

Essentials of
Medical
Pharmacology

Essentials of
**Medical
Pharmacology**
Sixth Edition

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New Delhi



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Essentials of Medical Pharmacology, 6th edition

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Preface

The unprecedented pace of developments over the recent years in the field of drugs (medicines) has further emphasized the relevance of Pharmacology to health professionals. Molecular targets of drug action are being defined at greater resolution, refining new drugs design. Practice of medicine is transforming from 'experience (impression) based' to 'evidence based', since more and more credible evidence from well designed clinical studies is now available on the impact of different treatments on mortality, morbidity and other therapeutic outcomes. The present edition is oriented to reflect the contemporary advancements.

Adopting the 'prototype drug' approach and a structured, systematic and user-friendly format, the actions, mechanisms, kinetics and toxicological aspects of drugs are described along with the pharmacological basis of their use and role/status in the therapy of various diseases/conditions. By a unique synthesis of pharmacology with clinical medicine, the book is designed to be useful both to the uninitiated medical student, as well as to prescribing physicians.

All chapters have been updated to include recently introduced drugs and published information. Latest therapeutic guidelines from leading professional bodies, WHO and National Health Programmes have been incorporated, especially in areas like hypertension, hyperlipidaemias, stroke prevention, surgical prophylaxis, tuberculosis, leprosy, malaria, and HIV-AIDS. Recent developments have been highlighted, notably in hormone replacement therapy, aromatase inhibitors, bisphosphonates, selective COX-2 inhibitors, atypical antipsychotics, therapy of diabetes mellitus, heart failure, acute coronary syndromes, Alzheimer's disease, parkinsonism, glaucoma, kala azar, etc. A chapter is devoted to the principles of 'rational use of medicines', elements of 'evidence based medicine' and the process of 'new drug development' to reflect current importance of these topics. Another new chapter compiles the clinically important drug interactions. Some other topics added are drug transporters, pharmacogenomics, pharmacovigilance, expiry date of pharmaceuticals, single enantiomer drugs, biological response modifiers, prescribing in pregnancy, etc.

New drugs marketed in India till mid 2007 are included, while obsolete ones are deleted. Infrequently used drugs and those not available in India are described briefly in extract type. Important points are summarized in boxes. Leading trade names with dosage forms are given. Emphasis is placed on the profile of diseases and drug use in India and other tropical countries, so as to be particularly useful to students and doctors in these regions; a need not well addressed by many texts.

Thanks are due to my colleagues and students for their valuable feedback and suggestions. As previously, the major impetus for this edition has come from Shri J.P. Vij, the ever agile Chairman of Jaypee Brothers. Commendable type setting, proof reading and improvement in illustrations has been done respectively by Ms Sunita Katla, Ms Geeta Srivastava and Mr Manoj. The editorial management and moral support of my wife has been a boon.

New Delhi
5th Nov. 2007

KD Tripathi

Extract from Preface to the First Edition

Pharmacology is both a basic and an applied science. It forms the backbone of rational therapeutics. Whereas the medical student and the prescribing physician are primarily concerned with the applied aspects, correct and skilful application of drugs is impossible without a proper understanding of their basic pharmacology. Medical pharmacology, therefore, must include both fundamental background and clinical pharmacological information. Objective and quantitative data on the use of drugs in man, i.e., relationship between plasma concentration and intensity of therapeutic/toxic actions, plasma half lives, relative efficacy of different medications and incidence of adverse effects etc., are being obtained with the aim of optimising drug therapy. The concepts regarding mechanism of action of drugs are changing. In addition, new drugs are being introduced in different countries at an explosive pace. A plethora of information thus appears to be important. However, trying to impart all this to a medical student would be counter-productive.

One of the important aims of this book is to delineate the essential information about drugs. The opening sentence in each chapter defines the class of drugs considered. A 'prototype' approach has been followed by describing the representative drug of a class followed by features by which individual members differ from it. Leading trade names have been included. Clinically relevant drug interactions have been mentioned. Clear-cut guidelines on selection of drugs and their clinical status have been outlined on the basis of current information. Original, simple and self-explanatory illustrations, tables and flow charts have been used with impunity. Selected chemical structures are depicted. Recent developments have been incorporated. However, discretion has been used in including only few of the multitude of new drugs not yet available in India. This is based on their likelihood of being marketed soon. The information and views have been arranged in an orderly sequence of distinct statements.

I hope this manageable volume book would serve to dispel awe towards pharmacology from the minds of medical students and provide a concise and upto-date information source for prescribers who wish to remain informed of the current concepts and developments concerning drugs.

My sincere thanks are due to my colleagues for their valuable comments and suggestions.

New Delhi
1st Jan., 1985

KD Tripathi

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List of Abbreviations

A-I/II/III	Angiotensin I/II/III	Asc LH	Ascending limb of Loop of Henle
AA	Amino acid	AT-III	Antithrombin III
ABC	ATP-binding cassette (transporter)	ATG	Antithymocyte globulin
ABLC	Amphotericin B lipid complex	ATP	Adenosine triphosphate
AB	Antibody	ATPase	Adenosine triphosphatase
AC	Adenylyl cyclase	ATPIII	Adult treatment panel III
ACE	Angiotensin II converting enzyme	ATS	Antitetanic serum
ACh	Acetylcholine	A-V	Atrioventricular
AChE	Acetylcholinesterase	AVP	Arginine vasopressin
ACT	Artemisinin-based combination therapy	AZT	Zidovudine
ACTH	Adrenocorticotrophic hormone		
AD	Alzheimer's disease	BAL	British anti lewisite
ADE	Adverse drug event	BAN	British approved name
ADH	Antidiuretic hormone	BB	Borderline leprosy
ADP	Adenosine diphosphate	BCG	Bacillus Calmette Guérin
Adr	Adrenaline	BCNU	Bischloroethyl nitrosourea (Carmustine)
ADR	Adverse drug reaction	BD	Twice daily
ADS	Anti diphtheritic serum	β -ARK	β adrenergic receptor kinase
AES	Atrial extrasystole	BHC	Benzene hexachloride
AF	Atrial fibrillation	BHP	Benign hypertrophy of prostate
AFI	Atrial flutter	BI	Bacillary index
AG	Antigen	BL	Borderline lepromatous leprosy
AGS	Antigangrene serum	BMD	Bone mineral density
AHG	Antihaemophilic globulin	BMR	Basal metabolic rate
AI	Aromatase inhibitor	BNP	Brain natriuretic peptide
AIDS	Acquired immunodeficiency syndrome	BOL	2-Bromolysergic acid diethylamide
AIP	Aldosterone induced protein	BP	Blood pressure
ALA	Alanine	BPN	Bisphosphonate
Am	Amikacin	BRMs	Biologic response modifiers
AMA	Antimicrobial agent	BSA	Body surface area
AMB	Amphotericin B	BT	Borderline tuberculoid leprosy
amp	Ampoule	BuChE	Butyryl cholinesterase
AMP	Adenosine mono phosphate	BW	Body weight
AMPA	α -Aminohydroxy methylisoxazole propionic acid	BZD	Benzodiazepine
ANC	Acid neutralizing capacity		
ANP	Atrial natriuretic peptide	C-10	Decamethonium
ANS	Autonomic nervous system	CA	Catecholamine
AP	Action potential	CaBP	Calcium binding protein
APC	Antigen presenting cell	CAD	Coronary artery disease
APD	Action potential duration	CAM	Calmodulin
aPTT	Activated partial thromboplastin time	cAMP	3', 5' Cyclic adenosine monophosphate
ARB	Angiotensin receptor blocker	cap	Capsule
ARC	AIDS related complex	CAR	Conditioned avoidance response
ARS	Anti rabies serum	CAsE	Carbonic anhydrase
ARV	Antiretrovirus	CAT	Computerized axial tomography
5-ASA	5-Amino salicylic acid	CBF	Cerebral blood flow
		CBG	Cortisol binding globulin

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CBS	Colloidal bismuth subcitrate	DI	Diabetes insipidus
CCB	Calcium channel blocker	DIT	Diiodotyrosine
CCNU	Chloroethyl cyclohexyl nitrosourea (Iomustine)	dl	Decilitre
CD	Collecting duct	DLE	Disseminated lupus erythematosus
CFTR	Cystic fibrosis transport regulator	DMA	Dimethoxy amphetamine
cGMP	3', 5' Cyclic guanosine monophosphate	DMARD	Disease modifying antirheumatic drug
CGRP	Calcitonin gene related peptide	DMPA	Depot medroxyprogesterone acetate
CH	Cholesterol	DMPP	Dimethyl phenyl piperazinium
ChE	Cholinesterase	DMT	Dimethyl tryptamine/Divalent metal transporter
CHE	Cholesterol ester	DNA	Deoxyribose nucleic acid
Chy	Chylomicron	DOC	Deoxycholate
Chy. rem.	Chylomicron remnants	DOCA	Desoxy corticosterone acetate
CHF	Congestive heart failure	DOM	Dimethoxymethyl amphetamine
CI	Cardiac index	dopa	Dihydroxyphenyl alanine
CL	Clearance	DOPAC	3, 4, Dihydroxyphenyl acetic acid
CLcr	Creatinine clearance	DOSS	Diocetyl sulfosuccinate
CMI	Cell mediated immunity	DOTS	Directly observed treatment short course
CMV	Cytomegalovirus	DPD	Dihydropyrimidine dehydrogenase
CNS	Central nervous system	DPT	Diphtheria-pertussis-tetanus triple antigen
c.o.	Cardiac output	DRC	Dose-response curve
CoEn-A	Coenzyme-A	DT	Distal tubule
COMT	Catechol-O-methyl transferase	DT-DA	Diphtheria-tetanus double antigen
COX	Cyclooxygenase	d-TC	d-Tubocurarine
c.p.s.	Cycles per second	DTIC	Dacarbazine
CPS	Complex partial seizures	DTPA	Diethylene triamine pentaacetic acid
CPZ	Chlorpromazine	DYN	Dynorphin
CRABP	Cellular retinoic acid binding protein		
CRBP	Cellular retinol binding protein	E	Ethambutol
CRF	Corticotropin releasing factor	EACA	Epsilon amino caproic acid
CSF	Cerebrospinal fluid	EAD	Early after-depolarization
CTZ	Chemoreceptor trigger zone	e.c.f.	Extracellular fluid
CV	Cardiovascular	ECG	Electrocardiogram
CVP	Central venous pressure	ECT	Electroconvulsive therapy
CVS	Cardiovascular system	ED	Erectile dysfunction
CWD	Cell wall deficient	EDTA	Ethylene diamine tetraacetic acid
CYP450	Cytochrome P450	EEG	Electroencephalogram
Cys	Cycloserine	ELAM-1	Endothelial leukocyte adhesion molecule-1
		β -END	β -Endorphin
DA	Dopamine	ENS	Enteric nervous system
DA-B ₁₂	Deoxyadenosyl cobalamin	ENT	Extraneuronal amine transporter
DAD	Delayed after-depolarization	EPEC	Enteropathogenic <i>E. coli</i>
DAG	Diacyl glycerol	EPO	Erythropoietin
DAM	Diacetyl monoxime	EPP	End plate potential
DAMP	Diphenyl acetoxy-N-methyl piperidine methiodide	ERP	Effective refractory period
DAT	Dopamine transporter	EPSP	Excitatory postsynaptic potential
dDAVP	Desmopressin	ER	Estrogen receptor
DDS	Diamino diphenyl sulfone (Dapsone)	ES	Extrasystole
DDT	Dichloro diphenyl trichloroethane	ESR	Erythrocyte sedimentation rate
DEC	Diethyl carbamazine citrate	ETEC	Enterotoxigenic <i>E. coli</i>
DHA	Dihydroartemisinin	EtM	Ethionamide
DHE	Dihydroergotamine		
DHFA	Dihydro folic acid	FA	Folic acid
DHFRase	Dihydrofolate reductase	FAD	Flavin adenine dinucleotide
DHP	Dihydropyridine	5-FC	5-Flucytosine
DHT	Dihydrotachysterol	FDT	Fixed duration therapy (of leprosy)
		FEV ₁	Forced expiratory volume in 1 second

FFA	Free fatty acid	5-HTP	5-Hydroxytryptophan
FMN	Favin mononucleotide	HVA	Homovanillic acid
FP	Ferropoirtin		
FQ	Fluoroquinolone	I	Indeterminate leprosy
FRase	Folate reductase	IBD	Inflammatory bowel disease
FSH	Follicle stimulating hormone	IBS	Irritable bowel syndrome
5-FU	5-Fluorouracil	ICAM-1	Intracellular adhesion molecule-1
		ICSH	Interstitial cell stimulating hormone
G	Genetic	i.d.	Intradermal (injection)
GABA	Gamma amino butyric acid	IDL	Intermediate density lipoprotein
GAT	GABA-transporter	IG	Immunoglobulin
GC	Guanylyl cyclase	IGF	Insulin-like growth factor
GCP	Good clinical practice	IL	Interleukin
G-CSF	Granulocyte colony stimulating factor	ILEU	Isoleucine
GDP	Guanosine diphosphate	i.m.	Intramuscular
GERD	Gastroesophageal reflux disease	INH	Isonicotinic acid hydrazide
g.f.	Glomerular filtration	INR	International normalized ratio
g.f.r.	Glomerular filtration rate	i.o.t.	Intraocular tension
GH	Growth hormone	IP ₃	Inositol trisphosphate
GHRH	Growth hormone releasing hormone	IP ₄	Inositol tetrakisphosphate
GHRH	Growth hormone release inhibitory hormone	IPSP	Inhibitory postsynaptic potential
GIP	Gastric inhibitory peptide/Glucose-dependent insulinotropic polypeptide	IPV	Inactivated poliomyelitis vaccine
g.i.t.	Gastrointestinal tract	IRS	Insulin response substrate
GITS	Gastrointestinal therapeutic system	ISA	Intrinsic sympathomimetic activity
GLP	Glucagon-like peptide	ISH	Isolated systolic hypertension
GLUT	Glucose transporter	IU	International unit
GM-CSF	Granulocyte macrophage colony stimulating factor	IUCD	Intrauterine contraceptive device
		i.v.	Intravenous
GnRH	Gonadotropin releasing hormone	JAK	Janus-kinase
GPCR	G-protein coupled receptor		
G-6-PD	Glucose-6-phosphate dehydrogenase	Kmc	Kanamycin
GPI	Globus pallidus interna	KTZ	Ketoconazole
GTCS	Generalised tonic-clonic seizures		
GTN	Glyceryl trinitrate	LA	Local anaesthetic
GTP	Guanosine triphosphate	LCAT	Lecithin cholesterol acyl transferase
		LDL	Low density lipoprotein
H	Isoniazid (Isonicotinic acid hydrazide)	LES	Lower esophageal sphincter
HAART	Highly active antiretroviral therapy	leu-ENK	Leucine enkephalin
Hb	Haemoglobin	LH	Luteinizing hormone
HBV	Hepatitis B virus	liq	Liquid
HCG	Human chorionic gonadotropin	LL	Lepromatous leprosy
HDCV	Human diploid cell vaccine	LMW	Low molecular weight
HDL	High density lipoprotein	LOX	Lipoxygenase
5-HIAA	5-Hydroxyindole acetic acid	LSD	Lysergic acid diethylamide
HES	Hydroxyethyl starch	LT	Leukotriene
HETE	Hydroxyeicosa tetraenoic acid	LVF	Left ventricular failure
HIV	Human immunodeficiency virus	MAC	Minimal alveolar concentration
HMG-CoA	Hydroxymethyl glutaryl coenzyme A	MAC	<i>Mycobacterium avium</i> complex
HMW	High molecular weight	MAO	Monoamine oxidase
HPA axis	Hypothalamo-pituitary-adrenal axis	MAP	Muscle action potential
HPETE	Hydroperoxy eicosatetraenoic acid	MAPKinase	Mitogen activated protein kinase
hr	Hour	max	Maximum
HR	Heart rate	MBC	Minimum bactericidal concentration
HRIG	Human rabies immunoglobulin	MBL	Multibacillary leprosy
HRT	Hormone replacement therapy	MDI	Manic depressive illness
5-HT	5-Hydroxytryptamine	MDMA	Methylene dioxy methamphetamine

xiv Abbreviations

MDR	Multidrug resistant	NTS	Nucleus tractus solitarius
MDT	Multidrug therapy (of leprosy)	NVBDCP	National vector borne diseases control programme
met-ENK	Methionine enkephalin	NYHA	New York Heart Association
mEq	milliequivalent	OAT	Organic anion transporter
methyl B ₁₂	Methyl cobalamin	OATP	Organic anion transporting polypeptide
Mf	Microfilariae	OC	Oral contraceptive
MF	Multifactorial	OCD	Obsessive-compulsive disorder
MHC	Major histocompatibility complex	OCT	Organic cation transporter
MHT	Methylene dioxy methamphetamine	OD	Once daily
MI	Myocardial infarction	OPG	Osteoprotegerin
MIC	Minimal inhibitory concentration	OPV	Oral poliomyelitis vaccine
MID	Multi infarct dementia	ORS	Oral rehydration salt (solution)
MIF	Migration inhibitory factor	ORT	Oral rehydration therapy
min	Minimum		
MIT	Monoiodo tyrosine		
MLCK	Myosin light chain kinase	PABA	Paraamino benzoic acid
MMF	Mycophenolate mofetil	PAE	Post antibiotic effect
6-MP	6-Mercaptopurine	PAF	Platelet activating factor
MPPT	Methylprednisolone pulse therapy	2-PAM	Pralidoxime
MPTP	4-methyl-4-phenyltetrahydro pyridine	PAN	Primary afferent neurone
MRP2	Multidrug resistance associated protein-2	PAS	Paraamino salicylic acid
MRSA	Methicillin resistant <i>Staphylococcus aureus</i>	PBI	Protein bound iodine
MSH	Melanocyte stimulating hormone	PBPs	Penicillin binding proteins
Mtx	Methotrexate	PBL	Paucibacillary leprosy
mV	millivolt	PCA	Patient controlled anaesthesia
MW	Molecular weight	PCEV	Purified chick embryo cell vaccine (rabies)
		PCI	Percutaneous coronary intervention
NA	Noradrenaline	PCPA	Parachloro phenylalanine
NABQI	N-acetyl-p-benzoquinoneimine	PD	Parkinsons's disease
NADP	Nicotinamide adenine dinucleotide phosphate	PDE	Phosphodiesterase
NADPH	Reduced nicotinamide adenine dinucleotide phosphate	PEMA	Phenylethyl malonamide
		PEP	Postexposure prophylaxis
NAG	N-acetyl glucosamine	PF	Purkinje fibre
NAM	N-acetyl muramic acid	PFOR	Pyruvate: ferredoxin oxidoreductase
NANC	Nonadrenergic noncholinergic	PG	Prostaglandin
NAPA	N-acetyl procainamide	PGI ₂	Prostacyclin
NaSSA	Noradrenergic and specific serotonergic antidepressant	Pgp	P-glycoprotein
		PI	Protease inhibitor
NAT	N-acetyl transferase	PIG	Phosphatidyl inositol glycan
NCEP	National cholesterol education programme	PIP ₂	Phosphatidyl inositol-4,5-bisphosphate
NEE	Norethindrone enanthate	PKA	Protein kinase: cAMP dependent
NET	Norepinephrine transporter	PKC	Protein kinase C
NFAT	Nuclear factor of activated T-cell	PL _A	Phospholipase A
NLEP	National leprosy eradication programme	PL _C	Phospholipase C
NMDA	N-methyl-D-aspartate	Pl. ph.	Platelet phospholipid
nNOS	Neural nitric oxide synthase	PnG	Penicillin G
NNRTI	Nonnucleoside reverse transcriptase inhibitor	POMC	Pro-opio melanocortin
NPY	Neuropeptide-Y	PP	Partial pressure
NR	Nicotinic receptor	PPA	Phenyl propanolamine
N-REM	Non rapid eye movement (sleep)	PPAR γ	Paroxysome proliferator-activated receptor γ
NRTI	Nucleoside reverse transcriptase inhibitor	PPH	Post partum haemorrhage
NSAID	Nonsteroidal antiinflammatory drug	PPI	Proton pump inhibitor
NSTEMI	Non ST-segment elevation myocardial infarction	ppm	Part per million
		PPNG	Penicillinase producing <i>N. gonorrhoeae</i>
		PRA	Plasma renin activity
		PRF	Prolactin releasing factor

PRIH	Prolactin release inhibitory hormone	SNP	Single nucleotide polymorphism
PSVT	Paroxysmal supra-ventricular tachycardia	SN-PC	Substantia nigra-pars compacta
PT	Proximal tubule	SN-PR	Substantia nigra-pars reticularis
PTCA	Percutaneous transluminal coronary angioplasty	SNRI	Serotonin and noradrenaline reuptake inhibitor
PTH	Parathyroid hormone	s.o.s.	as required
PTMA	Phenyl trimethyl ammonium	S/P	Sulfonamide + pyrimethamine
PTP	Post-tetanic potentiation	SPF	Sun protection factor
PTZ	Pentylentetrazol	SPS	Simple partial seizures
PUV A	Psoralen-Ultraviolet A	SR	Sustained release
PVP	Poly vinyl pyrrolidone	SRS-A	Slow reacting substance of anaphylaxis
PVRV	Purified verocell rabies vaccine	SSG	Sodium stibogluconate
		SSI	Surgical site infection
QID	Four times a day	SSRIs	Selective serotonin reuptake inhibitors
		STAT	Signal transducer and activator of transcription
R	Rifampin (Rifampicin)	STEMI	ST-segment elevation myocardial infarction
RANK	Receptor for activation of nuclear factor KB	StK	Streptokinase
RANKL	RANK ligand	SULT	Sulfotransferase
RAS	Renin-angiotensin system	SUR	Sulfonyl urea receptor
RBC	Red blood cells	susp	Suspension
RBP	Retinol binding protein	SWS	Slow wave sleep
RC	Respiratory centre	syr	Syrup
RE	Reticuloendothelial		
REM	Rapid eye movement (sleep)	t½	Half life
RIG	Rabies immunoglobulin	T ₃	Triiodothyronine
RIMA	Reversible inhibitor of MAO-A	T ₄	Thyroxine
rINN	Recommended international nonproprietary name	tab	Tablet
RMP	Resting membrane potential	TAB	Typhoid, paratyphoid A and B vaccine
RNA	Ribonucleic acid	TB	Tubercle bacilli
RNTCP	Revised National Tuberculosis Control Programme	TBG	Thyroxine binding globulin
RP	Refractory period	TCII	Transcobalamin II
RTF	Resistance transfer factor	TCAs	Tricyclic antidepressants
RXR	Retinoid X receptor	TCID ₅₀	Tissue culture infectious dose 50%
RyR	Ryanodine receptor	TDM	Therapeutic drug monitoring
		TDS	Three times a day
S	Streptomycin	Tf	Transferrin
SA	Sinoauricular (node)	TG	Triglyceride
SAARD	Slow acting antirheumatic drug	6-TG	6-Thioguanine
SABE	Subacute bacterial endocarditis	THC	Tetrahydrocannabinol
s.c.	Subcutaneous	THFA	Tetrahydro folic acid
SCC	Short course chemotherapy (of tuberculosis)	Thio	TEPA Triethylene thiophosphoramide
SCh	Succinylcholine	THR	Threonine
SCID	Severe combined immunodeficiency disease	TIA _s	Transient ischaemic attacks
SERDs	Selective estrogen receptor down regulators	TNF-α	Tumour necrosis factor α
SERM	Selective estrogen receptor modulator	TOD	Target organ damage
SERT	Serotonin transporter	TOF	Train of four
SGA	Second generation antihistaminic	t-PA	Tissue plasminogen activator
SGLT	Sodium-glucose transporter	TPMT	Thiopurine methyl transferase
SHBG	Sex hormone binding globulin	t.p.r.	Total peripheral resistance
s.l.	Sublingual	TR	Thyroid hormone receptor
SLC	Solute carrier	TRE	Thyroid hormone response element
SLE	Systemic lupus erythematosus	TRH	Thyrotropin releasing hormone
SMON	Subacute myelo-optic neuropathy	TSH	Thyroid stimulating hormone
		TT	Tuberculoid leprosy
		TTS	Transdermal therapeutic system
		TX	Thromboxane
		Tzn	Thiacetazone

xvi Abbreviations

U	Unit	VMA	Vanillyl mandelic acid
UDP	Uridine diphosphate	VMAT	Vesicular monoamine transporter
UFH	Unfractionated heparin	VRE	Vancomycin resistant enterococci
UGDP	University group diabetic programme	VRSA	Vancomycin resistant <i>Staphylococcus aureus</i>
UGT	UDP-glucuronosyl transferase	VRUT	Vasopressin regulated urea transporter
USAN	United States adopted name	VT	Ventricular tachycardia
UTI	Urinary tract infection	vWF	von Willebrand factor
v	Volt	WBC	White blood cells
V	Volume of distribution	WCVs	Water channel containing vesicles
VAL	Valine	WHO	World Health Organization
VDR	Vit D receptor	WPW	Wolff-Parkinson-White syndrome
VES	Ventricular extrasystole	XDR-TB	Extensively drug resistant-TB
VF	Ventricular fibrillation	Z	Pyrazinamide
VIP	Vasoactive intestinal peptide	ZE (syndrome)	Zollinger-Ellison (syndrome)
Vit	Vitamin		
VLDL	Very low density lipoprotein		