Table of Contents

Cover
<u>Epilepsy</u>
<u>Copyright</u>
<u>Dedication</u>
<u>Preface</u>
<u>Foreword</u>
<u>List of Contributors</u>
Section I: Epilepsy: Epidemiology, Diagnostic Evaluation and Co-Morbidities
1 Introduction and Epidemiology
<u>Incidence and Prevalence of Epilepsy</u>
<u>Incidence and Prevalence of Acute</u>
<u>Symptomatic Seizures</u>
<u>Looking Beyond Epidemiology: The State of Epilepsy Care in the United States</u>
<u>Risk Factors for Epilepsy</u>
<u>Conclusion</u>
<u>References</u>
2 Classification of Seizures and the Epilepsies
<u>Introduction</u>
Why Is Classification Important?
<u>Classification Scheme</u>
<u>Determination of Etiology</u>
Natural History of Epilepsies
<u>References</u>
3 Etiology and Pathology of Epilepsy

Introduction
Provoked Seizures
Etiologic Classification of Epilepsy
<u>Summary</u>
<u>References</u>
4 Genetics of Epilepsy
Introduction
Genetic Testing
<u>Genotype-Phenotype correlation</u>
Precision Medicine in Epilepsy Genetics
Selected Genetic Epilepsy Syndromes
<u>Conclusion</u>
<u>References</u>
5 Burden of Epilepsy
<u>Introduction</u>
<u>Behavioral Risk Factors</u>
<u>Conclusion</u>
<u>References</u>
6 EEG and Epilepsy
<u>Introduction</u>
Types and Techniques of Recording
<u>Interictal EEG</u>
<u>Ictal EEG Findings in Epilepsy</u>
EEG Source Localization and Epilepsy
MEG and Source Localization and Epilepsy
<u>Conclusion</u>
<u>References</u>
7 Neuroimaging in Epilepsy

<u>Introduction</u>
Computerized Tomography (CT)
<u>Magnetic Resonance Imaging (MRI)</u>
Positron Emission Tomography (PET)
<u>Single Photon Emission Computed Tomography</u> (SPECT)
<u>Functional Magnetic Resonance Imaging (fMRI)</u>
<u>Image Processing</u>
<u>Conclusion</u>
References
8 The Evaluation of Nonepileptic Paroxysmal
<u>Events</u>
Introduction
<u>Syncope</u>
<u>Transient Ischemic Events</u>
<u>Transient Global Amnesia (TGA)</u>
<u>Movement Disorders</u>
<u>Sleep Disorders</u>
Psychogenic Nonepileptic Seizures (PNES)
<u>Autoimmune Neurologic Disorders Associated</u> <u>with Epilepsy</u>
Conclusion
References
9 Sleep, Sleep Disorders, and Epilepsy
Background/Introduction
<u>Epidemiology of Sleep-Related Seizures and</u> <u>Epilepsies</u>
Sleep and Circadian Physiology for the Epileptologist

Pathophysiology and Mechanisms of Sleep-
Related Interictal Epileptiform Discharges and
Seizures, and Epileptic Perturbation of the
Sleep State
Common Sleep-Related Epilepsies
<u>Diagnostic Approach and Treatment of Sleep-</u> <u>Related Epilepsies</u>
<u>Differential Diagnosis of Other Common</u> <u>Nocturnal Events and Mimickers of Sleep-</u> <u>Related Epilepsies</u>
<u>Diagnosis and Treatment of Sleep</u>
Comorbidities in Epilepsy: Obstructive Sleep
Apnea, Insomnia, and Restless Legs Syndrome
Sleep and Risk of Sudden Unexpected Death in
Epilepsy (SUDEP)
<u>Conclusions</u>
<u>References</u>
9 Epilepsy Journey 1: Identification of a Genetic Etiology for Epilepsy
Patient Case
<u>References</u>
9 Epilepsy Journey 2: Evaluation of Spells in Adults
Case 1
Case 2
Case 3
Case 4
Case 5
<u>Epilepsy Journey 3: The Pediatric Patient with</u> <u>Spells: Recommendations for Evaluation</u>
<u>Is the Event Due to a Seizure and Is It Likely to Recur?</u>

If the Event Was Not Felt to be Seizure-Related, What Type of Non-epileptic Event Was It?
If the Event Was Felt to be Seizure-Related, What Type of Seizure Was it and Is the Event
Part of an Epilepsy Electro-Clinical Syndrome?
References
Epilepsy Journey 4: Transitioning from Pediatric to
Adult Epilepsy Clinic
What Is Transition?
<u>References</u>
ection II: Epilepsy: Treatment of Epilepsy: Non- urgical Therapy
10 First Seizure
Background and Epidemiology of First-Time
<u>Seizures</u>
Causes of Acute Symptomatic Seizures
Evaluation of a First Seizure
<u>Treatment after a First Seizure</u>
<u>Summary</u>
<u>References</u>
11 Antiseizure Medication Therapy
<u>Introduction</u>
ASM Selection
The ASMs: Summary of Clinical Use,
<u>Pharmacokinetics, and Efficacy</u>
References
12 Epilepsy in Women
<u>Introduction</u>
<u>Hormonal Influences on Epilepsy</u>
Reproductive Health in Women with Epilepsy

Scoring Systems in the Evaluation and
<u>Treatment of Autoimmune Epilepsy</u>
<u>Diagnostic Testing in Autoimmune Epilepsy</u>
<u>Treatment</u>
<u>Conclusion</u>
<u>References</u>
16 Discontinuation of Antiseizure Medication
<u>Introduction</u>
Methodological Issues in Studies Evaluating ASM Discontinuance
Seizure Recurrence Rates After ASM <u>Discontinuance</u>
Factors that Predict Seizure Recurrence After ASM Discontinuance
Practical Considerations of ASM <u>Discontinuance</u>
References
17 Investigational Therapy and Drug Approval Process within the US and Cannabidiol
Introduction
US Food and Drug Administration
Pharmaceutical Development and Approval Process
Expedited Approval Tracks for Pharmaceutical Therapies
Generic Drugs
Medical Device Development and Approval Process
Cannabidiol for Epilepsy
Government's Role in Regulation

Current Pipeline, Futuristic Therapies, and the
Regulatory Implications
<u>References</u>
18 Devices to Monitor and Track Your Epilepsy
<u>Introduction</u>

Generators and Origins of Biosignals

Sensitivity, Specificity, False-Alarm Rates, and Receiver Operating Characteristic Curves

<u>Seizure Detection for Different Types of</u> <u>Seizures</u>

Commercially Available Devices

Cost

Conclusions

References

<u>Epilepsy Journey 5: Seizure Emergencies (Include status Epilepticus, Fires, Norse, Seizure First Aid, and Seizure Clusters)</u>

<u>Epilepsy Journey 6: The First seizure - How to Evaluate: Pediatric</u>

References

18 Epilepsy Journey 7: The First Seizure - How to Evaluate: Adult

References

<u>Epilepsy Journey 8: Treating Epilepsy Second</u> <u>Seizure and beyond: How to Choose a Drug - An</u> <u>Algorithm</u>

References

<u>Epilepsy Journey 9: Treating Status Epilepticus: An Algorithm</u>

<u>Epilepsy Journey 10: Withdrawal of ASDs in Adults:</u> <u>An Algorithm</u>

Re	fer	en	CE	<u>es</u>

<u>Epilepsy Journey 11: Withdrawal of ASDs in</u> <u>Seizure-Free Patients Children: The Pediatric</u> <u>Neurologist's Perspective</u>

References

<u>Epilepsy Journey 12: Withdrawing ASDs in Adults</u> <u>after Epilepsy Surgery</u>

References

<u>Epilepsy Journey 13: The Pregnant Patient with</u> <u>Epilepsy: An Algorithm</u>

<u>Section III: Epilepsy: Treatment of Epilepsy: Surgical Management</u>

19 Pre-surgical Evaluation

Introduction

Patient Selection

Diagnostic Evaluation

Surgically Remediable Epilepsy Syndromes

Conclusion

References

20 Minimally Invasive Epilepsy Surgery

Radiofrequency Thermoablation

Stereotactic Radiosurgery (SRS)

Laser Interstitial Thermal Therapy

Mesial Temporal Lobe

Specific Lesions

Minimally Invasive Corpus Callosotomy

Conclusion

References

21 Intracranial EEG Monitoring

<u>Introduction</u>
<u>Identifying Candidates for Invasive EEG</u> <u>Monitoring</u>
Indications for Invasive EEG Monitoring
<u>Choosing an Implantation Strategy: Benefits</u> <u>and Risks</u>
Conclusion
<u>References</u>
22 Surgical Strategies (Include Cortical Resection Lesionectomy, Cortical Stimulation and Functional Mapping, Hemispherotomy)
<u>Introduction</u>
<u>References</u>
23 Corpus Callosotomy
<u>Indications</u>
Surgical Techniques
Evaluation of Callosotomy Extent
<u>Complications of Callosotomy</u>
Efficacy of Callosotomy
Efficacy of MST in Landau Kleffer Syndrome
Efficacy of MST in Other Cases Involving Eloquent Cortex
Efficacy of Multiple Hippocampal Transection in Temporal Lobe Epilepsy
Pre-surgical Evaluations
Surgical Techniques
<u>Complications</u>
Seizure Outcome / Efficacy
Global Functional Outcome
Surgical Failures/Re-Operations

<u>Conclusion</u>
<u>References</u>
24 Neuromodulation for Epilepsy
<u>Introduction</u>
<u>References</u>
25 Emerging Treatments for Epilepsy
<u>Introduction</u>
<u>Conclusions</u>
<u>Acknowledgement</u>
<u>References</u>
26 Seizure Forecasting in Epilepsy: From Computation to Clinical Practice
Introduction
Computational and Data Resources
Devices and Ambulatory Monitoring
New Devices and Ongoing Efforts
<u>Summary</u>
<u>References</u>
Epilepsy Journey 14: The Drug-Resistant Patient: Pre-surgical Evaluation and Surgery-Approach to the "Skip" Candidate
Discussion
References
<u>Epilepsy Journey 15: The Drug-Resistant Patient</u> <u>and Discordant Pre-surgical Evaluation</u>
Case 1
Case 2
Discussion
References

<u>Epilepsy Journey 16: The Drug-Resistant Patient</u> who is not a Candidate for Resective Surgery: An <u>Approach to Neuromodulation</u>

Introduction

Case Discussion

Conclusion

References

<u>Epilepsy Journey 17: Epilepsy Surgery in Pediatric</u> Patients

<u>Pre-surgical Evaluation: Antiseizure Drugs</u> (ASDs)

Seizure Semiology

<u>Identification of Drug-resistant Epilepsy</u>

EEG and Epilepsy Monitoring Unit (EMU) planning

Epilepsy Pre-Surgical Conference

Intracranial EEG Monitoring

<u>Surgical Treatment of Neocortical Focal</u> <u>Epilepsy</u>

Hemispheric Epilepsy

<u>Drug-resistant Generalized Epilepsy and Non-localized Focal Epilepsy</u>

References

Index

bplates

End User License Agreement

List of Tables

Chapter 1

<u>Table 1.1 Incidence and prevalence of epilepsy as</u> reported in various populat...

Chapter 2

<u>Table 2.1 Epilepsy syndromes recognized by the International League Against E...</u>

Chapter 3

<u>Table 3.1 Selected causes of acute symptomatic</u> seizures.

<u>Table 3.2 Common chromosomal abnormalities</u> <u>associated with epilepsy (www.epil...</u>

<u>Table 3.3 Selected gene abnormalities associated</u> with epilepsy (www.epilepsyd...

<u>Table 3.4 Focal cortical dysplasia (FCD)</u> <u>classification [21].</u>

<u>Table 3.5 Selected inborn errors of metabolism</u> <u>associated with epilepsy.</u>

Chapter 4

<u>Table 4.1 Targeted therapies in genetic epilepsy</u> disorders.

<u>Table 4.2 Major and minor criteria for tuberous</u> <u>sclerosis complex (2012 Inter...</u>

<u>Table 4.3 Genetic-structural epilepsies and imaging phenotypes.</u>

<u>Table 4.4 Neurodevelopmental disorders in developmental and epileptic encepha...</u>

<u>Table 4.5 Progressive myoclonic epilepsies.</u>

Chapter 6

Table 6.1 The role of EEG in epilepsy.

<u>Table 6.2 The spectrum of EEG bandwidth and frequencies and their significanc...</u>

<u>Table 6.3 Different types of artifacts and their sources.</u>

<u>Table 6.4 Criteria for interictal spikes and sharp</u> waves.

<u>Table 6.5 Interictal and ictal EEG findings in focal epilepsy.</u>

<u>Table 6.6 Temporal lobe seizure patterns.</u>

<u>Table 6.7 Electrographic feature in adult generalized epilepsies.</u>

Chapter 8

<u>Table 8.1 Common differential diagnosis of seizure</u>like events.

<u>Table 8.2 Features of the history favoring syncope</u> <u>events.</u>

<u>Table 8.3 Hodges and Warlow Diagnostic Criteria</u> for TGA.

Chapter 9

<u>Table 9.1 Typical sleep stage polysomnography and</u> EEG characteristics.

<u>Table 9.2 Characteristics of common sleep-related</u> <u>epilepsy syndromes.</u>

<u>Table 9.3 Differential diagnosis and distinguishing</u> features of nocturnal eve...

Chapter 9b

Table J1.1 Is there an underlying genetic etiology? [3, 4].

<u>Table J1.2 Choice of genetic testing modality.</u>

<u>Table J1.3 Medication choice and genetic epilepsies.</u>

Chapter 10

<u>Table 10.1 Selected causes of acute symptomatic seizures.</u>

Chapter 11

Table 11.1 ASM selection based on seizure type.

<u>Table 11.2 ASM pharmacokinetic properties, effect of added ASM, serum concent...</u>

Table 11.3 ASM: mechanisms of action.

<u>Table 11.4 ASM selection based on medical</u> comorbidities.

<u>Table 11.5 ASM side effects (SE) and toxicities (Tox).</u>

Table 11.6 ASM drug-to-drug interactions with other ASMs.

<u>Table 11.7 ASM drug-to-drug interactions with non-ASM.</u>

Table 11.8 ASM: Treatment initiation rates.

Chapter 12

<u>Table 12.1 Congenital malformations in infants with first trimester, monother...</u>

<u>Table 12.2 Antiepileptic drugs adversely effecting</u> <u>effectiveness of hormonal ...</u>

Table 12.3 Contraceptive methods for women on enzyme-inducing antiepileptic d...

Chapter 14

<u>Table 14.1 Possible adverse effects of dietary therapy for epilepsy.</u>

Chapter 15

Table 15.1 Antibody Prevalence in Epilepsy and Encephalopathy (APE) [2], and ...

<u>Table 15.2 Neural antibodies associated with autoimmune epilepsy – clinical f...</u>

<u>Table 15.3 Immunotherapy regimens for autoimmune epilepsy.</u>

Chapter 16

<u>Table 16.1 Average seizure recurrence rates after ASM discontinuance from pub...</u>

<u>Table 16.2 EEG finding indicating epilepsy</u> <u>syndrome and associated prognosis.</u>

<u>Table 16.3 Published prediction models for seizure</u> recurrence after ASM disco...

Chapter 17

Table 17.1 General characteristics of pharmaceutical clinical trial phases.

<u>Table 17.2 Overview of FDA's Expedited Drug</u> <u>Approval Programs.</u>

Chapter 18

Table 18.1 Methods for seizure detection

Chapter 19

<u>Table 19.1 Common misconceptions about epilepsy surgery candidacy.</u>

<u>Table 19.2 Proposed ideal MRI sequences for outpatient epilepsy evaluation.</u>

<u>Table 19.3 Common semiology characteristics of</u> <u>mesial temporal lobe epilepsy.</u>

<u>Table 19.4 International League Against Epilepsy</u> classification of focal cort...

<u>Table 19.5 Features suggestive of epilepsy with</u> "bottom-of-sulcus" focal cort...

Chapter 20

<u>Table 20.1 Types of Surgical Procedures that have been performed in patients ...</u>

<u>Table 20.2 Pathologies Treated MRgLITT.</u>

Chapter 21

<u>Table 21.1 Potential Indications for Invasive EEG Monitoring.</u>

<u>Table 21.2 Implantation Techniques: Advantages</u> and <u>Disadvantages</u>.

Table 21.3 Nomenclature Used for sEEG.

Chapter 24

Table 24.1 Approximate 4-7 Yr Outcomes (Percent).

Chapter 26c

<u>Table J15.1 Utility of presurgical ancillary tests [1].</u>

List of Illustrations

Chapter 2

<u>Figure 2.1 ILAE classification of the epilepsies</u> (<u>ILAE classification of the...</u>

Figure 2.2 Operational classification of seizure types (ILAE classification ...

Chapter 4

Figure 4.1 8-year-old boy with maternally inherited TSC1 mutation. (a) Bilat...

<u>Figure 4.2 2-week-old female with left V-1</u> <u>distribution port-wine stain. MRI...</u>

<u>Figure 4.3 4-month-old girl with intractable focal</u> <u>epilepsy and DEPDC5 micro...</u>

Chapter 6

Figure 6.1 Modified combinatorial nomenclature of the 10–10-system, extended...

<u>Figure 6.2 EEG in a longitudinal bipolar montage</u> showing frequent right TIRD...

Figure 6.3 EEG tracing in bipolar (A) and Laplacian (B) montages showing rig...

Figure 6.4 EEG in longitudinal bipolar (A) and average referential (B) monta...

<u>Figure 6.5 EEG in longitudinal bipolar montage</u> <u>showing generalized atypical ...</u>

<u>Figure 6.6 EEG tracings in a 35-year-old patient</u> with drug-resistant epileps...

<u>Figure 6.7 EEG in a longitudinal bipolar montage</u> showing a rhythmic right mi...

Figure 6.8 EEG tracing in bipolar (A) and Laplacian (B) montages showing a r...

Figure 6.9 EEG in a bipolar montage showing a generalized 3 Hz spike and wav...

Figure 6.10 ESI (sLORETA) during a focal impaired awareness seizure involvin...

Chapter 7

Figure 7.1 16-year-old male with history of seizures since the age of 10 mon...

<u>Figure 7.2 52-year-old male with history of partial epilepsy since the age o...</u>

<u>Figure 7.3 An 18-year-old female with medically-intractable focal epilepsy s...</u>

<u>Figure 7.4 FDG-PET coregistered to MRI showing</u> reduced uptake at the right t...

Figure 7.5 A. SISCOM analysis of ictal and interictal SPECT data did not sho...

Figure 7.6 A 29-year-old female with chronic medically refractory epilepsy p...

<u>Figure 7.7 Multimodality image registration and fusion provides anatomic and...</u>

Chapter 9

Figure 9.1 Sleep activation of right temporal interictal spike. Note the int...

Chapter 9c

<u>Figure J2.1 Differential diagnosis, features, and</u> basic evaluation considera...

Chapter 15

<u>Figure 15.1 Examples of EEG findings in patients</u> with autoimmune epilepsy. (...

<u>Figure 15.2 MRI examples in Autoimmune Epilepsy.</u>
(a): MRI from a patient wit...

<u>Figure 15.3 Immunotherapy treatment algorithm in suspected autoimmune epilep...</u>

Chapter 16

<u>Figure 16.1 Nomogram to predict seizure</u> recurrence after ASM discontinuance ...

Chapter 17

Figure 17.1 FDA Organization Overview.

<u>Figure 17.2 Generalized drug discovery and development timeline..</u>

<u>Figure 17.3 Similarities in FDA-approval process of drugs and medical device...</u>

Chapter 18

<u>Figure 18.1 ROC curve [43].</u>

Chapter 19

<u>Figure 19.1 STATISCOM in a patient with right frontal epilepsy shows positiv...</u>

<u>Figure 19.2 MRI-PET in a patient with MRI-negative right temporal lobe epile...</u>

Figure 19.3 MRI brain coronal FLAIR sequence demonstrating left hippocampal ...

<u>Figure 19.4 MRI brain showing axial T2 (left) and double inversion recovery ...</u>

Chapter 20

<u>Figure 20.1 Axial T2 MRI revealing sequela of a right-sided mesial temporal ...</u>

Figure 20.2 (a) Axial T2 flair revealing right-sided mesial temporal lobe sc...

Chapter 21

<u>Figure 21.1 Frontal sEEG electrode examples: (a)</u> <u>LF and RF example of electr...</u> <u>Figure 21.2 Cingulate Electrodes: (a) These are common entry points in the i...</u>

<u>Figure 21.3 Long Pathway Insular electrodes: (a)</u> <u>These electrodes (RP and RV...</u>

Figure 21.4 Mesial Temporal Implant (a) Common entry sites for the A, B, and...

Figure 21.5 Examples of left occipital-temporal high-density implantation of...

<u>Figure 21.6 **StereoEEG implantation.** A right-handed 25-year-old was evaluated...</u>

<u>Figure 21.7 Bilateral temporal depth</u> <u>electrodes</u>. A 30-year-old right-handed ...

Figure 21.8 **Subdural grid implantation**. This patient presented with drug-res...

<u>Figure 21.9 Grid and strip subdural electrodes used</u> <u>for localization around ...</u>

<u>Figure 21.10a,b Grid implant over the left frontal</u> <u>lobe of an area of prior ...</u>

Chapter 22

Figure 22.1 (a) MRI reveals abnormal architecture and atrophy of the right h...

Figure 22.2 (a) T2 axial and (b) T2 sagittal MRI images. (c) Intraoperative ...

Chapter 23

<u>Figure 23.1 Open craniotomy for corpus callosotomy.</u>

<u>Figure 23.2 Postoperative MRI of six-year-old girl</u> with hemiconvulsion-hemia...

<u>Figure 23.3 Surgical technique for peri-insular hemispherotomy.</u>

<u>Figure 23.4 Eight-year-old boy without hemiparesis</u> or visual field defects w...

Chapter 24

<u>Figure 24.1 Methods of invasive brain stimulation</u> use different stimulation ...

Chapter 25

Figure 25.1 **Next-Generation Epilepsy Management System.** Multisite elec...

Chapter 26

<u>Figure 26.1 Illustration of the interaction and flow of data, annotations, a...</u>

Figure 26.2 Implantation of the SummitTM RC + S device in a pet canine with n...

Figure 26.3 This example shows stimulation initiation in response to a seizu...

Chapter 26b

Figure J14.1 Axial (a) and coronal FLAIR (b), coronal T2 (c), and IR (d) 3 T...

<u>Figure J14.2 EEG in a bipolar montage showing a rhythmic right mid-temporal ...</u>

<u>Figure J14.3 Color-coded brain PET coregistered</u> with brain MRI showing promi...

<u>Figure J14.4 3T Brain MRI three-month post laser</u> interstitial thermal therap...

<u>Table J14.1 Epilepsy-associated anatomic lesions</u> <u>amenable to epilepsy surger...</u>

<u>Figure J14.5 Flowchart showing an algorithm for patients being evaluated for...</u>

Chapter 26c

<u>Figure J15.1 (a) 3D EEG source localization of ictal onset showed peak in th...</u>

<u>Figure J15.2 Epilepsy surgery algorithm [5].</u> <u>Abbreviations: LITT, laser inte...</u>

Chapter 26d

<u>Figure J16.1 Process flow and decision analysis in a case of pharmacological...</u>

<u>Figure J16.2 Bilateral subdural strip survey. Red arrows indicate earliest a...</u>

<u>Figure J16.3 Anterior-posterior (a) and lateral (b) X-ray of the skull with ...</u>

<u>Figure J16.4 Independent left (short arrow) and right temporal (long arrow) ...</u>

<u>Figure J16.5 An algorithm for incorporating a neuromodulatory strategy acros...</u>

b02

<u>Figure 7.4 FDG-PET coregistered to MRI showing</u> reduced uptake at the right t...

<u>Figure 7.5 A. SISCOM analysis of ictal and</u> interictal SPECT data did not sho...

<u>Figure 7.6 A 29-year-old female with chronic medically refractory epilepsy p...</u>

<u>Figure 7.7 Multimodality image registration and fusion provides anatomic and...</u>

Epilepsy

Second Edition

Edited by

Gregory D. Cascino Mayo Clinic Rochester, MN, USA

Joseph I. Sirven Mayo Clinic Jacksonville, FL, USA

William O. Tatum Mayo Clinic Jacksonville, FL, USA



This edition first published 2021

© 2021 John Wiley & Sons, Ltd

Edition History

John Wiley & Sons (1e, 2011)

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, except as permitted by law. Advice on how to obtain permission to reuse material from this title is available at http://www.wiley.com/go/permissions.

The right of Gregory D. Cascino, Joseph I. Sirven and William O. Tatum to be identified as the author(s) of this the editorial material in this work has been asserted in accordance with law.

Registered Office(s)

John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, USA

John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK

Editorial Office

9600 Garsington Road, Oxford, OX4 2DQ, UK

For details of our global editorial offices, customer services, and more information about Wiley products visit us at www.wiley.com.

Wiley also publishes its books in a variety of electronic formats and by print-ondemand. Some content that appears in standard print versions of this book may not be available in other formats.

Limit of Liability/Disclaimer of Warranty

The contents of this work are intended to further general scientific research, understanding, and discussion only and are not intended and should not be relied upon as recommending or promoting scientific method, diagnosis, or treatment by physicians for any particular patient. In view of ongoing research, equipment modifications, changes in governmental regulations, and the constant flow of information relating to the use of medicines, equipment, and devices, the reader is urged to review and evaluate the information provided in the package insert or instructions for each medicine, equipment, or device for, among other things, any changes in the instructions or indication of usage and for added warnings and precautions. While the publisher and authors have used their best efforts in preparing this work, they make no representations or warranties with respect to the accuracy or completeness of the contents of this work and specifically disclaim all warranties, including without limitation any implied warranties of merchantability or fitness for a particular purpose. No warranty may be created or extended by sales representatives, written sales materials or promotional statements for this work. The fact that an organization, website, or product is referred to in this work as a citation and/or potential source of further information does not mean that the publisher and authors endorse the information or services the organization, website, or product may provide or recommendations it may make. This work is sold with the understanding that the publisher is not engaged in rendering professional services. The advice and strategies contained herein may not be suitable for your situation. You should consult with a specialist where appropriate. Further, readers should be aware that websites listed in this work may have changed or disappeared between when this work was written and when it is read. Neither the publisher nor authors shall be liable for any loss of profit or any other commercial damages, including but not limited to special, incidental, consequential, or other damages.

Library of Congress Cataloging-in-Publication Data

Names: Cascino, Gregory, editor. | Sirven, Joseph I., editor. | Tatum, William O., IV, editor. Title: Epilepsy / edited by Dr Gregory D. Cascino, Dr Joseph I. Sirven, Dr William O. Tatum. Other titles: Adult epilepsy Description: Second edition. | Hoboken, NJ: Wiley-Blackwell, 2021. | Preceded by Adult epilepsy / edited by Gregory D. Cascino and Joseph ISirven. 2011. | Includes bibliographical references and index. Identifiers: LCCN 2020027892 (print) | LCCN 2020027893 (ebook) | ISBN 9781119431824 (cloth) | ISBN 9781119431930 (Adobe PDF) | ISBN 9781119432005 (epub)Subjects: MESH: Epilepsy Classification: LCC RC372.3 (print) | LCC RC372.3 (ebook) | NLM WL 385 | DDC 616.85/3-dc23 LC record available at https://lccn.loc.gov/2020027892LC ebook record available at https://lccn.loc.gov/2020027893

Cover Design: Wiley

Cover Image: © Andrus Ciprian/Shutterstock

This book is dedicated to Dr. Frank W. Sharbrough who, approximately 50 years ago, developed a contemporary epilepsy surgery program at the Mayo Clinic. Frank was a pioneer in EEG monitoring techniques and involved in innovations in electrocorticography, neuroimaging and surgical strategies. He was a Mayo Clinic "distinguished clinician" and adored by his patients and their families. His lasting legacy is the integration of multiple disciplines including neurosurgery, neuroradiology and basic research at our institution in the care and management of people with epilepsy. Frank embodied the basic concept inherent in a successful epilepsy center: "the power of talent and teamwork."

Preface

This book represents the efforts of the Mayo Clinic Epilepsy Enterprise encompassing colleagues at the three comprehensive Level IV epilepsy programs in Jacksonville, FL., Phoenix, AZ., and Rochester, MN. The authors of this monograph are actively involved in patient care, clinical research and education at the Mayo Clinic and our associated institutions including the Mayo Clinic Health System. Individuals from multiple disciplines including pediatric and adult epilepsy, EEG, autoimmune neurology, sleep medicine, neurosurgery, neuroradiology, and basic research dedicated to the care and management of people with epilepsy contributed material to the chapters. Every attempt has been made to provide a contemporary and current presentation addressing challenging diagnostic and therapeutic issues that confront the healthcare provider evaluating patients with suspected seizure disorders. Moreover, our epilepsy journey sections that accompany many of our chapters, provide a glimpse into the decisionmaking process that our authors utilize in managing complex epilepsy patients. The goal of any such book is to become a trusted, dependable and used guide providing a reliable source of *useful* information that improves the quality of life of people with epilepsy. Our hope is that we have accomplished that goal!

Greg Cascino Rochester, MN

Joe Sirven Jacksonville, FL

Bill Tatum *Jacksonville, FL* July 2019

Foreword

I'm delighted to hear that this book will be dedicated to Dr. Frank Wilson Sharbrough III on his 50th anniversary of joining the Mayo Clinic. Frank certainly deserves this honor. Frank is both an outstanding neurologist as well as an accomplished electroencepahlographer. Once he joined the Mayo Clinic in the late 1960s, he rapidly absorbed the philosophy of the "Mayo Clinic school of electroencephalography" and was one of the most distinguished and beloved EEG teachers. However, in addition, he maintained and grew his clinical skills, particularly in epilepsy. These qualifications put him in an ideal position to pioneer an epilepsy surgery program at the Mayo clinic that now has grown to become one of the leading epilepsy surgery programs in the USA.

I was fortunate to have Frank as my EEG teacher during the four years I spent in Rochester studying clinical neurophysiology. Frank always had time to answer my questions and to review an "interesting" EEG. Besides, integrating the EEG findings with the actual clinical situation, made his teachings particularly valuable. There is no doubt that Frank's teachings greatly influenced the development of EEG and Epilepsy in the USA as well as worldwide. We certainly feel privileged and most thankful for his mentorship.

Hans Lüders, MD, PhD
Professor of Neurology
Cleveland Medical Center
OH, USA