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978-0-521-18484-7 - Acute Stroke Care: A Manual from the University of
Texas-Houston Stroke Team, Second Edition

Ken Uchino, Jennifer Pary and James C. Grotta

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Second Edition

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A Manual from the University
of Texas-Houston Stroke Team

SECOND EDITION

Ken Uchino, M.D.

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James Grotta, M.D.



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Preface to the second edition

You have just been called to the emergency department to evaluate and treat a possible stroke patient. You ask yourself: What should I do first? How do I know it is a stroke? Is it too late to reverse the damage, and if not, how do I do it? How do I make sure that I do things correctly during the first day or so to prevent worsening? This handbook is designed to answer these real-life questions. As new and effective stroke treatments are now available, and the creation of designated stroke centers for optimal care of stroke patients is endorsed and put into practice, there is a need for a guidebook that will help enlarge and inform the group of healthcare professionals responsible for delivering this care.

The handbook has been compiled from the day-to-day experiences of the Stroke Team at the University of Texas Medical School – Houston, and from subsequent experience by the co-authors in their respective practices, in caring for acute stroke patients on a dedicated in-patient stroke service. It describes the options and underlying rationale for making treatment decisions for stroke patients in the emergency department, stroke unit, neurological critical care unit, and pre-rehabilitation setting. It is evidence-based where evidence exists, but much of what is included reflects our best interpretation of what should be done in the absence of conclusive data.

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It is intended as a practical guide to be used by medical students, house officers, and other clinicians with first-hand responsibility for the “nuts and bolts” care of these patients.

The handbook has been arranged generally in chronological order, covering the things one should consider in assessing and treating the patient in the emergency department, then in the stroke unit, and then on discharge or transfer to a rehabilitation facility.

Having dealt with the diagnosis of stroke and the essential first steps in the emergency department, we then consider the management of each type of stroke in turn. We begin with ischemic stroke, followed by separate chapters detailing several important issues in ischemic stroke management; the use of thrombolytic therapy (both intravenous and endovascular), how to approach neurological deterioration, selecting appropriate secondary stroke prevention, and, finally, transient ischemic attack. Then we move on to intracerebral hemorrhage and subarachnoid hemorrhage, before ending with chapters on how to organize stroke care and the principles of rehabilitation and stroke recovery.

There is more detail in the ischemic stroke chapter because it represents the initial and most complex decision-making in the ED. When called to the ED to see an acute stroke patient, most often it will be an ischemic stroke, and since the therapy for this condition is most urgent, you should start by assuming it is an ischemic stroke. If, during your evaluation of the patient, you determine that the patient has a TIA or hemorrhage, then many of the same principles outlined in the ischemic stroke chapter also will apply, but you will find specific information for patients with TIA or hemorrhage in the appropriate chapters.

The appendices contain useful reference information that is referred to in the text but is detailed and hard to remember, such as dosing algorithms and conversion factors, standing orders, drug

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protocols, various stroke scales, and detailed description of imaging sequences and brainstem syndromes.

* In the text, an asterisk marks where there is sufficient evidence to make a strong recommendation based on randomized trials or consensus statements. However, for most decisions, such data do not exist, and we have not hesitated to include our advice based on our collective experiences, including observations of where mistakes are frequently made, and we have emphasized by bold lettering some of those areas where there are particular important values or pieces of information that can help facilitate proper treatment and avoid errors.

Since the first edition in 2007, stroke treatment has continued to evolve, and this edition includes new information in several areas. The use of TPA has now been shown to be effective in an expanded time window, and endovascular approaches and acute imaging are gaining wider use, although solid scientific data for individual decision-making are still needed. Additional recommendations based on studies of antiplatelet drugs, anticoagulants, lipid reduction, and DVT prophylaxis are also covered. We cover evidence related to most of the performance measures required for stroke center designation. Finally, this edition is fully indexed, allowing quicker access to relevant information as the reader assesses the patient in the acute care setting.

Although stroke treatment continues to become more complex, the main goals and means of patient care have not changed: quick smooth evaluation and treatment to minimize effects of stroke, supporting the patient and family through the changes that stroke brings about, evaluation of etiology for preventing future strokes, preventing complications, and enhancing recovery.

We emphasize that this is a **manual for acute stroke diagnosis and treatment**, and hence some disclaimers are needed regarding what this work does *not* cover. We presume the reader has a basic

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knowledge of neuroanatomy and vascular physiology, covered in medical and nursing school curricula. None of this is covered, though we provide a refresher for vascular anatomy in an appendix. Similarly, we presume the reader has a basic knowledge of the neurological examination and its common findings in stroke patients, covered in courses on physical diagnosis. Again, this is not covered, though we provide a review of some of the rarer brainstem syndromes in an appendix. Finally, we recognize that a detailed description of the epidemiology, pathology, and outcome of stroke and all of its subtypes, and even many aspects of its diagnosis, treatment, and prevention, are left uncovered. For these, we refer the reader to excellent standard texts on cerebrovascular disease.

We hope that this work will help the reader become more comfortable in dealing with the complexities of urgent decision-making, thereby increasing the number of medical personnel engaged in providing acute stroke care, with the end result of reducing the devastation caused by stroke in our society.

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Abbreviations

ACA	anterior cerebral artery
ACE	angiotensin converting enzyme
AHA	American Heart Association
ARR	absolute risk reduction
ASA	American Stroke Association
AVM	arteriovenous malformation
CBC	complete blood count
CBV	cerebral blood volume
CEA	carotid endarterectomy
CN	cranial nerve
CPP	cerebral perfusion pressure
CSF	cerebrospinal fluid
CT	computed tomography
CTA	CT angiography
CTP	CT perfusion
CUS	carotid ultrasound
DBP	diastolic blood pressure
DSA	digital subtraction angiography
DVT	deep venous thrombosis
DWI	diffusion-weighted imaging
ECG	electrocardiogram
ED	emergency department

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EEG	electroencephalogram
EMA	European Medicines Agency
FDA	Food and Drug Administration (USA)
FFP	fresh frozen plasma
GCS	Glasgow Coma Scale
HIT	heparin-induced thrombocytopenia
HITTS	heparin-induced thrombocytopenia with thrombotic syndrome
IA	intra-arterial
ICA	internal carotid artery
ICH	intracerebral hemorrhage
ICP	intracranial pressure
ICU	intensive care unit
IM	intramuscular
INR	international normalized ratio
IV	intravenous
IVH	intraventricular hemorrhage
LDL	low-density lipoprotein
LMN	lower motor neuron
LOC	level of consciousness
LTAC	long-term acute care
MAP	mean arterial pressure
MCA	middle cerebral artery
MI	myocardial infarction
MRA	magnetic resonance angiogram
MRI	magnetic resonance imaging
mRS	modified Rankin Scale
MTT	mean transit time
NIH	National Institutes of Health
NIHSS	National Institutes of Health Stroke Scale

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NINDS	National Institute of Neurological Disorders and Stroke
NNH	number needed to harm
NNT	number needed to treat
NPO	nil per os (nil by mouth)
OT	occupational therapy
PCA	posterior cerebral artery
PCC	prothrombin complex concentrate
PEG	percutaneous endoscopic gastrostomy
PFO	patent foramen ovale
PO	per os (by mouth)
PT	physical therapy
PTT	partial thromboplastin time
PWI	perfusion-weighted imaging
RLS	right-to-left shunt
RRR	relative risk reduction
SAH	subarachnoid hemorrhage
SBP	systolic blood pressure
SC	subcutaneous
SNF	skilled nursing facility
ST	speech therapy
TCD	transcranial Doppler ultrasound
TEE	transesophageal echocardiogram
TIA	transient ischemic attack
TPA	tissue plasminogen activator
TTE	transthoracic echocardiogram
WFNS	World Federation of Neurological Surgeons