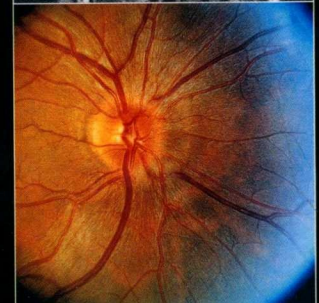
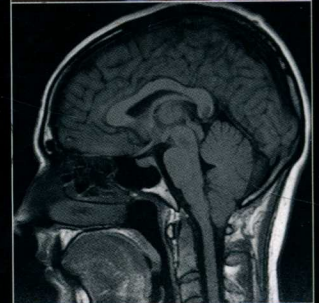
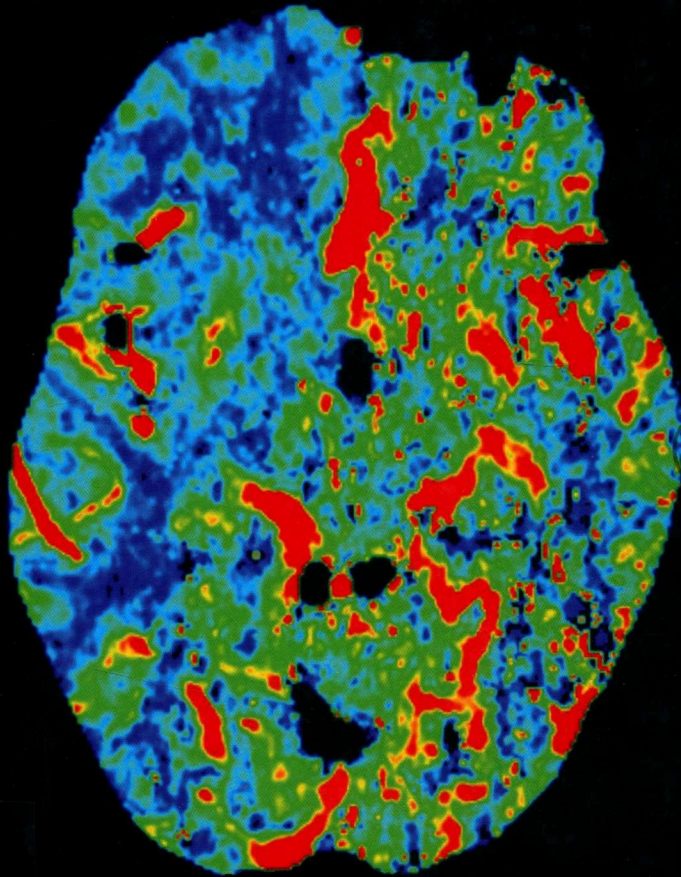


# Hankey's CLINICAL NEUROLOGY

Second  
Edition



Philip B Gorelick  
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Graeme J Hankey  
Joanna M Wardlaw

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# PREFACE

A DECADE HAS PASSED since the first edition of *Clinical Neurology*. Those who have embraced it have encouraged us to update it. The explosion of rigorous scientific evidence for interventions in clinical neurology, coupled with astonishing advances in the clinical neurosciences, have further inspired us to undertake a second edition. As the initial authors (GJH and JMW) are now a decade older and have gravitated toward greater subspecialization, another couple of fellow enthusiasts (PBG and FT) from Grand Rapids and Chicago, USA have joined to facilitate a re-energized, comprehensive, and more global, rather than Anglo-Australian, effort. Together we have enlisted the generosity and specialist expertise of our friends and colleagues throughout the world who are recognized leaders in their field and who have kindly agreed to enlighten us with a chapter on the subject to which they are dedicated.

The subjects and format of the first edition have been maintained and are complemented by the addition of a new chapter on sleep disorders. The chapter covering degenerative diseases of the nervous system has now been subdivided into three main sections, dementias, Parkinson's disease and parkinsonian syndromes, and hereditary ataxias. The cranial neuropathies chapter now includes an entirely new section on neuro-ophthalmology. In addition there are over 440 new illustrations.

The perspective for each chapter is also fresh, as each chapter (with the exception of the chapter on stroke) has been written by one or more of our new contributors, in contrast to the first edition which represented the perspective of GJH and JMW. The purpose of the book, nevertheless, continues to focus on the essentials for students of clinical neurology, particularly neurologists-in-training and practicing neurologists, who wish to have ready access to a comprehensive, up-to-date, and evidence-based guide to the understanding, diagnosis, and management of common and important neurologic disorders.

Many of the illustrations are images taken from our own patients, whom we would like to thank for allowing us to photograph them or the outcome of their investigations. Furthermore, we would also like to thank all the current and past contributors of figures (too many to list individually here) for providing illustrations, as indicated throughout the book. Finally, we would like to thank our families and colleagues for supporting us in this endeavor. We hope you enjoy it and we welcome any comments and criticisms.

Graeme J. Hankey  
Joanna M. Wardlaw  
Philip B. Gorelick  
Fernando D. Testai

## DEDICATIONS

*I dedicate this book in honor of Mr. Ralph Hauenstein for service to his country and his many generous commitments to the neuroscience programs at Saint Mary's Health Care and the Western Michigan area, and to Sister Myra Bergman for her dedication, devotion and spirited work as a missionary and religious leader in our region and beyond.*

Philip B. Gorelick

*To my wife, Flavia, for her love, patience, and endless support; to our beautiful children, Sofia and Martin, for being continuous examples of enthusiasm and dedication; to my parents, Ruben and Stella, and sisters, Alejandra and Naiara, for their motivation and support throughout the years; to our neurology residents for having chosen one of the most amazing paths in the medical sciences; and foremost, to our most brilliant mentors – our patients.*

Fernando D. Testai

*To the memory of my father, the late Dr. John Hankey*

Graeme J. Hankey

*I am grateful to my family for ongoing support and so dedicate this work to them.*

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# ABBREVIATIONS

5HT	5-hydroxytryptamine	ARSA	arylsulfatase A
AA	anaplastic astrocytoma	ARSACS	autosomal recessive spastic ataxia of Charlevoix-Saguenay
AAD	atlantoaxial dislocation	ARX	Aristaless-related homeobox
AASM	American Association of Sleep Medicine	ASA	atrial septal aneurysm
A $\beta$	amyloid- $\beta$	ASD	atrial septal defect
Aca	aceruloplasminemia	AST	aspartate aminotransferase
ACE	angiotensin-converting enzyme	AT	ataxia telangiectasia
ACE-R	Addenbrooke's Cognitive Examination Revised	ATM	acute transverse myelitis
AChR	acetylcholine receptors	AVM	arteriovenous malformation
ACTH	adrenocorticotrophic hormone	AVS	acute vestibular syndrome
AD	Alzheimer's disease	AZA	azathioprine
ADAMTS	a disintegrin and metalloprotease with thrombospondin motif	BAEP	brainstem auditory evoked potential
ADC	apparent diffusion coefficient	BAL	British anti-Lewisite
ADCA	autosomal dominant cerebellar ataxia	BBS	Bardet-Biedl syndrome
ADEM	acute disseminated encephalomyelitis	BDNGF	brain-derived nerve growth factor
ADHD	attention deficit hyperactivity disorder	BF	blood flow
ADL	activities of daily living/adrenoleukodystrophy	bFGF	basic fibroblast growth factor
ADLP	adrenoleukodystrophy protein	BHC	benign hereditary chorea
ADP	adenosine diphosphate	BMD	Becker's muscular dystrophy
AED	antiepileptic drug	BMI	body mass index
AF	atrial fibrillation	BNCT	boron neutron capture therapy
AFB	acid-fast bacilli	BP	blood pressure
AFP	alpha-fetoprotein	BPAP	bilevel positive airways pressure
AHI	apnea/hypopnea index	BPPV	benign paroxysmal positional vertigo
AICA	anterior inferior cerebellar artery	BSE	bovine spongiform encephalopathy
AIDP	acute inflammatory demyelinating polyradiculoneuropathy	BSK	Barbour-Stoenner-Kelly
AIDS	acquired immunodeficiency syndrome	BWSTT	body weight supported treadmill training
AION	anterior ischemic optic neuropathy	CADASIL	cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy
AIP	acute intermittent porphyria	CAM	computer assisted myelography
ALD	adrenoleukodystrophy	CAS	carotid artery stenting
ALDP	adrenoleukodystrophy protein	CBD	corticobasal degeneration
ALS	amyotrophic lateral sclerosis	CBF	cerebral blood flow
ALT	alanine aminotransferase	CBS	corticobasal syndrome/cystathionine $\beta$ -synthase deficiency
AMAN	acute motor axonal neuropathy	CBT	cognitive behavioral therapy
AML	angiomyolipoma	CDC	Centers for Disease Control and Prevention
AMN	adrenomyeloneuropathy	CEA	carotid endarterectomy/carcinoembryonic antigen
(c)AMP	(cyclic) adenosine monophosphate	cEEG	continuous electroencephalography
AMSAN	acute motor and sensory axonal neuropathy	CE-MRA	contrast-enhanced magnetic resonance angiography
ANCL	adult neuronal ceroid lipofuscinoses	CGRP	calcitonin gene-related peptide
AO	anaplastic oligodendroglioma	CI	confidence interval/cholinesterase inhibitor
AOA	oligoastrocytoma	CIDP	chronic inflammatory demyelinating polyneuropathy
ApoE	apolipoprotein E	CIM	critical illness myopathy
APP	amyloid precursor protein	CIMT	constraint-induced movement therapy
APS	antiphospholipid syndrome	CIP	critical illness polyneuropathy
aPTT	activated partial thromboplastin time	CIS	clinically isolated syndrome
ARAS	ascending reticular activating system	CISC	clean intermittent self-catheterization
ARDS	adult respiratory distress syndrome		
ARI	absolute risk increase		
ARR	absolute risk reduction		



(f/i/s/v)CJD	(familial/iatrogenic/sporadic/variant) Creutzfeldt–Jakob disease	EITB	enzyme-linked immunoelectrotransfer blot assay
CK	creatine kinase	ELISA	enzyme-linked immunosorbent assay
CLAM	cholesterol-lowering agent	EM	erythema migrans
CM	congenital myopathy	EMD	Emery–Dreifuss muscular dystrophy
CMAP	compound muscle action potential	EMG	electromyography
CMD	congenital muscular dystrophy	EOG	electro-oculogram
CMT	Charcot–Marie–Tooth disease	EPP	endplate potential
CMV	cytomegalovirus	EPT	enhanced physiologic tremor
CNS	central nervous system	ER	extended-release
COACH	cerebellar vermis hypo/aplasia, oligophrenia, ataxia congenital, coloboma, and hepatic fibrosis	ERG	electroretinography
COMT	catechol-O-methyltransferase	ESR	erythrocyte sedimentation rate
CORS	cerebello-oculo-renal syndrome	ESRD	end-stage renal disease
COX	cyclo-oxygenase	ET	essential tremor
CPA	cerebello-pontine angle	EV	Eustachian valve
CPAP	continuous positive airway pressure	EVD	extraventricular drain
CPK	creatine phosphokinase	FA	Friedreich's ataxia
CPM	central pontine myelinolysis	FAST	Functional Assessment Staging Test
CPP	cerebral perfusion pressure	FDA	Food and Drug Administration
Cr	creatinine	FES	functional electrical stimulation
CRAO	central retinal artery occlusion	FFI	fatal familial insomnia
CRP	C-reactive protein	FHM	familial hemiplegic migraine
CRVO	central retinal vein occlusion	FIESTA	fast imaging employing steady state acquisition sequence
CS	Cowden's syndrome	FLAIR	fluid attenuated inversion recovery
CSA	central sleep apnea	FMD	fibromuscular dysplasia
CSF	cerebrospinal fluid	FSHD	facioscapulohumeral muscular dystrophy
CT	computed tomography	FTA	fluorescent treponemal antibody
CTA	computed tomography angiography	FTD	frontotemporal dementia
CTV	computed tomography venography	FTLD	frontotemporal lobar degeneration
CV	color vision	FVC	forced vital capacity
CVA	cerebrovascular accident	FXTAS	fragile X-associated tremor/ataxia syndrome
CVT	cerebral venous thrombosis	GABA	gamma-aminobutyric acid
DAI	diffuse axonal injury	GAD	glutamic acid decarboxylase
DALY	disability-adjusted life year	GALC	galactocerebrosidase
DBS	deep-brain stimulation	GBM	glioblastoma multiforme
DFA	direct immunofluorescent antibody	GBS	group B streptococci/Guillain–Barré syndrome
DGC	dystrophin glycoprotein complex	GCI	glial cytoplasmic inclusion
DIC	disseminated intravascular coagulation	GCS	Glasgow Coma Scale
DLB	dementia with Lewy bodies	GCSE	generalized convulsive status epilepticus
DMD	Duchenne's muscular dystrophy	GCT	undifferentiated germinoma
DNA	deoxyribonucleic acid	GFR	glomerular filtration rate
DNET	dysembryoplastic neuroepithelial tumor	Glut 1	glucose transporter type 1 (deficiency)
DRPLA	dentato-rubro-pallido-luysian atrophy	GMP	guanosine monophosphate
DSA	digital subtraction cerebral angiography	GPi	globus pallidus internus
DSPN	distal symmetric polyneuropathy	GSS	Gerstmann–Sträussler–Scheinker syndrome
DUB	deubiquitinating enzyme	GTN	glyceryl trinitrate
DVT	deep vein thrombosis	GTP	guanosine triphosphate
DWI	diffusion-weighted imaging	H&E	hematoxylin and eosin
EACA	epsilon-aminocaproic acid	HAART	highly-active antiretroviral therapy
EBRT	external beam radiation therapy	HAM/TSP	HTLV-associated myelopathy/tropical spastic paraparesis
EBV	Epstein–Barr virus	HANAC	hereditary angiopathy, nephropathy, aneurysm, and muscle cramps
ECG	electrocardiogram/electrocardiography	HARP	hypoprebetalipoproteinemia, acanthocytes, retinitis pigmentosa, pallidal degeneration
ECT	electroconvulsive therapy	HCD	hepatocerebral degeneration
EDH	extradural hematoma	HCG	human chorionic gonadotropin
EEG	electroencephalography	HCP	hereditary coproporphyrria
EGF(R)	epidermal growth factor (receptor)		
EIAC	enzyme-inducing anticonvulsant		

HD	Huntington's disease	LDL	low-density lipoprotein
HDL	Huntington disease-like	LEMS	Lambert-Eaton myasthenic syndrome
HE	hepatic encephalopathy	LFT	liver function testing
HELLP	hemolysis, elevated liver enzymes, low-platelet count syndrome	LGG	low-grade glioma
HHT	hereditary hemorrhagic telangiectasia (Osler-Rendu-Weber syndrome)	LGMD	limb-girdle muscular dystrophy
HHV	human herpesvirus	LGV	lymphogranuloma venereum
hIBM	hereditary inclusion body myopathy	LHON	Leber's hereditary optic neuropathy
HIF	hypoxia-inducible factor	LITAF	lipopolysaccharide-induced tumor necrosis factor- $\alpha$ factor
HIS	head impulse sign	LLN	lower limit of normal
HIT	horizontal head impulse test	LMN	lower motor neuron
HIV	human immunodeficiency virus	LNS	Lesch Nyhan syndrome
HLA	human leukocyte antigen	LNSS	linear nevus sebaceous syndrome
HNPP	hereditary neuropathy with liability to pressure palsies	LMWH	low-molecular weight heparin
HPE	holoprosencephaly	LOC	loss of consciousness
HR	hazard ratio/heart rate	LP	lumbar puncture
HRIG	human rabies immune globulin	LS	Leigh syndrome
HSP	hereditary spastic paraparesis	LTBI	latent tuberculous infection
HSV	herpes simplex virus	MAO	monoamine oxidase
HTIG	human tetanus immune globulin	MAP	mean arterial pressure
HTLV	human T-lymphotropic virus	MAPT	microtubule-associated tau gene
hyperPP	hyperkalemic periodic paralysis	MBP	myelin basic protein
hypoPP	hypokalemic periodic paralysis	MCA	middle cerebral artery
HZV	herpes zoster virus	MCI	mild cognitive impairment
IBM	inclusion body myositis	MCP	middle cerebellar peduncle
IBPN	immune-mediated brachial plexus neuropathy	MCPH	microcephaly
ICA	internal carotid artery	MCTD	mixed connective tissue disease
ICCA	infantile convulsions and choreoathetosis	MEG	magnetoencephalography
ICH	intracerebral hemorrhage	MELAS	mitochondrial encephalomyopathy, lactic acidosis, and stroke-like episodes
ICP	intracranial pressure	MEP	motor evoked potential
ICU	Intensive Care Unit	MERRF	myoclonic epilepsy with ragged red fibers
ICVT	intracranial cerebral venous thrombosis	MFAP	muscle fiber action potential
IF	intrinsic factor	MFS	Miller-Fisher syndrome
Ig	immunoglobulin	MHA-TP	microhemagglutination for antibodies to <i>Treponema pallidum</i>
IGF	insulin-like growth factor	MG	myasthenia gravis
IGRA	interferon- $\gamma$ release assay	MGMT	methylguanine-DNA methyltransferase
IIH	idiopathic intracranial hypertension	MIP	maximum intensity projection/maximal inspiratory pressure
IL	interleukin	MJD	Machado-Joseph disease
ILAE	International League against Epilepsy	MLD	metachromatic leukodystrophy
ILOCA	idiopathic late onset cerebellar ataxia	MLF	medial longitudinal fasciculus
INO	internuclear ophthalmoplegia	MMF	mycophenolate mofetil
INR	international normalized ratio	MMR	mumps, measles, rubella
ION	ischemic optic neuropathy	MMSE	Mini Mental State Examination
IOP	intraocular pressure	MND	motor neuron disease
IPC	intermittent pneumatic compression	MoCA	Montreal Cognitive Assessment
IPV	inactivated poliovirus vaccine	MOTSA	multiple overlapping thin-slab acquisition
IRIS	immune reconstitution inflammatory syndrome	MPR	multi-planar reformat
IVIG	intravenous immune globulin	MRA	magnetic resonance angiography
JCV	John Cunningham virus	MRI	magnetic resonance imaging
JME	juvenile myoclonic epilepsy	mRS	Modified Rankin Score
KBS	Klüver-Bucy syndrome	MRSA	methicillin-resistant <i>Staphylococcus aureus</i>
KD	Krabbe disease	MRV	magnetic resonance venography
KSS	Kearns-Sayre syndrome	MS	multiple sclerosis
LAA	left atrial appendage	MSA	multiple system atrophy
LCMV	lymphocytic choriomeningitis virus	MSLT	Multiple Sleep Latency Test
LD	Lhermitte-Duclos disease		

MSM	men who have sex with men	PCD	paraneoplastic cerebellar degeneration
MSPNST	malignant peripheral nerve sheath tumor	PCNSL	primary CNS lymphoma
MTHFR	methylenetetrahydrofolate reductase	PCom	posterior communicating artery
MTR	methionine synthase	PCR	polymerase chain reaction
MUP	motor unit action potential	PCV	vincristine
MuSK	muscle-specific receptor tyrosine kinase	PD	Parkinson's disease
MUT	methylmalonyl-CoA mutase	PDD	Parkinson's disease dementia
MWT	Maintenance of Wakefulness Test	PDGF	platelet-derived growth factor
MZ	monozygotic/marginal zone	PDW	proton density-weighted
NAAT	nucleic acid amplification testing	PE	plasma exchange
NAC	neuroacanthocytosis	PEG	percutaneous endoscopic gastrostomy
NAD	nicotinamide adenine dinucleotide	PEM	paraneoplastic encephalomyelitis
NADP	nicotinamide adenine dinucleotide phosphate	PEO	progressive external ophthalmoplegia
NAION	nonarteritic anterior ischemic optic neuropathy	PET	positron emission tomography
NARP	neurogenic weakness with ataxia and retinitis pigmentosa	PFK	phosphofructokinase
NBIA	neurodegeneration with brain iron accumulation	PFO	patent foramen ovale
NCL	neuronal ceroid lipofuscinosis	PION	posterior ischemic optic neuropathy
NCS	nerve conduction studies	Pi-TON	posterior indirect traumatic optic neuropathy
NCSE	nonconvulsive status epilepticus	PKAN	pantothenate kinase-associated neurodegeneration
NDT	neurodevelopmental therapy	PLED	periodic lateralized epileptiform discharge
NF	neuroferritinopathy	PLEX	plasmapheresis
NF-1	neurofibromatosis 1	PLM	periodic leg movement
NFT	neurofibrillary tangle	PLMD	periodic leg movement disorder
NFG	nerve growth factor	PMA	progressive myoclonic ataxia
NFLE	nocturnal frontal lobe epilepsy	PME	progressive myoclonic epilepsy
NGGCT	nongerminoma	PML	progressive multi-focal leukoencephalopathy
NHL	non-Hodgkin's lymphoma	PMN	polymorphonuclear
NIF	negative inspiratory pressure	PMzD	Pelizeus–Merzbacher disease
NIH-SS	National Institutes of Health Stroke Scale	PNET	primitive neuroectodermal tumor
NIID	neuronal intranuclear inclusion disease	PNFA	progressive nonfluent aphasia
NMDA	N-methyl-D-aspartate	POCI	posterior circulation infarct
NMJ	neuromuscular junction	POCS	posterior circulation syndrome
NMO	neuromyelitis optica	POEMS	polyneuropathy, organomegaly, endocrinopathies, M-protein, skin changes including thickening and hyperpigmentation, clubbing of the fingers
NMS	neuroleptic malignant syndrome	POST	positive occipital sharp transients of sleep
NO	nitrous oxide	POVL	postoperative visual loss
NPC	Niemann–Pick type C	PP	preplate zone/perfusion pressure
NPH	normal pressure hydrocephalus	PPA	primary progressive aphasia
NPHP	nephronophthisis	PPRF	paremedian pontine reticular formation
NSE	neuron-specific enolase	PRES	posterior reversible encephalopathy syndrome
NTD	neural tube defect	PRG	pontine respiratory group
O-AA	organic amino aciduria	PrP	prion protein
OAA	oculomotor apraxia	PSN	paraneoplastic sensory neuropathy
OCD	obsessive compulsive disorder	PSP	progressive supranuclear palsy
ONH	optic nerve head	PSV	peak systolic velocity
OP	opening pressure	PSWC	periodic sharp wave complex
OPCA	olivopontocerebellar atrophy	PTH	parathyroid hormone
OPV	oral poliovirus vaccine	PTSD	post-traumatic stress disorder
OR	odds ratio	PWI	perfusion-weighted imaging
OSA	obstructive sleep apnea	PXA	pleomorphic xanthoastrocytoma
OTR	ocular tilt reaction	PXE	pseudoxanthoma elasticum
PA	pernicious anemia	RBC	red blood cell
PACI	partial anterior circulation infarct	RCT	randomized controlled trial
PACS	partial anterior circulation syndrome	RCVS	reversible cerebral vasoconstriction syndrome
PAF	pure autonomic failure	RDI	respiratory disturbance index
PAM	potassium aggravated myotonia	REM	rapid eye movement
PAS	para-aminosalicylic acid/periodic acid–Schiff	RERA	respiratory event-related arousal
PC	phase contrast		



RF	resistance to flow	TGF	transforming growth factor
rFVIIa	recombinant activated factor VII	THB	tetrahydrobiopterin
RLS	right-to-left shunt/restless legs syndrome	TIA	transient ischemic attack
RMSF	Rocky Mountain spotted fever	TMJ	temporomandibular joint
RNA	ribonucleic acid	TMP-SMX	trimethoprim-sulfamethoxazole
RNS	repetitive nerve stimulation	TN	trigeminal neuralgia
ROM	range-of-motion	TNF	tumor necrosis factor
RPR	rapid plasma reagin	TOAST	Trial of Org 10172 in Acute Stroke Treatment
RR	risk ratio/relative risk	TOE	trans-esophageal echocardiography
RRR	relative risk reduction	TOF	time-of-flight
(r)-tPA	(recombinant) tissue plasminogen activator	TPHA	<i>Treponema pallidum</i> particle agglutination assay
SAM	S-adenosyl-methionine	TS	Tourette's syndrome
SC	Sydenham's chorea	TSE	turbo spin echo/transmissible spongiform encephalopathy
SCA	spinocerebellar ataxia	TSH	thyroid stimulating hormone
SCC	semicircular canal	TST	thermoregulatory sweat test
SCD	subacute combined degeneration	TTE	transthoracic echocardiography
SCI	spinal cord injury	TTR	time in therapeutic range/transthyretin
SCLC	small-cell lung carcinoma	UBO	unidentified bright object
SCN	suprachiasmatic nucleus	UFH	unfractionated heparin
ScvO <sub>2</sub>	central venous oxygen saturation	ULN	upper limit of normal
SD	semantic dementia	UMN	upper motor neuron
SDB	sleep-related breathing disorder	VA	visual acuity
SDS	Shy-Drager syndrome	VaD	vascular dementia
SE	status epilepticus	VAPP	vaccine-associated paralytic poliomyelitis
SEGA	subependymal giant cell astrocytoma	VLDL	very low-density lipoprotein
SFEMG	single fiber electromyography	VDRL	Venereal Disease Research Laboratory
SGCT	subependymal giant cell tumor	V-EEG	video electroencephalography
SIADH	syndrome of inappropriate antidiuretic hormone	VEGF	vascular endothelial growth factor
SIBM	sporadic inclusion body myositis	VEMP	vestibular evoked potential
SIS	second impact syndrome	VEP	visual evoked potential
SISCOM	subtraction ictal SPECT coregistered to MRI	VF	visual field
SLE	systemic lupus erythematosus	VGCC	voltage-gated calcium channel
SMA	spinal muscular atrophy	VHL	von Hippel-Lindau disease
SMN	survival of motor neuron	VKA	vitamin K antagonist
SNAP	sensory nerve action potential	VLCFA	very long-chain fatty acid
SND	striatonigral degeneration	VLM	ventrolateral medulla
SOD	septo-optic dysplasia	VNG	video-nystagmography
SOREMP	sleep onset REM period	VNS	vagal nerve stimulation
SPECT	single photon emission tomography	VOR	vestibulo-ocular reflex
SSCP	single-stranded conformational polymorphism	VP	vascular parkinsonism/variegate porphyria
SSEP	somatosensory evoked potential	VPM	ventral posteromedial
SSPE	subacute sclerosing panencephalitis	VR	volume rendered
SSRI	selective serotonin-reuptake inhibitor	VSGP	vertical supranuclear gaze palsy
SSS	superior sagittal sinus/Scandinavian Stroke Scale	VSR	vestibulospinal reflex
SUDEP	sudden unexplained death in epilepsy	VTE	venous thromboembolism
SVV	subjective visual vertical	vWF	von Willebrand factor
SVZ	subventricular zone	VWFCP	von Willebrand factor-cleaving protease
SW	Sturge-Weber syndrome	VZ	ventricular zone
SWI	susceptibility-weighted imaging	VZV	varicella-zoster virus
TA	temporal arteritis	WBC	white blood cell
TAB	temporal artery biopsy	WBRT	whole brain radiation therapy
TACI	total anterior circulation infarct	WD	Wilson's disease
TACS	total anterior circulation syndrome	WHO	World Health Organization
TAO	thyroid-associated ophthalmopathy	WNV	West Nile virus
TB	tuberculosis	XP	xeroderma pigmentosum
TBI	traumatic brain injury		
TCD	transcranial Doppler ultrasonography		
TCS	tuberous sclerosis complex		

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# CLINICAL NEUROLOGY

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