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978-1-107-47625-7 - Neurocritical Care Essentials: A Practical Guide

Mypinder S. Sekhon & Donald E. Griesdale

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# Neurocritical Care Essentials: A Practical Guide

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## Foreword 1

As our knowledge of the neurosciences continues to expand, so does our ability to diagnose and treat neurological and neurosurgical disorders. The complexity of these cases necessitates critical care, evidenced by the evolution of neurocritical care units around the world. In recent years, the requirement of neurocritical care units has been underlined by the improved outcomes of patients admitted to them. In establishing these units, the concept of neurocritical care as a recognized subspecialty of critical care medicine has been realized.

There are many attractions to the subspecialty; the breadth and complexity of the clinical problems that present are both interesting and intellectually challenging. The ability to use advanced technology, whether it be state-of-the-art imaging or neuromonitoring techniques to help clinical decision making, and combining this with the practical diversity of the interventions available to us is both stimulating and rewarding. However, one of the greatest privileges of being part of this small clinical subspecialty is to meet and learn from fellow neurointensivists from around the world. I have been fortunate to work recently with Drs Sekhon and Griesdale, who are not only exemplary clinicians but also dedicated teachers of the specialty. It is therefore not surprising that they have produced this excellent handbook which will be an immensely useful resource not only for healthcare professionals who look after patients within neurocritical care but also for those who look after such patients in non-specialist units.

It is not uncommon to observe our residents (and sometimes attending staff) scratching their heads while on the unit, trying to resolve problems in a timely and appropriate manner. This book will help them with decision making while on service as well as contribute to further understanding of the subject. The chapters are well organized and laid out in a way that makes them easily readable either in depth or for quick reference, so I am sure it will prove a popular resource.

As our subspecialty comes of age, it is reassuring to know that we have such dedicated faculty as are the authors of this book, and that they will train the next generation of neurointensivists to a high standard. The future of neurocritical care is in safe hands.

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## Foreword 2

Clinicians who are newly exposed to neurointensive care are burdened with a novel conceptual framework of physiology, pathophysiology and management.

This huge collection of new facts can overwhelm attempts to understand the integrated whole of clinical practice in neurointensive care. While there are many high-quality textbooks on the topic which contain detailed information, these often assume an initial basic framework of knowledge, which may be incomplete (or sometimes absent!).

This handbook provides new entrants to neurointensive care with a useful broad perspective on clinical practice in the subspeciality. The text is both informative and accessible, and will provide an excellent resource for the clinician who wishes to rapidly access key clinical facts, or acquire a foundation to support a wider and more detailed exploration of neurointensive care.

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## Abbreviations

Ab	Antibody
ABC	Airway, breathing, circulation
ABG	Arterial blood gas
ACA	Anterior cerebral artery
ACE	Angiotensin converting enzyme
ACEI	Angiotensin converting enzyme inhibitor
ADC	Apparent diffusion coefficient
ADEM	Acute disseminated encephalomyelitis
ADH	Antidiuretic hormone
AED	Antiepileptic drug
AFB	Acid-fast bacilli
AKI	Acute kidney injury
ALS	Amyotrophic lateral sclerosis
ANA	Antinuclear antibody
ANCA	Antineutrophil cytoplasmic antibody
ANP	Atrial natriuretic peptide
ARB	Angiotensin receptor blocker
ARDS	Acute respiratory distress syndrome
ARR	Absolute risk reduction
ARV	Antiretroviral
ARVD	Arrhythmogenic right ventricular dysplasia
ASA	Acetylsalicylic acid
ASA	Anterior spinal artery
ASIA	American Spinal Injury Association
AT	Antithrombin
ATP	Adenosine triphosphate
ATIII	Antithrombin III
AVM	Arteriovenous malformation
BG	Basal ganglia
BG	Blood glucose
BID	Twice daily
BNP	Brain natriuretic peptide
BP	Blood pressure
BUN	Blood urea nitrogen
CAD	Coronary artery disease
CaO <sub>2</sub>	Arterial oxygen content
CBC	Complete blood count
CBF	Cerebral blood flow

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C <sub>Br</sub> DO <sub>2</sub>	Cerebral oxygen delivery
CBV	Cerebral blood volume
CCP	Anticyclic citrullinated peptide
CE	Cerebellar encephalitis
CG	Cryoglobulinemia
CI	Contraindication
CIDP	Chronic inflammatory demyelinating polyneuropathy
CK	Creatinine kinase
CMRO <sub>2</sub>	Cerebral metabolic oxygen uptake
CMV	Cytomegalovirus
CN	Cranial nerves
CNS	Central nervous system
CO <sub>2</sub>	Carbon dioxide
COPD	Chronic obstructive pulmonary disease
CPAP	Continuous positive airway pressure
CPP	Cerebral perfusion pressure
CS	Churg–Strauss
CSF	Cerebrospinal fluid
CSW	Cerebral salt wasting
CT	Computed tomography
CTA	Computed tomography angiogram
CVA	Cerebrovascular accident
CvO <sub>2</sub>	Cerebral venous oxygen content
CVR	Cerebrovascular resistance
DDAVP	Arginine vasopressin
DE	Diencephalon encephalitis
DI	Diabetes insipidus
DIP	Distal interphalangeal
DKA	Diabetic ketoacidosis
DM	Diabetes mellitus
DVT	Deep vein thrombosis
DWI	Diffusion-weighted imaging
EBV	Ebstein–Barr virus
EDH	Epidural hematoma
EEG	Electroencephalogram
EMG	Electromyography
ENA	Extractable nuclear antibody
EOM	Extraocular movements
ETT	Endotracheal tube
EVD	External ventricular drain
FiO <sub>2</sub>	Fractional inspired oxygen
GABA	Gamma-aminobutyric acid
GAD	Gadolinium

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GBS	Guillain–Barré syndrome
GCA	Giant cell arteritis
GCS	Glasgow Coma Scale
GI	Gastrointestinal
GN	Glomerulonephritis
Hb	Hemoglobin
HCO <sup>3-</sup>	Bicarbonate
HELLP	Hemolysis elevated liver enzymes low platelet count
Hep B	Hepatitis B
Hg	Mercury
HHV-6	Human herpes virus 6
HIT	Heparin-induced thrombocytopenia
HIV	Human immunodeficiency virus
HOB	Head of bed
HOCM	Hypertrophic obstructive cardiomyopathy
HONK	Hyperglycemic hyperosmolar non-ketotic coma
HRT	Hormone replacement therapy
HSP	Henoch–Schönlein purpura
HSV	Herpes simplex virus
HTN	Hypertension
IA	Intra-arterial
ICA	Internal carotid artery
ICD	Implantable cardioverter defibrillator
ICH	Intracerebral hemorrhage
ICP	Intracranial pressure
ICU	Intensive care unit
IM	Intramuscular
INH	Isoniazid
INR	International normalized ratio
IP	Interphalangeal
IV	Intravenous
IVH	Intraventricular hemorrhage
IVIG	Intravenous immunoglobulin
LCMV	Lymphocytic choriomeningitis virus
LE	Limbic encephalitis
LMWH	Low molecular weight heparin
LOC	Level of consciousness
LP	Lumbar puncture
LV	Left ventricle
MAOI	Monoamine oxidase inhibitor
MAP	Mean arterial pressure
MCA	Middle cerebral artery
MCP	Metacarpal phalangeal

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MEP	Maximal expiratory pressure
MI	Myocardial infarction
MIP	Maximal inspiratory pressure
MM	Multiple myeloma
MPA	Microscopic polyangiitis
MRA	Magnetic resonance angiogram
MRI	Magnetic resonance imaging
MS	Multiple sclerosis
MTP	Metatarsal-phalangeal
NMDA	N-methyl D-aspartate
NMO	Neuromyelitis optica
NNT	Number needed to treat
NSAID	Non-steroidal anti-inflammatory drug
NSE	Neuron-specific enolase
O <sub>2</sub>	Oxygen
OCP	Oral contraceptive pill
ODS	Osmotic demyelination syndrome
OER	Oxygen extraction ratio
PaCO <sub>2</sub>	Arterial partial pressure of carbon dioxide
PaO <sub>2</sub>	Arterial partial pressure of oxygen
PAN	Polyarteritis nodosa
PbO <sub>2</sub>	Brain tissue oxygenation
P <sub>br</sub> O <sub>2</sub>	Brain tissue oxygen pressure
PCA	Posterior cerebral artery
PCR	Polymerase chain reaction
pCO <sub>2</sub>	Partial pressure of carbon dioxide
PE	Pulmonary embolism
PEA	Pulseless electrical activity
PEEP	Positive end-expiratory pressure
PIP	Proximal interphalangeal
PMN	Polymorphonuclear neutrophil
PNH	Paroxysmal nocturnal hemoglobinuria
PNS	Parasympathetic nervous system
PRx	Pressure reactivity index
PSH	Paroxysmal sympathetic hyperactivity
PTT	Prothrombin time
RA	Rheumatoid arthritis
RASS	Richmond Agitation Sedation Scale
RCMP	Restrictive cardiomyopathy
RCT	Randomized controlled trial
RE	Rhomboencephalitis
RF	Rheumatoid factor
ROSC	Return of spontaneous circulation

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## List of abbreviations

RVOT	Right ventricular outflow tachycardia
SAH	Subarachnoid hemorrhage
SaO <sub>2</sub>	Arterial hemoglobin oxygen saturation
SBP	Systolic blood pressure
SC	Subcutaneous
SCD	Sequential compression devices
SCI	Spinal cord injury
SDH	Subdural hemorrhage
SIADH	Syndrome of inappropriate antidiuretic hormone
SE	Status epilepticus
SE	Striatal encephalitis
SjO <sub>2</sub>	Jugular venous bulb oxygen saturation
SjO <sub>2</sub> ER	Jugular venous bulb oxygen saturation extraction ratio
SLE	Systemic lupus erythematosis
SNRI	Serotonin norepinephrine reuptake inhibitor
SSEP	Somatosensory evoked potential
SSRI	Selective serotonin reuptake inhibitor
TB	Tuberculosis
TBI	Traumatic brain injury
TCA	Tricyclic antidepressant
TCD	Transcranial Doppler
TIA	Transient ischemic attack
tPA	Tissue plasminogen activator
UE	Upper extremity
UFH	Unfractionated heparin
US	Ultrasound
VC	Vital capacity
VF	Ventricular fibrillation
VGCC	Voltage-gated calcium channel
VGKC	Voltage-gated potassium channel
VKA	Vitamin K antagonists
VT	Ventricular tachycardia
VZV	Varicella zoster virus
WBC	White blood count
WFNS	World Federation of Neurosurgeons Society
WG	Wegener's granulomatosis