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978-1-009-26116-6 — Critical Care EEG Basics
Neville M. Jadeja, Kyle C. Rossi
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Critical Care EEG Basics

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Rapid Bedside EEG Reading for Acute Care Providers

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Shaftesbury Road, Cambridge CB2 8EA, United Kingdom
 One Liberty Plaza, 20th Floor, New York, NY 10006, USA
 477 Williamstown Road, Port Melbourne, VIC 3207, Australia
 314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India
 103 Penang Road, #05-06/07, Visioncrest Commercial, Singapore 238467

Cambridge University Press is part of Cambridge University Press & Assessment, a department of the University of Cambridge.

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www.cambridge.org
 Information on this title: www.cambridge.org/9781009261166

DOI: 10.1017/9781009261159

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First published 2024

A catalogue record for this publication is available from the British Library.

Library of Congress Cataloging-in-Publication Data

Names: Jadeja, Neville M., 1986- author. | Rossi, Kyle C., author.

Title: Critical care EEG basics : rapid bedside EEG reading for acute care providers /

Neville M. Jadeja, University of Massachusetts Medical School, Massachusetts,

Kyle C. Rossi, University of Massachusetts Medical School, Massachusetts.

Description: Cambridge, United Kingdom ; New York, NY : Cambridge University Press, 2023. | Includes bibliographical references and index.

Identifiers: LCCN 2023031153 (print) | LCCN 2023031154 (ebook) |

ISBN 9781009261166 (paperback) | ISBN 9781009261159 (ebook)

Subjects: LCSH: Electroencephalography. | Critical care medicine.

Classification: LCC RC386.6.E43 J33 2023 (print) | LCC RC386.6.E43 (ebook) |

DDC 616.8/047547—dc23/eng/20230817

LC record available at <https://lcn.loc.gov/2023031153>

LC ebook record available at <https://lcn.loc.gov/2023031154>

ISBN 978-1-009-26116-6 Paperback

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NMJ dedicates this book to Shilpa Deshmukh.

KCR dedicates this book to Megan Rossi.

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Foreword

The EEG, one of the oldest diagnostic tools for evaluating brain function, has now been in use for 100 years since its invention by Hans Berger. There has been a renaissance in EEG use as a means of evaluating and monitoring critically ill patients in the past 20 years, made possible by advances in computing and visualization technologies. Therefore, although EEG is a relatively ancient tool, it is simultaneously a young field. In particular, continuous EEG monitoring in the ICU has markedly improved the management of neurocritically ill patients.

There are several comprehensive textbooks, handbooks, and atlases dedicated to critical care EEG monitoring, as well as new chapters in classical EEG tomes. This can be particularly intimidating to medical professionals whose backgrounds are not in clinical neurophysiology or epilepsy, but who are nonetheless expected to utilize these tools in everyday practice. Practitioners may not even have more than a passing familiarity with EEGs themselves. This is where the new book by Neville Jadeja and Kyle Rossi becomes a valuable asset in learning critical care EEG that is both efficient and practical.

The book is short enough that it can be read cover-to-cover within a couple of days of concerted effort, even less with some familiarity with EEGs. Nonetheless, it is comprehensive enough that it should cover most of the common scenarios encountered by caretakers of the critically ill patients. The book introduces the basics of EEG recordings, when and how to order an EEG, and the importance of recognizing and accounting for recording artifacts and medication effects. The core principles of critical care EEGs – ranging from interictal epileptiform discharges to rhythmic and periodic discharges, the ictal–interictal continuum, seizures, and status epilepticus – are well covered. A special emphasis is placed on post-cardiac-arrest EEGs, which are distinct from most other critical care EEGs, and encephalopathy, which is encountered in the majority of patients undergoing critical care EEGs. As all modern EEG systems have quantitative EEG tools, this topic, too, is given special consideration, rather than detailed analysis, which can only be seen under scrutiny in retrospect.

There is a very large audience who would benefit from reading this book: the EEG technologists, nurses, advanced practice providers, non-neurology critical care physicians, and even neurocritical care physicians without specialized training in clinical neurophysiology. One of the key strengths of this book lies in its comprehensive coverage of the latest standard terminology as established by the American Clinical Neurophysiology Society. This terminology is now a cornerstone in the field, adopted by nearly all contemporary clinical

neurophysiologists. Additionally, the book describes the structure of the reports generated in this discipline, enhancing the communication between the care team and the clinical neurophysiologist. This ensures a more streamlined and effective exchange of information, crucial for optimal patient care. I cannot emphasize how critical this communication is in the care of these patients, and I can think of no better way to quickly learn this language than through this very useful, readable, well-illustrated book. I warmly congratulate Drs Jadeja and Rossi on producing this outstanding work.

Jong Woo Lee, MD, PhD

Associate Professor of Neurology, Harvard Medical School
Department of Neurology, Brigham and Women's Hospital

Preface

Electroencephalograms (EEG) are commonplace in acute care environments such as emergency rooms, intensive care units, and hospital floors. Critically ill patients with altered mental status are at a high risk of seizures, which may occur without clinically apparent convulsions (nonconvulsive seizures) and therefore can only be diagnosed on EEG. Delay in the detection and treatment of continuous seizures (status epilepticus) is associated with refractoriness to therapy and secondary neurological injury. Additionally, the EEG may help confirm encephalopathy, grade its severity, characterize paroxysmal events, and titrate anesthetics and sedation, among other indications, in critically ill patients.

However, most acute care providers (including many neurologists) are unfamiliar with critical care EEG despite easy availability and widespread use. Without confident bedside EEG reading skills, they are dependent on official reports or remote interpretations, which can be difficult to understand or not immediately available for review. This pocketbook introduces the reader to the basics of critical care EEG with an emphasis on *real-time bedside EEG reading*.

Tailored specifically for acute care providers without an EEG background, this book allows readers of all skill levels to become familiar with common critical care EEG patterns and what they mean and what to do about them. With practice, quick and easy bedside EEG reading will become a powerful extension to your neurological assessment. We hope that this unique book, which is easy to understand and heavily illustrated, will help you to harness the immense potential of this fascinating test in order to best help your patients.

Acknowledgments

This approach borrows heavily from those of our teachers at the Brigham and Women's Hospital and Beth Israel Deaconess Medical Center, Harvard Medical School. We also gratefully acknowledge our colleagues at UMass Memorial Medical Center, UMass Chan Medical School, including Don Chin; Felicia Chu, MD; Ika Novyawaty, MD; Mugdha Mohanty, MD; and Brian Silver, MD. Last but not least, we thank Catherine Barnes, Kim Ingram, Beth Sexton, Ruth Swan, Marijasintha Srinivasan, and the team at Cambridge University Press for making this work possible.

How to Read This Book

This book has two parts that should be read sequentially:

Part I (Introduction) describes the basics of EEG (emphasizing critical care EEG). Additionally, it includes clinical indications for EEG, an approach to rapid bedside EEG reading, how to recognize artifact and medication effects, how to explain rhythmic or periodic patterns, and the increasingly relevant concept of the ictal-interictal continuum (IIC). It also describes how to diagnose seizures and status epilepticus as well as post-cardiac arrest patterns and quantitative EEG.

Part II (Case-Based Approach to Specific Conditions) describes an approach to specific commonly encountered ICU conditions using case-based clinical reasoning. Each case consists of a short clinical vignette that includes a brief clinical description, sample EEG, and what to do next with relevant clinical reasoning. This provides a direct practical approach to common critical care EEG patterns.

Finally, there is an appendix about understanding EEG reports. This explains the common presentation and meaning of terms used in an EEG report for acute care providers of all specialties.