collaboration with extended degree programs, would be desirable in attracting experienced neurologists who wish to continue practice while they are training.

11. Methods of Evaluation of the Trainee

Since the emphasis in this program would be on formal training in affiliated departments, with a targeted Masters Degree in one of the core topic areas, evaluation would generally occur through graduate education programs. In addition, oversight by the Program Director, and certification of competence after fellowship completion would be provided (e.g., via a test, production of peer reviewed research, or completion of Masters Degree requirements).

12. Methods of Evaluation of the Training Process

A national advisory group would be established (through the AUPN, the Neuroepidemiology Section or other appropriate groups) to monitor the quality of training programs. This group would proceed in collaboration with the AAN and other appropriate national certifying groups, and would evaluate the competency/success of the fellowship program at least every four years.

13. Mechanisms for Trainee Evaluation

Each program shall receive regular formal program evaluation from all trainees.

14. Methods of Constantly Upgrading Knowledge

The majority of fellows completing this program would be expected to pursue academic or policy relevant careers. As such, they would likely continue to participate in teaching and research programs.

15. List of References/resources

(This list will be augmented in the future)

- a. Sackett DL, Haynes RB, Guyatt GH, Tugwell P. *Clinical Epidemiology: A Basic Science for Clinical Medicine*, 2nd Edition. Boston: Little, Brown and Company, 1991.
- b. Rothman KJ. *Modern Epidemiology*. Boston: Little Brown and Company, 1986.
- c. Kelsey JL, Thompson WD, Evans AS. *Monographs in Epidemiology and Biostatistics, Volume 10: Methods in Observational Epidemiology*, Lilienfeld AM, Editor. New York: Oxford University Press, 1986.

16. Continuing Medical Education Needed

Continued participation within the AAN, the ANA, as well as with appropriate other relevant professional and research organizations.

Developed by the following members of the Neuroepidemiology Section:

Gary Franklin, MD, MPH	University of Washington
Lorene Nelson, PhD	Stanford University
Milton Alter, MD, PhD	Wynnewood, Pennsylvania
Robert Holloway, MD, MPH	University of Rochester
Walter A. (Bud) Kukull, PhD	University of Washington
Will Longstreth, MD, MPH	University of Washington
Ralph Sacco, MD, MS	Columbia University