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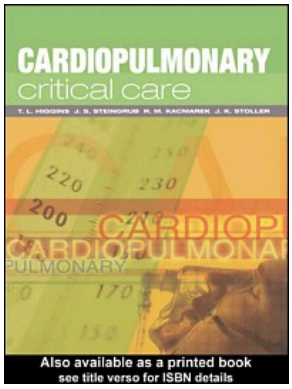
CARDIOPULMONARY
critical care
T. L. HIGGINS J. S. STEINGRUB R. M. KACMAREK J. K. STOLLER
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CARDIOPULMONARY CRITICAL CARE

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CARDIOPULMONARY CRITICAL CARE

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Contents

Abbreviations

ABG	arterial blood gas
A/C	assist/control
ACE	angiotensin converting enzyme
ACEI	angiotensin-converting enzyme inhibitor
ACLS	advanced cardiac life support
ACT	activated clotting time
ADH	antidiuretic hormone
AF	atrial fibrillation
AFl	atrial flutter
AG	anion gap
ALI	acute lung injury
ALV	adaptive lung ventilation
AMI	acute myocardial infarction
AP	accessory pathway
APACHE	Acute Physiology and Chronic Health Evaluation
APD	atrial premature depolarization
APRV	airway pressure release ventilation
APS	adaptive pressure support
aPTT	activated partial thromboplastin time
AR	adrenergic receptor
AR	aortic regurgitation
ARDS	adult/acute respiratory distress syndrome
ARF	acute respiratory failure
AS	aortic stenosis
ATC	automatic tube compensation
AV	atrioventricular
a-vDO_2	arteriovenous O_2 content difference
AVNRT	atrioventricular nodal re-entrant tachycardia
AVRT	atrioventricular re-entrant tachycardia
BAL	broncho-alveolar lavage
BiPAP	bi-level positive airway pressure
BOOP	bronchiolitis obliterans organizing pneumonia
BUN	blood urea nitrogen
CABG	coronary artery bypass grafting
CAD	coronary artery disease
cAMP	3′, 5′-cyclic adenosine monophosphate
CAP	community-acquired pneumonia
CAVH	continuous arteriovenous hemofiltration
CHF	congestive heart failure
CI	cardiac index
CNS	central nervous system
CO	cardiac output
COMT	catecholamine-o-methyl transferase
COP	colloid osmotic pressure
COPD	chronic obstructive pulmonary disease
CPAP	continuous positive airway pressure
CPB	cardiopulmonary bypass
CPK	creatine phosphokinase
CPR	cardiopulmonary resuscitation
CRRT	continuous renal replacement therapy
CSM	carotid sinus massage
CT	computer tomography
CVC	central venous catheter
CVP	central venous pressure
CVVHD	continuous veno-venous hemofiltration with dialysis
CXR	chest radiograph
DAG	diacylglycerol
DCA	dichloroacetate
DIC	disseminated intravascular coagulation
DOPA	dihydroxyphenylethylamine
2, 3-DPG	2, 3-diphosphoglycerate
DVT	deep venous thrombosis
ECCO_2R	extracorporeal membrane carbon dioxide removal

ECG	electrocardiogram/ electrocardigraphy
ECMO	extracorporeal membrane oxygenation
EDV	end-diastolic blood volume
EKG	electrocardiograph
ELISA	enzyme-linked immune serum assay
EMG	electromyogram
ERV	expiratory reserve volume
ESBL	extended spectrum β-lactamase
ESV	end-systolic blood volume
ETA	endotracheal aspirate FAST focused abdominal sonogram for trauma
FEV_1	forced expiratory volume in 1 s
FFP	fresh frozen plasma
FiO_2	fraction of inspired oxygen
FOB	fiberoptic bronchoscopy
FRC	functional residual capacity
FVC	forced vital capacity
GI	gastrointestinal
Gi	G-inhibitory (protein)
Gs	G-stimulatory (protein)
HAP	hospital-acquired pneumonia
HALF	hypertonic albuminated fluid
HFJV	high-frequency jet ventilation
Hgb	hemoglobin
HSS	hypertonic saline solution
5-HT	5-hydroxytryptamine
HTN	hypertension
IABC	intraaortic balloon counterpulsation
IABP	intraaortic balloon pump
IC	inspiratory capacity
ICD	internal cardiac defibrillator
ICU	intensive care unit
IL	interleukins
IJV	internal jugular vein
IMV	intermittent mandatory ventilation
INR	international normalized ratio
IP3	inositol 1,4,5-triphosphate
IPC	intermittent pneumatic compression
IPG	impedance plethysmograpy
IRV	inspiratory reserve volume
LA	left atrial
LAP	left atrial pressure
LBBB	left bundle branch block
LDUH	low-dose unfractionated heparin
LMWH	low molecular weight heparin
LPVS	lung-protective ventilatory strategy
LR	lactated Ringer's solution
LV	left ventricle/ ventricular
LVEDP	left ventricular end-diastolic pressure
LVEDV	left ventricular end-diastolic blood volume
LVSWI	left ventricular stroke work index
MAO	monoamine oxidase
MAP	mean arterial pressure
MAT	multifocal atrial tachycardia
MCT	medium-chain triglyceride
MI	myocardial infarction
MIC	minimal inhibitory concentration
MICU	medical intensive care unit
MIP	maximal inspiratory pressure
MMV	mandatory minute ventilation
MODS	multiple organ dysfunction syndrome
MPAP	mean pulmonary arterial pressure
MPM	Mortality Probability Model
MR	mitral regurgitation
MRI	magnetic resonance imaging
MRSA	methicillin-resistant *Staphylococcus aureus*
MS	mitral stenosis
MSOF	multiple system organ failure
MV	mechanical ventilator
MVV	maximal voluntary ventilation
MW	molecular weight
NE	norepinephrine
NG	nasogastric
NIF	negative inspiratory force
NIPPV	noninvasive positive pressure ventilation
NPV	negative predictive value
NS	normal saline solution
NSTEMI	non-ST elevation myocardial infarction
OHS	open-heart surgery
OR	operating room

PA	pulmonary artery
PA/C	pressure assist/control
PAC	pulmonary artery catheterization/catheter
$PaCO_2$	arterial CO_2 tension
PACU	post-anesthesia care units
PAI-1	plasminogen activator inhibitor I
PAO	pulmonary artery occlusion
PaO_2	mixed venous O_2 tension
PAOP	pulmonary artery occlusion pressure
PAP	pulmonary artery pressure
PAWP	pulmonary artery wedge pressure
PBS	protected brush specimens
PCIRV	pressure control inverse ratio ventilation
PCWP	pulmonary capillary wedge pressure
PDI	phosphodiesterase inhibitor
PE	pulmonary embolism
PEA	pulseless electrical activity
PEEP	positive end-expiratory pressure
PLV	partial liquid ventilation
PMC	point of maximum compliance change
Ppl	intrathoracic/intrapleural pressure
PPV	positive predictive value
PRVC	pressure-regulated volume control
PS	pressure support
PSV	pressure support ventilation
PVC	premature ventricular contraction
PVR	pulmonary vascular resistance
q	every
RBBB	right bundle branch block
RBC	red blood cells
rhAPC	recombinant activated protein C
RIJV	right internal jugular vein
RPF	renal plasma flow
RPP	rate pressure product
RTA	renal tubular acidosis
rtPA	recombinant tissue type plasminogen activator
RV	residual volume
RV	right ventricle/ventricular
RVSWI	right ventricular stroke work index
SaO_2	arterial O_2 saturation
SB	sinus bradycardia
SCM	sternocleidomastoid muscle
SDD	selective digestive decontamination
SI	stroke index
SILV	synchronous independent lung ventilation
SIMV	synchronized intermittent mandatory ventilation
SIRS	systemic inflammatory response syndrome
SR	sinus rhythm
ST	sinus tachycardia
ST	surface tension
STEMI	ST elevation myocardial infarction
SV	stroke volume
SVC	superior vena cava
SVR	systemic vascular resistance
SVT	supraventricular tachycardia
TBW	total body water
TCO	thermodilution cardiac output
TdP	Torsades de Pointes
TEE	transesophageal echocardiogram
TFPI	tissue factor protein inhibitor
THAM	tromethamine
TLC	total lung capacity
TNF	tumor necrosis factor
TV	tidal volume
UAG	urinary anion gap
UIP	upper inflection point
US	compression ultrasonography
VAP	ventilator-associated pneumonia
VAPS	volume-assured pressure support
VC	vital capacity
VILI	ventilator-induced lung injury
VIP	vasoactive infusion port
VO_2	O_2 consumption
VQ	ventilation-perfusion (ratio)
VRE	vancomycin-resistant enterococci
VS	volume support
VT	ventricular tachycardia
VTE	venous thromboembolism
WCT	wide complex tachycardias
WOB	work of breathing
WPW	Wolfe-Parkinson-White (pattern)

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Introduction

Does the world need another critical care textbook? As I look around my office, I count four hefty, comprehensive critical care tomes, five ICU handbooks, and more than two dozen related texts on mechanical ventilation, nutritional support, arrhythmia management, monitoring and pharmacotherapy. My handheld organizer provides me with instant antibiotic and drug-dosage recommendations, and I can easily search the literature on computers in my office, at home, and at every nursing station. With all of this information readily at hand, why would anyone want another critical care text?

The answer may be found in the concept of the evolutionary 'niche'. The audience for this book is not necessarily the expert in critical care, who presumably also has a well-stocked bookshelf in his or her office. This book is intended for clinicians with intermittent responsibilities for critically ill patients in a world of competing demands. Our target audience includes the medical student on a final-year elective, the house officer on a one-month rotation in the ICU, the nurse or respiratory therapist seeking more information, and the general internist, surgeon or anesthesiologist who occasionally cares for critically ill patients. Hospitalists (hospital-based doctors) may find this book to be particularly useful, especially if their hospital does not support full-time critical care staff. Our goal was to create a work with more depth than the typical pocket reference, while avoiding the bulk and expense of a more encyclopedic work. In order to achieve this goal, we have concentrated this volume on cardiac and pulmonary issues in the ICU. While the intent is for this book to be part of a larger family of books that would, in total, approximate a standard text this volume also stands on its own. The hope is that it will provide a logical approach and best-practice suggestions for a variety of common critical care issues, while remaining small enough to be read cover-to-cover. The authors recognize that controversy exists in many treatment decisions, but have chosen to present a consensus approach, buttressed by essential references. My feeling is that questions raised at 3 in the morning should be answered succinctly. I'm happier to engage in a spirited discussion supported by 200 conflicting references when the patient has been stabilized.

Where possible, chapters have been arranged to present a brief overview of the disease process and epidemiology, diagnostic criteria, important differential diagnostic considerations, and practical, evidence-based advice on patient management. We have only touched on prognostic information, enough to use in discussions with family members. Tables have been used to facilitate quick reference, and the figures are similar to what we would hand-draw on morning rounds to illuminate a concept. Some chapters are intended to expose background information (Respiratory and Cardiac Physiology, Oxygen Delivery and Utilization, Clinical Shock States, Respiratory Muscle Function, ARDS) while others are more practically oriented (Pressors and Inotropes, Hypertensive Emergencies, Cardiac Rhythm Disturbances, Nosocomial Pneumonia, Weaning from Mechanical Ventilation, and Postoperative Care). In looking through other textbooks, we felt that the mechanics of line placement were seldom detailed, and have included a richly illustrated chapter on Line Placement Techniques.

In order to keep the book to a reasonable size, we have deliberately omitted important aspects of critical care—specifically neurologic and neurosurgical management, gastrointestinal bleeding, toxicity and poisoning, hematalogic and oncologic management, renal issues including dialysis, and infectious/immuno-logic issues. Plans are in the works for companion volumes to address these topics.

Just as the practice of critical care is a multi-disciplinary, team effort, so to is the process of bringing a textbook to life. The authors would like to recognize the efforts of a number of individuals whose contributions were essential to this book. First and foremost, Ms. Suzanne Allen, administrative assistant for Baystate Medical Center's Critical Care Division, spent countless hours typing and retyping manuscripts, chased down letters of permission to reprint figures and tables, and kept the project moving and organized. Mr. Jonathan Gregory initiated the project for BIOS Scientific Publishers Ltd, helped formulate the style of the book and provided much-needed encouragement during the battle to complete the manuscripts. Ms. Victoria Oddie and Dr. Katie Deaton, of the Editorial Department at BIOS, helped tidy up the manuscript and fix the many overlooked details as the book wound its way to production. Aimie Haylings, our Production Editor, gracefully pushed the book through its final months, and managed to turn indecipherable scrawls and eighth-generation photocopies into art.

Special thanks is also due to our colleagues: attending physicians, nurses, respiratory therapists, fellows, residents and medical students who asked the right questions at the right times, and who generously read manuscript drafts and offered valuable suggestions. Our spouses and families deserve thanks for their unconditional love, patience, wit and support when another impossible deadline loomed. Above all, we thank our patients and their families, from whom we have learned so much to be applied in the future.

Thomas L.Higgins MD

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