END-2451: NEONATAL/PEDIATRIC ELECTROENCEPHALOGRAPHY

Cuyahoga Community College

Viewing: END-2451: Neonatal/Pediatric Electroencephalography

Board of Trustees:
January 2018

Academic Term:
Fall 2018

Subject Code
END - Electroneurodiagnostic

Course Number:
2451

Title:
Neonatal/Pediatric Electroencephalography

Catalog Description:
Discussion of neonatal and pediatric electroencephalography. Review the electrographic and clinical findings associated with neonatal and pediatric epilepsy syndromes and seizures. Discussion of long term epilepsy monitoring, pediatric epilepsy surgery and functional cortical mapping. Discussion of automatic seizure detection, artifact rejection and trending software.

Credit Hour(s):
3

Lecture Hour(s):
3

Requisites

Prerequisite and Corequisite
END-1450 Intermediate Electroencephalography (EEG).

I. ACADEMIC CREDIT

Academic Credit According to the Ohio Department of Higher Education, one (1) semester hour of college credit will be awarded for each lecture hour. Students will be expected to work on out-of-class assignments on a regular basis which, over the length of the course, would normally average two hours of out-of-class study for each hour of formal class activity. For laboratory hours, one (1) credit shall be awarded for a minimum of three laboratory hours in a standard week for which little or no out-of-class study is required since three hours will be in the lab (i.e. Laboratory 03 hours). Whereas, one (1) credit shall be awarded for a minimum of two laboratory hours in a standard week, if supplemented by out-of-class assignments which would normally average one hour of out-of-class study preparing for or following up the laboratory experience (i.e. Laboratory 02 hours). Credit is also awarded for other hours such as directed practice, practicum, cooperative work experience, and field experience. The number of hours required to receive credit is listed under Other Hours on the syllabus. The number of credit hours for lecture, lab and other hours are listed at the beginning of the syllabus. Make sure you can prioritize your time accordingly. Proper planning, prioritization and dedication will enhance your success in this course.

The standard expectation for an online course is that you will spend 3 hours per week for each credit hour.

II. ACCESSIBILITY STATEMENT

If you need any special course adaptations or accommodations because of a documented disability, please notify your instructor within a reasonable length of time, preferably the first week of the term with formal notice of that need (i.e. an official letter from the Student Accessibility Services (SAS) office). Accommodations will not be made retroactively.

For specific information pertaining to ADA accommodation, please contact your campus SAS office or visit online at http://www.tri-c.edu/accessprograms (http://www.tri-c.edu/accessprograms/). Blackboard accessibility information is available at http://access.blackboard.com.

Eastern (216) 987-2052 - Voice
Innovative or imaginative ways.

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

III. ATTENDANCE TRACKING

Regular class attendance is expected. Tri-C is required by law to verify the enrollment of students who participate in federal Title IV student aid programs and/or who receive educational benefits through other funding sources. Eligibility for federal student financial aid is based in part on enrollment status.

Students who do not attend classes for the entire term are required to withdraw from the course(s). Additionally, students who withdraw from a course or stop attending class without officially withdrawing may be required to return all or a portion of their financial aid based on the date of last attendance. Students who do not attend the full session are responsible for withdrawing from the course(s).

Tri-C is responsible for identifying students who have not attended a course before financial aid funds can be applied to students’ accounts. Therefore, attendance is recorded in the following ways:

- For in-person and blended-learning courses, students are required to attend the course by the 15th day of the semester (or equivalent for terms shorter than five weeks) to be considered attending. Students who have not met all attendance requirements for in-person and blended courses, as described herein, within the first two weeks or equivalent, will be considered not attending.
- For online courses, students are required to login at least two times per week and submit one assignment per week for the first two weeks of the semester, or equivalent to the 15th day of the term. Students who have not met all attendance requirements for online courses, as described herein, within the first two weeks or equivalent, will be considered not attending.

At the conclusion of the first two weeks of a semester or equivalent, instructors report any registered students who have “Never Attended” a course. Those students will be administratively withdrawn from that course. However, after the time period in the previous paragraphs, if a student stops attending a class or wants or needs to withdraw, for any reason, it is the student’s responsibility to take action to withdraw from the course. Students must complete and submit the appropriate Tri-C form by the established withdrawal deadline.

Tri-C is required to ensure that students receive financial aid only for courses that they attend and complete. Students reported for not attending at least one of their registered courses will have all financial aid funds held until confirmation of attendance in registered courses has been verified. Students who fail to complete at least one course may be required to repay all or a portion of their federal financial aid funds and may be ineligible to receive future federal financial aid awards. Students who withdraw from classes prior to completing more than 60 percent of their enrolled class time may be subject to the required federal refund policy. If illness or emergency should necessitate a brief absence from class, students should confer with instructors upon their return. Students having problems with coursework due to a prolonged absence should confer with the instructor or a counselor.

IV. LEARNING OUTCOMES ASSESSMENT

Occasionally, in addition to submitting assignments to their instructors for evaluation and a grade, students will also be asked to submit completed assignments, called ‘artifacts,’ for assessment of course and program outcomes and the College’s Essential Learning Outcomes (ELOs). The artifacts will be submitted in Blackboard or a similar technology. The level of mastery of the outcome demonstrated by the artifact DOES NOT affect the student’s grade or academic record in any way. However, some instructors require that students submit their artifact before receiving their final grade. Some artifacts will be randomly selected for assessment, which will help determine improvements and support needed to further student success. If you have any questions, please feel free to speak with your instructor or contact the Learning Outcomes Assessment office.

V. CONCEALED CARRY STATEMENT

College policy prohibits the possession of weapons on college property by students, faculty and staff, unless specifically approved in advance as a job-related requirement (i.e., Tri-C campus police officers) or, in accordance with Ohio law, secured in a parked vehicle in a designated parking area only by an individual in possession of a valid conceal carry permit.

As a Tri-C student, your behavior on campus must comply with the student code of conduct which is available on page 29 within the Tri-C student handbook, available athttp://www.tri-c.edu/student-resources/documents/studenthandbook.pdf You must also comply with the College’s Zero Tolerance for Violence on College Property available athttp://www.tri-c.edu/policies-and-procedures/documents/3354-1-20-10-zero-tolerance-for-violence-policy.pdf

Outcomes

Course Outcome(s):
Apply knowledge of neonatal and pediatric electroencephalography to perform monitoring in pediatric epilepsy monitoring units, routine, bedside, ICU EEG testing of pediatric patients of various ages under supervision.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.
Objective(s):
1. Discuss and describe the American Clinical Neurophysiology Society (ACNS) Guideline 5: Minimum Technical Standards for Pediatric Electroencephalography.
2. Explain the activation procedures used in neonatal and pediatric EEG including the advantages and disadvantages of each.
3. Describe and discuss terminology related to pediatric and neonatal electroencephalography
4. Describe and discuss the approach to visual analysis and interpretation of neonatal electroencephalogram.
5. Describe and discuss the techniques of neonatal electroencephalography recording.
6. Describe and discuss artifacts in the neonatal intensive care unit.
7. Describe and discuss elements of the normal neonatal electroencephalogram.
8. Describe and discuss patterns of uncertain diagnostic significance relative to the neonatal electroencephalogram.
9. Discuss abnormal EEG patterns through a classification of abnormalities, which will be related to all age groups.
10. Describe and discuss the electroencephalographic findings and clinical features of the different seizure types throughout neonatal, infant and adolescent period of life.
11. Describe and discuss imitators of epileptic seizures and their clinical correlations.
12. Describe and Discuss the American Clinical Neurophysiology Society (ACNS) Guideline on Continuous Electroencephalography Monitoring in Neonates.
13. Perform head measurement for placement of electrodes according to the International 10-20 electrode placement and the modified 10-20 system of electrode place for neonatal electroencephalography recordings.
14. Demonstrate the different techniques of applying electrodes using collodion, paste, electrode caps in the neonates and pediatric patients.
15. Describe and discuss how waveforms displays are affected by variations in instrumentation in the neonatal and pediatric patient.
16. Describe and discuss the definition of an epilepsy syndrome.
17. Define the descriptors of EEG activity: wave form, repetition, frequency, amplitude, distribution, phase, timing, persistence, and reactivity.
18. Describe and discuss pediatric epilepsy surgery, electrocorticography and functional cortical mapping.
19. Describe and discuss the utility and functionality of automated seizure detection and trending.
20. Describe and discuss the American Clinical Neurophysiology Society Standardized EEG terminology and categorization for the description of continuous EEG Monitoring in neonates.
21. Describe and discuss the 2017 International League Against Epilepsy (ILAE) Classification of Seizures, and compare and contrast it to the 1981 ILAE Classification scheme.
22. Describe and discuss the ILAE Classification of the Epilepsies: Position paper of the ILAE Commission for Classification and Terminology. Identify the epilepsy syndromes of the neonatal, infancy and adolescent period of life.
23. Describe and discuss the American Clinical Neurophysiology Society's Standardized Critical Care EEG Terminology.
24. Discuss and describe pediatric appropriate care by EEG technologists.
25. Identify normal awake and sleep rhythms in an EEG to relate criteria specific to the neonatal and pediatric age groups.
26. Describe and discuss the effects of pain in the human neonate.

Methods of Evaluation:
1. Quizzes
2. Assignments
   a. Analysis of pediatric EEG
   b. Analysis of neonatal EEG
3. Participation
4. Final exam, including pediatric/neonatal EEG analysis

Course Content Outline:
1. The Normal Pediatric EEG Normal and Benign Variants/Artifacts Pediatric / ACNS Guidelines
   a. Terminology
      i. CA, GA
      ii. Pre-Term
      iii. Term
      iv. Infants
      v. Childhood
      vi. Adolescence/adult
      vii. PDR ranges for different ages
      viii. Overall sleep stage breakdown
         1. N1, N2, N3, REM
      ix. Apgar Scores
   b. (b) The Normal EEG see http://www.pediatrics.emory.edu/divisions/neurology/education/pedeeg.html
i. Infancy: 1 month to 1 year
   1. Awake/drowsy:
      a. HV and Photic
   2. Sleep (chart for sleep architecture vs ages):
ii. Toddler/early Childhood: 1-3yrs
   1. Awake/Drowsy
   2. Sleep
iii. 6-12 yrs
   1. Awake/Drowsy
   2. Sleep
iv. Artifacts: Common pediatric and neonatal artifact
v. Normal Variants:
   1. Sleep stage identifiers: spindles, v waves, K-Complexes, REM
   2. MU
   3. Lambda
   4. PSWY
   5. Posterior slow wave transients with eye movements
   6. Occipital slow transients
   7. Slow/fast alpha variants
   8. Wicket Spikes
   9. Mitten pattern
  10. Hypnagogic hypersynchrony
  11. RMTD
  12. 13/6hz positive spikes
  13. SSS or BETS
  14. Phantom spike wave bursts
vi. Activation Procedures for Pediatric Patients Overview
   1. HV responses: buildup. H-response
   2. Photic Stimulation responses:
      a. Photoconvulsive response
      b. H-Response
   3. Sleep Deprivation and sleep activated epileptiform discharges
vii. ACNS guidelines: “Minimum Technical Standards for Pediatric EEG”(c)

   a. Introduction
   b. Terminology
   c. Approach to visual analysis and interpretation
      i. CA
      ii. Evidence of focal brain dysfunction
      iii. Evidence of diffuse brain dysfunction
      iv. Prognosis
   d. Techniques of Recording
      i. Personnel
      ii. Infant Preparation
      iii. Nursery environment
      iv. Electrode placement
      v. Polygraphic parameters
      vi. Montage selection
      vii. Recording protocols
   e. Artifacts relative to the NICU
      i. Environment
      ii. Recording instrumentation
      iii. Noncerebral Physiologic potentials
         1. Alterations in electrical properties of scalp or skull
         2. Vital signs
         3. Movements
   f. Elements of The Normal neonatal EEG
i. Continuum of development
   1. Continuity
   2. Bilateral synchrony

ii. EEG Developmental Landmarks
   1. First review the “neonatal cheat sheets”
   2. Trace Discontinuity
   3. Delta Brushes, Beta-Delta Complexes
   4. Monorhythmic occipital delta activity
   5. Temporal Theta and Alpha Bursts
   6. Trace alternant
   7. Frontal Sharp waves (encoches frontales)
   8. Distinguishing between the waking and sleep EEG
   9. Reactivity to Stimulation: table 4.1 in neonatal book says 34 weeks EEG becomes reactive. This is the most important EEG milestone.

10. Additional special waveforms and Patterns
    a. Bifrontal Delta activity
    b. Temporal Sharp Waves

iii. Summary of conceptional age-Dependent findings
    1. 24-26 weeks CA
    2. 27-28 Weeks CA
    3. 29-30 weeks CA
    4. 31-32 weeks CA
    5. 33-34 weeks CA
    6. 35-36 weeks CA
    7. 37-38 weeks CA

   g. Articles for review
      i. Article: “Guideline on Continuous EEG Monitoring in Neonates”
      ii. Article: “Standardized EEG Terminology and Categorization for the Description of Continuous EEG Monitoring in Neonates”

3. Epileptic Seizures and their Classification and Imitators of Epileptic Seizure
   a. Epileptic Seizures and their Classification from Epileptic Syndromes and their Treatment
      i. Definitions:
         1. Epilepsy
         2. Epileptic Seizures
         3. Ictal vs interictal
         4. Pharmaco-resistant epilepsy stats
         5. Seizure
         6. Refractory/intractable
         7. Idiopathic vs cryptogenic vs symptomatic
         8. Paroxysmal
         9. Encephalopathy
         10. Epileptiform
         11. Epileptic or epileptiform encephalopathy
         12. Aura
      ii. Classifications of Epileptic Seizures
      iii. Seizure Classification in the new ILAE Task Force reports
   b. Status Epilepticus
i. Generalized SE
ii. Focal SE
iii. Treatment of SE
c. Imitators of Epileptic Seizures
   i. Syncopal attacks imitating seizures
      1. Neuromediated syncope
      2. Cardiogenic syncope
      3. Syncopal Attacks provoking epileptic seizures
   ii. Psychogenic NEPEs imitating Epileptic Seizures
      1. Convulsive psychogenic status epilepticus
      2. Non-Epileptic Paroxysmal Movement disorders imitating Epileptic Seizures
      3. Non Epileptic Severe amnesic and confusional attacks imitating Epileptic Seizures
      4. NEPEs occurring during sleep and sleep disorders
      5. Migraine, migralepsy, basilar migraine with EEG occipital paroxysms and diagnostic errors
      6. Cerebrovascular NEPEs imitating epileptic seizures
      7. Cerebrovascular NEPEs imitating epileptic seizures
d. Seizure First Aid
   i. Imitators of epileptic seizures
   ii. Seizures: (article: "Semiology: Witness to a Seizure – What to Note and How to Report")
   iii. Basic seizure first aid
   iv. The seizure interview
      1. Outcomes
e. Articles
   i. International League Against Epilepsy Classification of the Epilepsies: Position paper of the ILAE Commission for Classification and Terminology
   ii. 2017 International League Against Epilepsy (ILAE) Classification of Seizures
   a. Article: "Epileptic and Epileptiform Encephalopathies"
   b. Introduction
c. Neonatal seizures
d. Neonatal epilepsy syndromes
e. Main causes of neonatal syndromes
f. Epileptic Encephalopathies in the Neonatal period
g. Early Myoclonic Encephalopathy
   i. Introduction
   ii. Clinical manifestations
   iii. EEG findings
   iv. Prognosis
h. Ohtahara Syndrome
   i. Introduction
   ii. Clinical manifestations
   iii. EEG findings
   iv. Prognosis
   i. Idiopathic epileptic seizures and syndromes in Infancy
j. Febrile seizures
k. Epilepsy with febrile seizures plus
l. Benign infantile seizures
m. Myoclonic epilepsy in infancy
n. Epileptic Encephalopathies in Infancy and Early Childhood
o. West Syndrome
   i. Introduction
   ii. Clinical manifestations
   iii. EEG findings
   iv. Prognosis
p. Dravet Syndrome
   i. Introduction
   ii. Clinical manifestations
iii. EEG findings
iv. Prognosis
q. xvii) Lennox Gaustaut
i. Introduction
ii. Clinical manifestations
iii. EEG findings
iv. Prognosis
r. Landau-Kleffner Syndrome
i. Introduction
ii. Clinical manifestations
iii. EEG findings
iv. Prognosis
s. Epilepsy with Continuous spikes and waves during slow-wave sleep
i. Introduction
ii. Clinical manifestations
iii. EEG findings
iv. Prognosis
a. Idiopathic epileptic seizures and syndromes in infancy
i. Febrile seizures
   1. Introduction
   2. Simple
   3. Complex
   4. EEG
   5. Clinical manifestations: Seizures
   6. Prognosis
b. Severe neocortical epileptic syndromes in infancy and childhood
   i. Rasmussen syndrome
      1. Introduction
      2. Clinical manifestations
      3. EET
      4. Prognosis
c. Benign Childhood focal seizures and Related Epileptic Syndromes
   i. Introduction
   ii. Benign Childhood epilepsy with centrotemporal spikes
      1. Introduction
      2. Clinical manifestations
      3. EEG
      4. Prognosis
   iii. Panayiotopoulos Syndrome
      iv. Introduction
      v. Clinical manifestations
      vi. EEG
      vii. Prognosis
d. Idiopathic Generalized Epilepsies
   i. Introduction
   ii. Epilepsy with Myoclonic-Astatic seizures (Doose Syndrome)
      1. Introduction
      2. Clinical manifestations
      3. EEG
      4. Prognosis
   iii. Childhood Absence epilepsy
      1. Introduction
      2. Clinical manifestations
      3. EEG
      4. Prognosis
   iv. Juvenile Myoclonic Epilepsy JME
1. Introduction
2. Clinical manifestations
3. EEG
4. Prognosis

e. Familial (autosomal dominant) Focal Epilepsies
   i. Introduction
   ii. Autosomal Dominant Nocturnal Frontal Lobe Epilepsy
      1. Introduction
      2. Clinical Manifestations
      3. EEG
      4. Prognosis

f. Symptomatic and Cryptogenic Focal Epilepsies
   i. Introduction
   ii. Mesial TLE with Hippocampal Sclerosis
      1. Introduction
      2. Clinical Manifestations
      3. EEG
      4. Prognosis
   iii. Frontal Lobe Epilepsies
      1. Introduction
      2. Clinical Manifestations
      3. EEG
      4. Prognosis

f. Reflex Seizures and Reflex Epilepsies
   i. Jeavons Syndrome
      1. Introduction
      2. Clinical Manifestations
      3. EEG
      4. Prognosis
   ii. Startle Seizures
      1. Introduction
      2. Clinical Manifestations
      3. EEG
      4. Prognosis

   a. History of Epilepsy Surgery
   b. Epilepsy Treatment: response rates to AED therapy
   c. General principles of the presurgical evaluation.
   d. Seizure freedom rates from different types of epilepsy surgery
   e. Phase 1 and Phase 2 epilepsy surgery workup
   f. Electrocorticography
      i. Intro
      ii. The controversial role of intraoperative Ecog in epilepsy
      iii. Indications
      iv. Methodology
      v. Interpretation
   g. Functional cortical mapping
      i. Intro
      ii. Surgical preparation
      iii. Sensorimotor mapping
      iv. Language mapping
      v. Cortical mapping threshold variability
      vi. Ecog during functional mapping
      vii. Anesthesia considerations
      viii. Functional MRI
      ix. PET
      x. SPECT: interictal and ictal
Resources


"Neonatal EEG"

"Pediatric EEG"

Resources Other

1. *American Journal of Electroneurodiagnostic Technology (AJET)* by the ASET; 4 issues annually; which reflects most recent changes and updates in the field.

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