DRUGS

DRUGS IN NEUROLOGY

Edited by Sathiji Nageshwaran | David Ledingham
Heather C Wilson

Covers the breadth of medications used in modern neurology with a clinical focus

Practical aspects related to prescribing and therapeutic drug monitoring are covered

Based on the most up-to-date evidence-based guidance

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Edited by

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Drugs in Neurology

Foreword by Professor Matthews

The amount of information that neurologists need for safe and effective practice has grown rapidly over the last generation as neurology has moved from a focus on diagnosis to one on treatment. As a consequence of this, the busy general neurologist or trainee faces new challenges in managing pharmacological treatments. This practical handbook, with its succinct summaries of widely accepted management approaches to diseases commonly encountered, and well-set out, detailed information on individual drugs, goes a long way towards addressing this challenge. It will be a welcome addition to my clinic desk.

Nageshwaran, Ledingham and Wilson have brought a range of experience to developing a text that will help doctors with very different levels of expertise. For those in training or approaching an area with which they are less familiar, the short chapters describing common syndromes and their management provides a quick review. While a sub-specialist might quibble with details, the approaches are sensible and reflect mainstream British practice. Particularly welcome are the well-selected references to the evidence base for treatments. These include the key points needed to explain to patients why they are being treated to engage them as a first step towards enabling them to be a full partners in their disease management.

For more experienced neurologists, the tables comparing pharmacological characteristics and the associated reminders of drug monitoring requirements and interactions provide important, practical aids to better practice. I find the pharmacokinetic data especially useful. Like all of the other data pulled together here, while available elsewhere, it can be difficult to access quickly when it is needed. The range of data summarised has been chosen thoughtfully. The tables also are set out well and in a typeface that doesn't challenge the aging neurologist's eyesight!

The role of reference books in an age of apps is increasingly questioned. This volume illustrates why there is still a place for the book. It is well edited, providing information selected to address practical clinical problems by a group of authors aware of the needs of both trainees and experienced clinicians who have "seen it all". As another volume in a respected series, the reader can have confidence in the quality of the data. Finally, it is organised to suit needs of everyday practice, even to the extent that the early chapters are arranged in approximate order of the frequency with which the problems arise in usual clinic practice.

The authors are to be congratulated!

Paul M. Matthews, OBE, MD,
D Phil, FRCP, FMedSci
Imperial College London, 2016

Foreword by Professor Bronstein

There are several roles practicing clinicians play in caring for patients but none are more essential than providing an accurate diagnosis and prescribing the appropriate treatments. Neurological disorders have often been seen as some of the most challenging especially to the general practitioner and non-neurologist. Furthermore, there has been an explosion in our understanding of neurological disease over the past few decades making the task of providing high-level care even more daunting. Clinical-pathological phenotypes have been much better refined with the development of advanced imaging techniques and genetics. The sub-specialization of neurology has also grown in recent years with this improved understanding of the pathophysiology of common and rare neurological disorders. With these advances came new medications and repurposing of older medications. The sheer volume of information that a clinician must assimilate has become overwhelming.

How we find medical information has also changed over the past few decades. When I worked in Nicaragua 25 years ago, there were essentially no resources covering neurological disease and treatment beyond what I could carry. Conversely, while studying at the National Hospital in London, the library was overflowing with reference books and journals. Reviewing and filtering the massive amount of information was exciting but time consuming and not very practical for a practicing clinician. The Internet has provided an even larger array of information on neurological disorders and treatments but it also comes with important cautions. The accuracy and reliability of Internet sources always has to be considered and is not always clear despite thorough investigation.

Drugs in Neurology is a wonderful practical resource to help manage the massive amount of critical information needed to be an effective practicing clinician. The book is divided into two sections. The first section provides an up to date but succinct description of clinical conditions and approaches to management. There is a clear emphasis on evidence-based medicine. The second section of this book contains comprehensive specific information on classes of medications and specific drugs which are organized alphabetically. Included are details on mechanism of actions, pharmacokinetics and interactions, toxicity and side effects, contraindications, and evidence of efficacy. Tables are effectively used for drug comparisons and pertinent references are provided.

This book will find a place in my doctor's bag and will be helpful for any clinician treating patients with neurological conditions. This succinct, well-organized Internet-independent resource will find plenty of use both in the outpatient clinic and during inpatient hospital rounds.

Jeff Bronstein MD, PhD
David Geffen School of Medicine at UCLA
Los Angeles, 2016

Preface

A new era in clinical neurology is under way. In recent years, neurology has seen a shift in practice; many hitherto incurable neurological conditions can now be effectively treated. Thanks to new insights into pathophysiology, improved diagnostic tools, and a focus on translational research increasingly efficacious treatments are emerging.

With the rapidly evolving pharmacopeia used in modern neurology, there is now a need for a practical guide which provides an evidence-based approach enabling the user to choose the most appropriate therapy for the increasingly wide range of neurological conditions amenable to treatment.

Drugs in Neurology comprehensively covers the modern management of neurological diseases in adults. Emphasis is placed on the pharmacological underpinnings behind the drugs used and on the evidence base for their use, but respect is also given to treatment recommendations established as a result of decades of clinical experience and to opinions from experts in the field.

We hope this book will be of value to trainees in neurology and clinical pharmacology and to all those involved in the treatment of adults with neurological disorders.

We welcome comments and feedback from readers to help refine subsequent print and online editions of *Drugs in Neurology*.

Please e-mail all correspondence to: editors.drugsinneurology@gmail.com.

Dedication

This work is dedicated to all the patients we serve, who keep us inspired, motivated, and interested in their lives.

SN, DL, HW

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SN would like to thank his incredible mentors in clinical neuroscience that have supported him throughout his career: Dr Heather Wilson, Miss Joan Grieve, Dr Yvette Bordelon, and Professor Susan Perlman.

DL would like to thank his (equally incredible) mentors, past and present and the book's contributors, whose hard work forms the core of this book and who tolerated numerous queries and revisions (for the most part in good humour).

HW would like to thank all her colleagues and friends in the Neurology Department at the Royal Free Hospital who have inspired and supported her throughout her career. And in memory of George Harwood who will always be her greatest role model.

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Symbols and abbreviations

🖉	website
~	approximately
°	degree
=	equal to
>	greater than
<	less than
≥	equal to or greater than
≤	equal to or less than
±	plus or minus
α	alpha
β	beta
δ	delta
γ	gamma
κ	kappa
μ	mu
%	per cent
£	pound sterling
®	registered trademark
4-AP	4-aminopyridine
A&E	accident and emergency
AAN	American Academy of Neurology
AbESSTT	Abciximab in Emergency Treatment of Stroke Trial
ABN	Association of British Neurologists
ACE	angiotensin-converting enzyme
AChEI	anticholinesterase inhibitor
AChR	acetylcholine receptor
AD	autosomal dominant; Alzheimer's disease
ADAS-Cog	Alzheimer's Disease Assessment Scale cognitive subscale
ADCS-ADL	Alzheimer's Disease Cooperative Study Activities of Daily Living
ADEM	acute disseminated encephalomyelitis
ADH	antidiuretic hormone
ADHD	attention-deficit/hyperactivity disorder
ADP	adenosine diphosphate
AED	antiepileptic drugs
AF	atrial fibrillation

AHS	American Headache Society
AIDP	acute inflammatory demyelinating polyradiculopathy
AIDS	acquired immune deficiency syndrome
AIP	acute intermittent porphyria
ALA	aminolevulinic acid
ALD	adrenoleukodystrophy
ALP	alkaline phosphatase
ALS	amyotrophic lateral sclerosis
ALT	alanine aminotransferase
a.m.	*ante meridiem* (before noon)
AMAN	acute motor axonal neuropathy
AMN	adrenomyeloneuropathy
AMPA	α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid
AMSAN	acute motor and sensory axonal neuropathy
ANA	antinuclear antibody
ANCA	anti-neutrophil cytoplasmic antibody
APLS	antiphospholipid syndrome
aPTT	activated partial thromboplastin time
AQP4	aquaporin 4
AR	autosomal recessive
ARB	angiotensin receptor blocker
ARR	annualized relapse rate
ASA	acetylsalicylic acid
ATACH	Antihypertensive Treatment of Acute Cerebral Hemorrhage
AV	atrioventricular
BAL	British Anti-Lewisite
BC	before Christ
bd	twice daily
BDI	Beck Depression Inventory
BH4	tetrahydrobiopterin
BIH	benign intracranial hypertension
BMI	body mass index
BP	blood pressure
BPPV	benign paroxysmal positional vertigo
BSA	bovine serum albumin; body surface area
BTX-A	botulinum toxin A
BTX-B	botulinum toxin B
CAA	cerebral amyloid angiopathy
CANOMAD	chronic ataxic neuropathy, ophthalmoplegia, IgM paraprotein, cold agglutinins, and disialosyl antibodies

CAST	Chinese Acute Stroke Trial
CBD	corticobasal degeneration; cannabidiol
CBT	cognitive behavioural therapy
CHD	coronary heart disease
CI	confidence interval
CIBIC-Plus	Clinician's Interview-Based Impression of Change Plus Caregiver Input
CIDP	chronic inflammatory demyelinating polyradiculopathy
CK	creatine kinase
cm	centimetre
CMAP	compound muscle action potential
cmH_2O	centimetre of water
CMT2	Charcot–Marie–Tooth disease type 2
CMV	cytomegalovirus
CNS	central nervous system
COC	combined oral contraceptive
COMT	catechol-*O*-methyltransferase
COPD	chronic obstructive pulmonary disease
CoQ10	coenzyme Q10
COX	cyclo-oxygenase
COX-2	cyclo-oxygenase 2
CR	controlled release
CrCl	creatinine clearance
CRP	C-reactive protein
CS	corticosteroid
CSF	cerebrospinal fluid
CT	computed tomography
CXR	chest X-ray
3,4-DAP	3,4-diaminopyridine
DA	dopamine agonist
DADS	distal acquired demyelinating symmetric neuropathy
DAWS	dopamine agonist withdrawal syndrome
DBN	downbeat nystagmus
DBS	deep brain stimulation
DDC	dopa decarboxylase
DDI	dopa decarboxylase inhibitor
DDS	dopamine dysregulation syndrome
DEXA	dual-energy X-ray absorptiometry
DIC	disseminated intravascular coagulation
DLB	dementia with Lewy bodies

DM	dermatomyositis
DM1	myotonic dystrophy type 1
DM2	myotonic dystrophy type 2
DMD	Duchenne muscular dystrophy
DML	distal motor latency
DMPS	2,3-dimercapto-1-propane sulfonate
DMSA	dimercaptosuccinic acid
DMT	disease-modifying therapy
DNA	deoxyribonucleic acid
DOPAC	3,4-dihydroxyphenylacetic acid
DRD	dopa-responsive dystonia
DRT	dopaminergic replacement therapy
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, fourth edition
dTT	diluted thrombin time
DWI	diffusion-weighted imaging
EA1	episodic ataxia type 1
EA2	episodic ataxia type 2
EBV	Epstein–Barr virus
ECG	electrocardiogram
ECT	ecarin clotting time
EDSS	Expanded Disability Status Scale
EDTA	ethylenediaminetetraacetic acid
EEG	electroencephalogram
EFNS	European Federation of Neurological Societies
eGFR	estimated glomerular filtration rate
EMG	electromyography
ENS	European Neurological Society
ERT	enzyme replacement therapy
ESR	erythrocyte sedimentation rate
ESRS	European Sleep Research Society
ET	essential tremor
EU	European Union
EULAR	European League Against Rheumatism
EXPRESS	EXelon in PaRkinson's disEaSe dementia Study
FBC	full blood count
FDA	Food and Drug Administration
FLAIR	fluid-attenuated inversion recovery
ft	foot
FTD	frontotemporal dementia

FVC	forced vital capacity
g	gram
GA	general anaesthesia
GABA	gamma-aminobutyric acid
GAD	glutamic acid decarboxylase
GAG	glycosaminoglycan
GBM	glioblastoma multiforme
GBS	Guillain–Barré syndrome
GC	glucocorticoid
GCA	giant cell arteritis
GDS	Geriatric Depression Scale
GMP	guanosine monophosphate
GnRH	gonadotrophin-releasing hormone
GON	greater occipital nerve
G6PD	glucose-6-phosphate dehydrogenase
GPi	globus pallidus internus
GTN	glyceryl trinitrate
5-HIAA	5-hydroxyindoleacetic acid
5HT	5-hydroxytryptamine
h	hour
HAART	highly active antiretroviral therapy
HbA1c	glycated haemoglobin
HBcAb	hepatitis B core antibody
HBsAg	hepatitis B surface antigen
HC	hemicrania continua
HCT	haematopoietic cell transplantation
HD	Huntington's disease
HDL	high-density lipoprotein
HERG	human ether-a-go-go related gene
HHV	human herpesvirus
HIV	human immunodeficiency virus
HMG-CoA	3-hydroxy-3-methyl-glutaryl-CoA
HPA	hyperphenylalaninaemia
HPS	Heart Protection Study (trial)
hs-CRP	high-sensitivity C-reactive protein
HSV	herpes simplex virus
HUS	haemolytic uraemic syndrome
HVA	homovanillic acid
Hz	hertz
IASP	International Association for the Study of Pain