Fundamentals of Anaesthesia

Third Edition

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to Beccy, Jane, Linda and Marlene

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Preface to the first edition

The advent of a syllabus for the FRCA examination, itself a requirement of the STA, seemed to me to provide an ideal opportunity for a dedicated revision textbook. It will therefore be of no surprise to readers that this volume mirrors closely the syllabus for the primary FRCA in both structure and content.

Having enlisted the willing help of my two co-editors, Tim Smith and Ted Lin, we set about recruiting authors to contribute. Chapter authors have been chosen for their ability and known prowess as teachers and a deliberate policy of not inviting 'usual' contributions from frequently seen names was taken. Having said that, several primary examiners appear as contributors and within each chapter coverage of revision topics has been kept as appropriate to the examination as possible.

To reduce the variability that is the bane of multi-author texts I have personally edited every chapter to ensure consistency of style and it is a reflection of the workload involved that it has taken three years to complete this project. I am grateful to all contributing authors for their tolerance and good humour during alteration of their golden prose.

Whilst no single book can cover the entire syllabus as a 'one stop' aid, the majority of material covered in the examination is detailed within these pages. Some items lately included in the syllabus, after completion of the manuscript, will be added in future editions (such as the anatomy pertaining to ankle block). Candidates will, however, be well served if this book is used as a general basis for revision.

I am extremely grateful to Rob Jones, who has been responsible for generating virtually all the artwork within this text, the few other diagrams being credited to their sources.

Thanks are also due to both my co-editors for their extensive work and dedication. If this volume enables any candidate to pass the primary examination, who would not have done so otherwise, then our job will have been well done.

C. A. Pinnock
July 1999

Preface to the second edition

I am delighted that the success of *Fundamentals* has enabled us to proceed to an early second edition. It will be apparent to the familiar reader that this edition has undergone rather more than a simple facelift. A great deal of feedback from both examiners and candidates has been used to modify and shape this current volume. New authors have been brought in to Section 1 to revise and modify the clinical chapters where necessary (incorporating several important and new areas of emerging knowledge), whilst resuscitation and trauma chapters have been updated by their original writers. Anatomy has been extended in scope to reflect subjects that are currently popular in the Primary FRCA.

In Section 2, there are new chapters on neurology and endocrinology, and an extra chapter on neonatal physiology has been incorporated to satisfy the demands of the examination syllabus.

Section 3 has been updated comprehensively with the removal of some drugs now lapsed and the incorporation of newer agents that have become available. By popular demand a new chapter on clinical trial design rounds off the pharmacology section.

It is, however, Section 4 that has undergone the most radical changes. I am very grateful to Ted Lin for the completely new physics and equipment chapters, which provide excellent core revision in these important areas. A greater number of diagrams (and many revised graphics) throughout the book and a completely new index complete the modifications over the first edition.

I thus believe that the second edition of *Fundamentals* is an even better revision aid to the Primary FRCA examination and will build on the reputation of its forerunner. Once again my thanks go to my three co-editors for their hard work and determination.

Colin Pinnock
October 2002

Preface to the third edition

I am privileged to have led the creation of the third edition of this popular Primary FRCA text, ably helped by my three co-editors. Once again, feedback from users of the book has helped enormously in developing *FoA3*. The Royal College of Anaesthetists' publication of the Primary syllabus within the Competency-based Training Framework has led us to include that knowledge base, uniquely referenced to *Fundamentals*, in a new Appendix. A number of new contributors have enhanced the proportion of current and past examiners amongst our writers. The greater use of colour allows the reader to navigate more easily, and changes to technique boxes make that information easier to assimilate. This edition contains a number of new chapters in addition to widespread updates, and has been thoroughly copy-edited by Hugh Brazier to an unrivalled standard of consistency over the previous editions.

Whilst all chapters have been reviewed, there are a number of significant changes.

- Section 1 contains a significantly updated chapter in the growing field of preoperative assessment, and a brand new chapter on resuscitation. The inclusion of the DAS algorithms for airway management is a particular bonus.
- In Section 2 Ted Lin has written an additional chapter specifically covering the physiology of pain, and Colin Pinnock has edited haematology to bring it more in line with the current syllabus.
- Section 3 has a new chapter on analgesic drugs, taking account of the substantial developments in this area. The new chapter on mechanisms of drug action puts clear emphasis on the current thinking on the mechanism of anaesthesia.
- In Section 4, Ted Lin has put together a clear and concise statistics chapter, which will make preparation for this part of the exam straightforward. The inclusion of aspects of ultrasound and MRI scanning here and in the clinical section follows its incorporation into the syllabus.

Despite suggestions to expand *Fundamentals* to cover anaesthesia to higher levels and in greater depth, we have adhered to our original aim of providing a textbook specifically designed around the RCA Primary Fellowship. In so doing, we have been better able to adapt to changes in that exam as well as in anaesthetic core knowledge. The result is a much more effective exam preparation tool, which in turn is frequently used as a starting point for anaesthetists (and indeed others) of all grades including consultants, some of whom achieved exam success helped by the first edition. Finally, I am particularly grateful to Colin for his help and advice during my turn at leading the editorial process.

We were saddened to hear of the death of Dr Andy Ogilvy, author of Section 2, Chapter 11, as this edition was in preparation.

Tim Smith
March 2008

How to use this book

FoA3 is not just a book. It is a tool to enable the reader to develop both their anaesthetic practice and an understanding of the scientific principles of anaesthesia.

The book has been structured to correlate closely with the syllabus of the Primary FRCA. The knowledge sections of the syllabus are listed in the Appendix, and each section of the syllabus is cross-referenced to the relevant page(s) of the text to facilitate revision.

Acknowledgements

A number of organisations have kindly allowed us to use illustrations, tables and other material in these pages. We gratefully acknowledge the help given by the parties listed below in granting permission to use the material cited.

Association of Anaesthetists of Great Britain and Ireland
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- Figure IA5: Clinical features of anaphylaxis
- Figure IA6: First clinical features of anaphylaxis
- Figure IA7: Management of a patient with suspected anaphylaxis

Section 1, Chapter 3
- Figure IN6: Recommendations for standards of monitoring during anaesthesia and recovery

Section 1, Chapter 4
- Figure PO1: Criteria to be met before transfer from recovery room to general ward

Section 1, Chapter 5
- Figure SC9: Indications for intubation and ventilation for transfer after brain injury
- Figure SC10: Transfer checklist for neurosurgical patients

Section 4, Chapter 3
- Figure EQ41: AAGBI checklist for anaesthetic equipment

British Journal of Anaesthesia (BMJ Publishing Group / Oxford University Press)
Section 1, Chapter 4
- Figure PO11: DVT risk group classification

Section 4, Chapter 3
- Figure EQ20: Mapleson classification system for breathing systems

Difficult Airway Society (UK)
Section 1, Chapter 2
- Figure IA11: Unanticipated difficult intubation during routine induction of anaesthesia
- Figure IA12: Unanticipated difficult intubation during rapid sequence induction
- Figure IA13: Failed intubation: rescue techniques for the 'can't intubate, can't ventilate' situation

European Resuscitation Council and **Resuscitation Council** (UK)
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European Society of Regional Anaesthesia
Section 1, Chapter 7
- Figure RA19: ESRA good practice guidelines for thromboprophylaxis and CNB

Pharmacokinetics of Anaesthesia, ed. C. Prys-Roberts and C. C. Hug. Oxford: Blackwell, 1984
Section 3, Chapter 4
- Figure PK9: Mapleson's water analogue models

Royal College of Anaesthetists
Appendix: Primary FRCA syllabus

The Sourcebook of Medical Illustration, ed. P. Cull. Carnforth: Parthenon Publishing Group, 1989
Section 1, Chapter 7
- Figure RA7: Patient positions for spinal anaesthesia

Abbreviations

2,3-DPG	2,3-diphosphoglycerate
5-HT	5-hydroxytryptamine
A	adenine
A	ampere
A&E	accident and emergency
ABC	airway, breathing, circulation
ABV	arterial blood volume
AC	alternating current
ACC	anterior cingulate cortex
ACE	angiotensin-converting enzyme
ACh	acetylcholine
ACT	activated clotting time
ACTH	adrenocorticotropic hormone
ACTH-RH	adrenocorticotropic hormone-releasing hormone
ADCC	antibody-dependent cell-mediated cytotoxicity
ADH	antidiuretic hormone
ADP	adenosine diphosphate
ADR	adverse drug reaction
ADROIT	Adverse Drug Reactions Online Information Tracking
AED	automated external defibrillator
AER	audio evoked response
AF	atrial fibrillation
AIDS	acquired immune deficiency syndrome
ALS	advanced life support
AMD	airway management device
AMP	adenosine monophosphate
AMPA	α-amino 3-hydroxy 5-methyl 4-isoxazolepropionic acid
Ang I	angiotensin I
Ang II	angiotensin II
ANOVA	analysis of variance
ANP	atrial natriuretic peptide
ANS	autonomic nervous system
ANSI	American National Standards Institute
AP	action potential (in cardiac physiology)
AP	anteroposterior
AP	anaesthetic proof
APC	activated protein C
APC	antigen-presenting cell
APCR	activated protein C resistance
APG	anaesthetic proof category G
APL	adjustable pressure-limiting
APTT	activated partial thromboplastin time
AQP	aquaporin
ARDS	acute respiratory distress syndrome
ARR	absolute risk reduction
ASA	American Society of Anesthesiologists
ASIC	acid-sensing ion channel
ASIS	anterior superior iliac spine
ATLS	advanced trauma life support
ATP	adenosine triphosphate
ATPS	ambient temperature and pressure saturated
AUC	area under curve
AV	atrioventricular
AVNRT	AV nodal re-entry tachycardia
AVRT	AV re-entry tachycardia
bd	twice a day
BDNF	brain-derived neurotrophic factor
BLS	basic life support
B_M	B memory cell
BMI	body mass index
BMR	basal metabolic rate
$BMRO_2$	basal metabolic rate of oxygen consumption
BNP	brain natriuretic peptide
BP	blood pressure
BP	boiling point
bpm	beats per minute
BSA	body surface area
BSER	brain-stem evoked responses
BTPS	body temperature and pressure saturated
c	centi
C	cytosine
Ca	arterial compliance
CAM	cell adhesion molecules
cAMP	cyclic adenosine monophosphate

C_AO_2	alveolar oxygen content
CaO_2	arterial oxygen content
CAPD	continuous ambulatory peritoneal dialysis
CBF	cerebral blood flow
CBG	corticosteroid-binding globulin
CBV	cerebral blood volume
CCK	cholecystokinin
CcO_2	capillary oxygen content
cd	candela
CFAM	cerebral function analysing monitor
CGRP	calcitonin gene-related peptide
CI	cardiac index
CI	confidence interval
CK	creatinine kinase
CL	confidence limit
Cl	clearance
C_L	lung compliance
$CMRO_2$	cerebral metabolic rate of oxygen consumption
CNB	central nerve block
CNS	central nervous system
CO	cardiac output
CO_2	carbon dioxide
CoA	co-enzyme A
COAD	chronic obstructive airways disease
COMT	catechol-O-methyl transferase
COP	colloid osmotic pressure
COPA	cuffed oropharyngeal airway
cos	cosine
COSHH	control of substances hazardous to health
COX	cyclo-oxygenase
CP	creatine phosphate
CPAP	continuous positive airway pressure
CPD-A	citrate phosphate dextrose adenine
CPK MB	creatinine phosphokinase (cardiac isoenzyme)
CPP	cerebral perfusion pressure
CPP	coronary perfusion pressure
CPR	cardiopulmonary resuscitation
C_R	respiratory system compliance
CRPS	complex regional pain syndrome
CSE	combined spinal–epidural
CSF	cerebrospinal fluid
CSM	Committee on Safety of Medicines
CT	computerised tomography
CTZ	chemoreceptor trigger zone
CV	controlled ventilation
CvO_2	mixed venous oxygen content
CVP	central venous pressure
CVS	cardiovascular system
Cw	chest wall compliance
d	deci
D	dopaminergic
da	deca
DAG	diacylglycerol
D&C	dilatation and curettage
DC	direct current
DCR	dacryocystorhinostomy
DDAVP	1-deamino-8-arginine vasopressin
DHEA	dehydroepiandrosterone
DIC	disseminated intravascular coagulation
DIT	di-iodothyronine
DLCO	diffusing capacity of the lungs for carbon monoxide
DNA	deoxyribonucleic acid
DNAR	do not attempt resuscitation
DNR	do not resuscitate
$\dot{D}O_2$	oxygen delivery
DRG	dorsal root ganglion
DVT	deep venous thrombosis
Ea	arterial elastance
EAR	expired air respiration
EBC	effective blood concentration
EC	effective concentration
ECA	electrical control activity
ECF	extracellular fluid
ECF-A	eosinophil chemotactic factor of anaphylaxis
ECFV	extracellular fluid volume
ECG	electrocardiogram
ECMO	extracorporeal membrane oxygenation
ECV	effective circulating volume
ED_{50}	effective dose in 50% of population
ED_{95}	effective dose in 95% of population
EDP	end-diastolic point
EDPVR	end-diastolic pressure–volume relationship
EDRF	endothelium-derived relaxing factor
EDTA	ethylenediaminetetra-acetate
EDV	end-diastolic volume
EEG	electroencephalogram
Ees	ventricular systolic elastance
EF	ejection fraction
EM	electromagnetic
EMD	electromechanical dissociation
EMF	electromotive force
EMG	electromyogram
EMLA	eutectic mixture of local anaesthetic
EMS	emergency medical service
ENT	ear nose and throat

EPO	erythropoietin
EPSP	excitatory postsynaptic potential
ER	endoplasmic reticulum
ER	extraction ratio
ERC	European Resuscitation Council
ERK	extracellular signal-regulated kinase
ERPC	evacuation of retained products of conception
ERV	expiratory reserve volume
ESP	end-systolic point
ESPVR	end-systolic pressure–volume relationship
ESR	erythrocyte sedimentation rate
ESRA	European Society of Regional Anaesthesia
ESV	end-systolic volume
ET	endothelium
ETC	oesophageal–tracheal combitube
$ETCO_2$	end-tidal carbon dioxide
ETT	endotracheal tube
f	femto
f	frequency of breaths
F	gas flow
F/M	feto maternal ratio
FA	fatty acid
FAC	fractional area change
$FACO_2$	fractional alveolar carbon dioxide concentration
$FADH_2$	flavine adenine dinucleotide
FBC	full blood count
FDC	F-decalin
FDP	fibrin degradation product
Fe^{2+}	ferrous iron state
$FĒCO_2$	fractional mixed expired carbon dioxide concentration
FEMG	frontalis electromyogram
FEV%	ratio of FEV_1 to FVC
FEV_1	forced expiratory volume in one second
FFA	free fatty acids
FFP	fresh frozen plasma
FFT	fast Fourier transform
FG	fat group
FGF	fresh gas flow
FIO_2	fractional inspired oxygen concentration
FNHTR	febrile non-haemolytic transfusion reactions
FRC	functional residual capacity
FSH	follicle-stimulating hormone
FTPA	F-tripropylamine
FVC	forced vital capacity
G	giga
G	guanine
GABA	gamma-aminobutyric acid
GCS	Glasgow coma scale
GDNF	glial cell line-derived neurotrophic factor
GDP	guanine diphosphate
GFR	glomerular filtration rate
GH	growth hormone
GI	gastrointestinal
GIT	gastrointestinal tract
GlyR	glycine receptor
GMP	guanosine monophosphate
GP	glycolytic phosphorylation
GPCR	G-protein-coupled receptor
GTN	glyceryl trinitrate
GTP	guanosine triphosphate
h	hecto
h	hour
H_2	histamine receptor 2
HAFOE	high airflow oxygen enrichment
HAS	human albumin solution
Hb	haemoglobin
HbA	adult haemoglobin
HbCO	carboxyhaemoglobin
HbF	fetal haemoglobin
HBF	hepatic blood flow
Hbmet	methaemoglobin
HbS	sickle haemoglobin
Hbsulph	sulphaemoglobin
HCG	human chorionic gonadotrophin
HCO_3^-	bicarbonate
Hct	haematocrit
HD	haemodialysis
HDL	high density lipoprotein
HDN	haemolytic disease of the newborn
HDU	high dependency unit
HELLP	haemolytic anaemia elevated liver enzymes low platelets
HER	hepatic extraction ratio
HFJV	high-frequency jet ventilation
HIV	human immunodeficiency virus
HME	heat and moisturiser exchanger
HMWK	high molecular weight kininogen
HPL	human placental lactogen
HPV	hypoxic pulmonary vasoconstriction
HR	heart rate
Hz	hertz
I	current
I : E	inspiratory : expiratory ratio
IABP	intra-aortic balloon pump

IC	insular cortex
ICAM	intercellular adhesion molecule
ICF	intracellular fluid
ICP	intracranial pressure
ICU	intensive care unit
IDDM	insulin dependent diabetes mellitus
IgA	immunoglobulin A
IgE	immunoglobulin E
IGF	insulin-like growth factor
IgG	immunoglobulin G
iGluR	ionotropic glutamine receptor
IgM	immunoglobulin M
IHD	ischaemic heart disease
IL	interleukin
ILCOR	International Liaison Committee on Resuscitation
IM	intramuscular
IML	intermediolateral
INR	international normalised ratio
IO	intraosseous
IOP	intra-ocular pressure
IP_3	inositol triphosphate
IPSP	inhibitory postsynaptic potential
IR	infrared
IRV	inspiratory reserve volume
ISI	international sensitivity index
ISPTA	spatial-peak temporal-average intensity
IT	implant tested
ITP	idiopathic thrombocytopaenia purpura
IU	International units
IV	intravenous
IVC	inferior vena cava
IVIg	intravenous immunoglobulin
IVRA	intravenous regional anaesthesia
J	joule
JVP	jugular venous pressure
k	kilo
K	kelvin
KCCT	kaolin clotting time
KE	kinetic energy
LAK	lymphokine-activated killer
LAP	left atrial pressure
Laser	light amplification by stimulated emission of radiation
LBP	lipopolysaccharide binding protein
LC	locus coeruleus
LCNT	lateral cutaneous nerve of the thigh
LD_{50}	lethal dose 50%
LDL	low density lipoprotein
LED	light-emitting diode
LH	luteinising hormone
LIS	lateral intracellular space
LMA	laryngeal mask airway
LMW	low molecular weight
LMWH	low molecular weight heparin
LOH	loop of Henle
LOR	loss of resistance
LOS	lower oesophageal sphincter
LT	leukotriene
LV	left ventricle
LVEDP	left ventricular end-diastolic pressure
LVEDV	left ventricular end-diastolic volume
LVF	left ventricular failure
LVH	left ventricular hypertrophy
LVSW	left ventricular stroke work
LVSWI	left ventricular stroke work index
μ	micro
m	metre
m	milli
M	mega
M	muscarinic
MAC	minimum alveolar concentration
MAO	monoamine oxidase
MAOI	monoamine oxidase inhibitor
MAP	mean arterial pressure
MCH	mean cell haemoglobin
MCV	mean cell volume
MDP	maximum diastolic potential
MEA	microwave endometrial ablation
MEFR	mid-expiratory flow rate
MEPP	miniature endplate potential
MEWS	modified early warning system
MFR	mannosyl–fucosyl receptor
MG	muscle group
MH	malignant hyperthermia
MHC	major histocompatability
MI	myocardial infarction
MIA	mechanically insensitive afferent
MIC	minimum inhibitory concentration
MILS	manual in line stabilisation
MIR	minimum infusion rate
MIRL	membrane inhibitor of reactive lysis
MIT	mono-iodothyronine
MMC	migratory motor complex
mmHg	millimetres of mercury (pressure)
MODS	multiple organ dysfunction syndrome

mol	mole
MONA	morphine, oxygen, nitrates, aspirin
MPAP	mean pulmonary arterial pressure
mRNA	messenger RNA
MSA	mechanically sensitive afferent
MRSA	methicillin-resistant *Staphyloccocus aureus*
MUGA	multigated scan
MV	minute volume
MW	molecular weight
n	nano
N	newton
nAChR	nicotinic acetylcholine receptor
NADH	nicotinamide adenine dinucleotide
NADPH	nicotinamide adenine dinucleotide phosphate
$NaHCO_3$	sodium bicarbonate
NANC	non-adrenergic non-cholinergic
Nd-YAG	neodymium yttrium aluminium garnet
NGF	nerve growth factor
NIBP	non-invasive blood pressure
NIST	non-interchangeable screw thread
NK	natural killer
NK	neurokinin receptor
NMDA	N-methyl-D-aspartate
NMJ	neuromuscular junction
NNH	number needed to harm
NNT	number needed to treat
NO	nitric oxide
NREM	non-rapid eye movement
NRM	nucleus raphe magnus
NSAID	non-steroidal anti-inflammatory drug
NTP	normal temperature and pressure
NTS	nucleus tractus solitarius
NV	nausea and vomiting
NWC	number of words chosen
Ω	ohm
O/G	oil/gas
O/W	oil/water
OCI	oesophageal contractility index
ODC	oxyhaemoglobin dissociation curve
OP	oxidative phosphorylation
OPAC	oximetric pulmonary artery catheter
OR	odds ratio
Osm	osmole
π	osmotic pressure
p	pico
P	probability
Pa	pascal
PA	pulmonary artery
PABA	para-aminobenzoic acid
PAC	pulmonary artery catheter
$PACO_2$	partial pressure of carbon dioxide – alveolar
$PaCO_2$	partial pressure of carbon dioxide – arterial
PACWP	pulmonary artery capillary wedge pressure
PADP	pulmonary artery diastolic pressure
PAF	platelet activating factor
PAG	periaqueductal grey
PAH	para-aminohippuric acid
PAO_2	partial pressure of oxygen – alveolar
PaO_2	partial pressure of oxygen – arterial
PARS	patient at risk score
PART	patient at risk team
Paw	airway pressure
PBP	penicillin-binding protein
PCA	patient controlled analgesia
PCC	prothrombinase complex concentrates
PCEA	patient-controlled epidural analgesia
PCO_2	partial pressure of carbon dioxide
PCWP	pulmonary capillary wedge pressure
PD	photodiode
PDE	phosphodiesterase enzyme
PDGF	platelet-derived growth factor
PDPH	post-dural puncture headache
PE	potential energy
PE	pulmonary embolus
$P\bar{E}CO_2$	partial pressure end-tidal carbon dioxide
PEA	pulseless electrical activity
PEEP	positive end-expiratory pressure
PEFR	peak expiratory flow rate
PFC	perfluorocarbon
PGE	prostaglandin E
PGG	prostaglandin G
PGH	prostaglandin H
PGI	prostaglandin I
Pi	inorganic phosphate
PIH	prolactin inhibiting hormone
PIP_2	phosphatidylinositol bisphosphate
PK	prekallikrein
PLOC	provoked lower oesophageal contractions
PMN	polymorphonuclear neutrophils
PNMT	phenylethanolamine N-methyl transferase
PO_2	partial pressure of oxygen
PONV	postoperative nausea and vomiting
PPAR	peroxisome proliferator-activated receptor
PPF	plasma protein fraction
PPHN	persistent pulmonary hypertension of the newborn

ppm	parts per million
PPP	pentose phosphate pathway
PRI	pain rating index
PRST	pressure, rate, sweating, tears
PSI	pounds per square inch
PSVT	paroxysmal supraventricular tachycardia
PT	prothrombin time
PTC	post tetanic count
PTH	parathyroid hormone
PTT	partial thromboplastin time
PTTK	partial thromboplastin time with kaolin
PV	pressure volume
PVC	poly vinyl chloride
PVD	peripheral vascular disease
PVG	periventricular grey
PVR	pulmonary vascular resistance
Q	flow
Q	charge
$\dot{Q}$	cardiac output
Qs	shunt flow
R	resistance (electrical)
R	universal gas constant
RAP	right atrial pressure
RAS	reticular activating system
RAST	radioallergosorbent test
RBC	red blood cell
RBF	renal blood flow
RDS	respiratory distress syndrome
Re	Reynolds number
REM	rapid eye movement
RH	relative humidity
RIMA	reversible inhibitor of monoamine oxidase A
RMP	resting membrane potential
RNA	ribonucleic acid
RNU	regional neurosurgical unit
ROC	receptor-operated ion channel
RPF	renal plasma flow
RQ	respiratory quotient
rRNA	ribosomal RNA
RR	relative risk
RRR	relative risk reduction
RS	respiratory system
RSI	rapid sequence induction
RT_3	reverse tri-iodothyronine
RV	residual volume
RV	right ventricle
RVM	rostral ventromedial medulla
RVSWI	right ventricular stroke work index
Σ	sum of
s	second
S/N	signal to noise ratio
SA	sinoatrial
SAGM	saline adenine glucose mannitol
SaO_2	arterial oxygen saturation
SARS	severe acute respiratory syndrome
SD	standard deviation
SEM	standard error of the mean
SFH	stroma-free haemoglobin
SI	stroke index
SI	Système International d'Unités (International System of Units)
SIADH	syndrome of inappropriate ADH secretion
SIMV	synchronised intermittent mandatory ventilation
sin	sine
SIRS	systemic inflammatory response syndrome
SL	semilunar
SLE	systemic lupus erythematosus
SLOC	spontaneous lower oesophageal contractions
SMP	sympathetically maintained pain
SNGFR	single-nephron glomerular filtration rate
SNP	sodium nitroprusside
SO_2	oxygen saturation
SpO_2	pulse oximeter oxygen saturation
SR	sarcoplasmic reticulum
SRS-A	slow reacting substance of anaphylaxis
SSRI	selective serotonin reuptake inhibitor
STOP	suction termination of pregnancy
STT	spinothalamic tract
SV	stroke volume
SVC	superior vena cava
SVI	systemic vascular index
SvO_2	mixed venous oxygen saturation
SVP	saturated vapour pressure
SVR	systemic vascular resistance
SVWI	stroke volume work index
SW	stroke work
T	absolute temperature
T	tera
T	thymine
$t_{1/2}$	half-life
T_3	tri-iodothyronine
T_4	thyroxine
tan	tangent
TBPA	thyroxine-binding prealbumin
TBG	thyroxine-binding globulin
TBV	total blood volume

TBW	total body water
Tc	cytotoxic T cell
TCA	tricyclic antidepressant
TCR	T-cell receptor
TCRE	transcervical resection of endometrium
TENS	transcutaneous electrical nerve stimulation
T_H	T helper cell
THC	terahydro-cannabinol
THR	total hip replacement
TIVA	total intravenous anaesthesia
TKR	total knee replacement
TLC	total lung capacity
TLV	total lung volume
T_m	tubular maximum
TNF	tumour necrosis factor
TOE	transoesophageal echocardiography
TOF	train of four
TP	threshold potential
t-PA	tissue-type plasminogen activator
TPP	thiamine pyrophosphate
TRALI	transfusion-related acute lung injury
TRH	thyrotropin-releasing hormone
tRNA	transfer RNA
TRP	transient receptor potential
TRPV1	transient receptor potential vanilloid 1
TSH	thyroid-stimulating hormone
TT	thrombin time
TTN	transient tachypnoea of the newborn
TUR	transurethral resection
TURBT	transurethral resection of bladder tumour
TURP	transurethral resection of the prostate
TXA_2	thromboxane A_2
U&E	urea and electrolytes
UBF	uterine blood flow
UFH	unfractionated heparin
UK	United Kingdom
UOS	upper oesophageal sphincter
URT	upper respiratory tract
URTI	upper respiratory tract infection
UTP	uridine triphosphate
UV	ultra violet
v	velocity
V	volt
$\dot{V}/\dot{Q}$	ventilation/perfusion
VA	alveolar volume
V_{BL}	blood volume
VC	vital capacity
VCO_2	carbon dioxide flux
VD	anatomical dead space
Vd	volume of distribution
VER	visual evoked response
VF	ventricular fibrillation
VIC	vaporiser inside circle
VIE	vacuum-insulated evaporator
V_{INT}	interstitial fluid volume
VIP	vasoactive intestinal peptide
VLDL	very low density lipoprotein
VMA	vannilyl mandelic acid
VO_2	oxygen uptake in the lungs
VOC	vaporiser outside circle
VPC	ventricular premature contractions
V_{PL}	plasma volume
VPN	ventral posterior nucleus of the thalamus
V_{RBC}	red blood cell volume
VRE	vancomycin-resistant enterococci
VRG	vessel-rich group
V_T	tidal volume
VT	ventricular tachycardia
$VTCO_2$	volume of carbon dioxide per breath
vWF	von Willebrand's factor
W	watt
WBC	white blood cell
WCC	white cell count
WHO	World Health Organization
WPW	Wolff–Parkinson–White