

FUNDAMENTALS

Fundamentals of

Pharmacology for Paramedics

EDITED BY

IAN PEATE

SUZANNE EVANS

LISA CLEGG



WILEY Blackwell

Fundamentals of

Pharmacology for Paramedics

To all those health professionals who have put themselves in harm's way to care for patients in the front lines of the COVID-19 pandemic.

Fundamentals of

Pharmacology for Paramedics

Edited by

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Contents

<i>Contributors</i>	xiii
<i>Preface</i>	xxi
<i>Acknowledgements</i>	xxiii
<i>Prefixes, suffixes and abbreviations</i>	xxiv
Chapter 1 Introduction to pharmacology	1
<i>Suzanne Evans and Tanya Somani</i>	
Aim	1
Naming and classifying drugs	5
How drugs bring about their actions	6
How are we able to manipulate physiological function using drugs?	6
Receptors as sites of drug action	7
Enzymes as sites of drug action	7
Ion channels	7
Transport molecules	9
Selectivity of binding and its effect	11
The drug–body interaction is a dynamic process	11
Conclusion	14
Glossary	14
References	15
Further reading	15
Multiple-choice questions	15
Chapter 2 How to use pharmaceutical and prescribing reference guides	18
<i>Nigel Conway and Jennifer Dod</i>	
Aim	18
Introduction	19
HCPC Standards of conduct, performance and ethics	19
HCPC Standards of proficiency for paramedics	20
Joint Royal Colleges Ambulance Liaison Committee (JRCALC)	
Clinical Practice Guidelines	21
JRCALC Update information	22
How to navigate the JRCALC Guidelines	23
JRCALC Pocket Book	30
JRCALC Guidelines digital application (app)	31
Useful additional resources	32
<i>British National Formulary</i> (BNF)	32
Monthly Index of Medical Specialities	33
Electronic Medicines Compendium (EMC)	34
Conclusion	34
Disclaimer	35
References	35
Further reading	35
Multiple-choice questions	35

Chapter 3	Legal and ethical issues	37
	<i>Claire Leader, Emma Senior, Deborah Flynn and Paul Younger</i>	
	Aim	37
	Introduction	38
	The law	38
	Ethical principles and theories	39
	Regulatory bodies	43
	Research	45
	Conclusion	47
	Glossary	47
	References	48
	Further reading	49
	Multiple-choice questions	50
Chapter 4	Medicines management and the role of the paramedic	52
	<i>Annette Hand, Carol Wills and Paul Younger</i>	
	Aim	52
	Introduction	53
	Medicines management	53
	Manufacturing, marketing, procurement and sale	54
	Selection	55
	Supply	55
	Patient-specific directions	56
	Prescriptions	56
	Patient Group Directions	56
	Exemptions	57
	Prescribing	59
	Handling and administration	60
	Special consideration: Controlled Drugs and critical medications	62
	Groups requiring special considerations	63
	Monitoring for side-effects	64
	Medicines optimisation	64
	Safety in medicines management	65
	Storage and disposal	66
	Conclusion	66
	References	66
	Further reading	68
	Multiple-choice questions	68
Chapter 5	Pharmacodynamics and pharmacokinetics	70
	<i>Dan Davern</i>	
	Aim	70
	Introduction	70
	Professional regulatory council	71
	Programmes of education and training	71
	Pharmacokinetics	71
	The pharmacokinetic processes	71
	Phase 1: absorption	72
	Phase 2: distribution	76
	Phase 3: metabolism (biotransformation)	77
	Phase 4: elimination	79
	Pharmacodynamics	81
	Agonists and antagonists	82

Drug potency and efficacy	84
Therapeutic index	84
Adverse drug reactions	85
Conclusion	87
References	87
Further reading	87
Multiple-choice questions	88
Chapter 6 Drug formulations	90
<i>Sarah Dineen-Griffin and Barbara C. Wimmer</i>	
Aim	90
Introduction	91
Routes of drug administration	91
Parenteral administration	92
Intravenous administration	92
Subcutaneous administration	93
Intramuscular administration	93
Intraosseous administration	95
Intrathecal administration	95
Intradermal administration	95
Formulations	97
Localised versus long-acting injectable formulations	97
Topical formulations	97
Inhaled formulations	99
Enteral formulations	101
Rectal formulations	105
Conclusion	105
Glossary	106
References	106
Further reading	108
Multiple-choice questions	108
Chapter 7 Adverse drug reactions	110
<i>Matt Dixon</i>	
Aim	110
What is an adverse drug reaction?	110
Classification of adverse drug reactions	111
How prevalent are adverse drug reactions?	111
Who is more likely to experience adverse drug reactions?	112
Recognising signs and symptoms of adverse drug reactions	114
Anaphylaxis	114
Rashes and skin eruptions	115
Serum sickness	115
Renal disorders	115
Geriatric syndrome	116
Idiosyncratic reactions	117
Preventing adverse drug reactions	117
Managing adverse drug reactions	117
Reporting adverse drug reactions	119
Conclusion	122
References	122
Further reading	123
Multiple-choice questions	123

Chapter 8 Analgesics	125
<i>Tom Mallinson</i>	
Aim	125
Pain and analgesia	125
Understanding and assessing pain	125
Why do we treat pain?	126
Psychology of pain	126
Physiology of pain	127
Pain transmission	127
Pain modulation	128
Types of pain	129
Assessment of pain	131
Approach to analgesia	132
Paracetamol	133
Non-steroidal anti-inflammatory drugs	133
Inhalational analgesia	136
Opioids	137
Antagonists	141
Atypical analgesics	142
Antidepressants and antiepileptics	143
Adjuncts to analgesia	143
Magnesium sulfate	143
Local anaesthetics	143
Conclusion	144
Glossary	145
References	146
Further reading	147
Multiple-choice questions	147
Chapter 9 Antibacterials	149
<i>Dean Whiting, Deborah Flynn and Dawn Ball</i>	
Aim	149
Introduction	149
Language and terminology	150
Antibacterial mechanisms of action	150
Disruption of bacterial cell wall synthesis: beta-lactams	151
Interference in folate metabolism: sulfonamides, trimethoprim	151
Inhibition of bacterial DNA synthesis: quinolones	151
Inhibition of bacterial protein synthesis: tetracyclines, aminoglycosides, macrolides, chloramphenicol, lincosamides	151
Choosing the right treatment	151
Antimicrobial resistance	151
Preventing antimicrobial resistance	152
Antimicrobial stewardship (AMS)	153
Antibacterials by clinical use	153
Beta-lactams	153
Tetracyclines	157
Chloramphenicol	158
When administered in combination with phenytoin, monitor seizure pattern. Aminoglycosides	159
Macrolides	161
Lincosamides	162

Conclusion	163
References	163
Further reading	164
Multiple-choice questions	164
Chapter 10 Medications used in the cardiovascular system	167
<i>Lisa Clegg and Fraser Russell</i>	
Aim	167
Cardiovascular diseases	167
Hypertension and heart failure	168
Management of hypertension and heart failure	168
Acute coronary Syndrome (ACS)	173
Management of acute coronary syndrome	173
Conclusion	177
Glossary	177
References	178
Further reading	179
Multiple-choice questions	180
Chapter 11 Medications used in the renal system	182
<i>Anthony Kitchener</i>	
Aim	182
Introduction	183
Acute kidney injury	183
Chronic kidney disease	185
Management of CKD	185
Electrolyte abnormalities resulting from poor renal function	187
Hyponatraemia (low serum sodium)	187
Hypokalaemia (low serum potassium) and hyperkalaemia (high serum potassium)	187
Urinary retention and incontinence	187
Drug-induced renal damage	188
Drugs that act on the renal system	188
Diuretics	188
Drugs used to treat urinary retention and urinary incontinence	193
Conclusion	195
Glossary	198
References	200
Further reading	201
Multiple-choice questions	201
Chapter 12 Medications and diabetes mellitus	203
<i>Hayley Croft and Olivia Thornton</i>	
Aim	203
Introduction	204
Hormonal control of blood glucose	204
Monitoring diabetes	205
Measuring blood glucose	206
Measuring ketones	207
Drug use in diabetes	207
Insulin replacement therapy	207

Metformin	209
Sulfonylureas	209
Incretin mimetics	210
SGLT-2 inhibitors	210
Thiazolidinediones	211
Alpha-glucosidase inhibitors	211
Drug use in diabetic emergencies	211
Hypoglycaemic emergency	211
Hyperglycaemic emergency	216
Management of hyperglycaemia	218
Conclusion	219
Glossary	219
References	220
Multiple-choice questions	221

Chapter 13 Medications used in the respiratory system **224**

<i>Jason McKenna</i>	
Aim	224
Introduction	225
Anatomy and physiology	225
Nervous system control	226
Common respiratory emergencies	227
Asthma	227
Chronic obstructive pulmonary disease	230
Croup	231
Pneumonia	232
Pneumothorax	232
Pulmonary oedema	233
Classes of medications	234
Bronchodilators	234
Diuretics	236
Nitrates	236
Steroids	237
Medical gases	238
Oxygen devices	238
Conclusion	239
Find out more	239
References	239
Further reading	241
Multiple-choice questions	241

Chapter 14 Medications used in the gastrointestinal system **243**

<i>George Bell-Starr and Ashley Ingram</i>	
Aim	243
Introduction	244
Anatomy and physiology of the gastrointestinal system	244
Nausea and vomiting	244
H1 receptor antagonists (antihistamines)	246
Dopamine (D2) receptor antagonists	246
Serotonin (5-HT3) receptor antagonists	246
Peptic ulcers	247
<i>Helicobacter pylori</i> infections	247

Non-steroidal anti-inflammatory drugs	248
Symptoms of peptic ulcer	248
Constipation	249
Laxatives	249
Gastro-oesophageal reflux disease	251
Drug interventions (patients with confirmed endoscope diagnosis)	252
Paramedic practice	252
Antidiarrhoeals	254
Inflammatory bowel disease (IBD)	255
Crohn's disease	255
Ulcerative colitis	255
Drug treatment for inflammatory bowel disease	255
Conclusion	257
References	257
Multiple-choice questions	258

Chapter 15 Medication and the nervous system **261**

Geoffrey Bench, Alastair Dolan, Lena Solanki, Paul Doherty, Charlotte White, Ricky Lawrence and Emma Beadle

Aim	261
Introduction	261
The nervous system	262
Parkinson disease and parkinsonism	262
Infections	264
Dementia	264
Drugs used in dementia	265
Cautions	266
Epilepsy	267
Antiepileptic medication	268
Psychogenic non-epileptic seizures (PNES) versus bilateral tonic clonic seizures (BTCS)	268
Emergency medication in the prehospital setting	268
Strokes (including transient ischaemic attacks)	270
Definition of a stroke and a transient ischaemic attack	271
Assessment of a stroke	271
Treatment	272
Conclusion	274
References	274
Further reading/resources	275
Multiple-choice questions	276

Chapter 16 Medications used in mental health **278**

Liam Rooney

Aim	278
Introduction	278
Neurotransmitters	279
Antidepressants	280
Selective serotonin reuptake inhibitors	281
Monoamine oxidase inhibitors	282
Serotonin and noradrenaline reuptake inhibitors	283
Serotonin syndrome	283
Other atypical antidepressants	284

Anxiolytics	285
Pregabalin	285
Benzodiazepines	285
Buspirone	286
Beta-blockers	286
Hypnotics	286
Benzodiazepines	286
Z-drugs	287
Mood-stabilising medications	287
Lithium	287
Valproate	287
Antipsychotics	288
Antipsychotic-related side-effects	288
Other side-effects	289
Dementia	291
Acetylcholinesterase inhibitors	291
Memantine	292
Attention deficit-hyperactivity disorder	292
Stimulants	292
Non-stimulants	292
Conclusion	293
Find out more about these conditions	293
Glossary	293
References	294
Further reading	296
Resources	296
Multiple-choice questions	296
Chapter 17 Immunisations	299
<i>Michael Fanner</i>	
Aim	299
Introduction	299
Understanding the fundamental epidemiological concepts and theories in preventing infectious diseases	300
Essential ways of examining infectious diseases	301
Becoming familiar with vaccine design to underpin clinical practice knowledge	302
Vaccine design	302
Appreciating public concerns in the acceptability and uptake of immunisations	303
Vaccine acceptability	307
Recognising the role of the paramedic in health promotion and immunisation administration	308
Immunisations as prescription-only medicines	308
Embedding immunisation history taking in clinical assessment	309
Conclusion	315
References	316
Further reading	317
Multiple-choice questions	317
<i>Normal Values</i>	319
<i>Answers</i>	323
<i>Index</i>	325

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Michael graduated in adult nursing (2012) and specialist community public health nursing/health visiting (2013) at King's College London and was awarded a PhD in social policy at the University of Greenwich in 2020. Michael was a main architect of the UK's first MSc in paramedic science (pre-registration) and subsequent module leader for a range of paramedic theory modules. Michael is

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Claire Leader
RN, RM, PGCAP, MA, BSc (Hons), FHEA. Senior Lecturer.

Claire qualified as a registered nurse from York University in 1998 after which she moved to Leeds, working in cardiothoracic surgery and emergency nursing. In 2003 she commenced her midwifery education at Huddersfield University where she was awarded a first class BSc (Hons). Working initially at Sheffield Teaching Hospitals, she later moved to the North East where she commenced her role as a staff midwife before moving into the area of research as a research nurse and midwife. She was awarded a distinction for her MA in sociology and social research at Newcastle University in 2012. Claire moved to Northumbria University in 2018 and is now a senior lecturer and programme lead for pre-registration nursing programmes, while also studying for her PhD in the area of nurse and midwife wellbeing.

Tom Mallinson
BSc (Hons), MBChB, PGCHE, MRCGP(2020), MCPara, MCoROM, FAWM, FHEA, FRGS. Prehospital Doctor, Rural Generalist, Responder Support Clinician.

Tom began his career in London, undertaking the IHCD ambulance aid and paramedic qualifications alongside a Bachelor's degree in paramedic science at the University of Hertfordshire. After working as a paramedic for the London Ambulance Service NHS Trust, he attended Warwick Medical School to qualify as a medical practitioner. He continued his studies with postgraduate qualifications in health-care education, wilderness medicine and primary care. Tom has published a variety of primary research and educational resources and is a member of the editorial board for the *Journal of Paramedic Practice*.

Jason McKenna
BSc, GDip, DipNQEMT AP. Advanced Paramedic Supervisor.

Jason began his prehospital career as an emergency medical technician within the private ambulance services in Ireland. In 2011 he joined the National Ambulance Service as a student paramedic, graduating from University College Dublin (UCD) with a diploma in emergency medical technology. In 2015 he continued his education as part of the Bachelor degree programme in paramedic studies at the University of Limerick. He subsequently joined the advanced paramedic programme, graduating from UCD in 2018 with a graduate diploma in emergency medical science. He is also a graduate of the University of South Wales where he studied Acute Medicine. He is a registered assistant tutor with PHECC and is involved with training and education of all levels of prehospital care from community first responder to paramedic. His interests lie in prehospital education and research.

Ian Peate
OBE, FRCN. Visiting Professor of Nursing, St George's University of London and Kingston University London; Visiting Professor, Northumbria University; Visiting Senior Clinical Fellow, University of Hertfordshire, and Editor-in-Chief of the British Journal of Nursing. Senior Lecturer University of Roehampton.

Ian began his nursing career at Central Middlesex Hospital, becoming an enrolled nurse practising in an intensive care unit. He later undertook 3 years' student nurse training at Central Middlesex and Northwick Park Hospitals, becoming a staff nurse and then a charge nurse. He has worked in nurse education since 1989. His key areas of interest are nursing practice and theory. Ian has published widely. He is editor in chief of the *British Journal of Nursing*, founding consultant editor of the *Journal*

of *Paramedic Practice* and editorial board member of the *British Journal of Healthcare Assistants*. Ian was awarded an OBE in the Queen's 90th Birthday Honours List for his services to nursing and nurse education and was granted a fellowship from the Royal College of Nursing in 2017.

Liam Rooney

BSc (Hons), GDip, DipNQEMT-AP. Assistant Tutor.

Liam has worked as a firefighter/paramedic with Dublin Fire Brigade since 2007, where he completed his diploma in emergency medical technology – paramedic with the Royal College of Surgeons, Ireland. In 2016 he completed a BSc (Hons) in paramedic studies at the University of Limerick, winning the Graduate Entry Medical School Award for overall performance. In 2017, he undertook a graduate diploma in emergency medical science through University College Dublin. Liam currently practises as an advanced paramedic in Ireland. In 2017, he joined the faculty of DX2, where he delivers multiple courses in prehospital education. He has a keen interest in geriatric medicine and pain management in dementia patients.

Fraser D. Russell

BSc (Deakin), PhD (Univ. Melb.). Associate Professor, University of the Sunshine Coast, Queensland, Australia.

Fraser's PhD investigating the regulation of cardiac beta-adrenoceptors was awarded by the University of Melbourne in 1994. A series of successful postdoctoral appointments followed at the University of Cambridge, UK (1995–1998), University of Otago, NZ (1998–2000) and University of Queensland, Australia (2000–2004). Fraser's research interests have focused on providing a better understanding of the intracellular trafficking and cardiovascular function of endothelin-1, urotensin II and glial cell line-derived neurotrophic factor. Since taking a faculty position at the University of the Sunshine Coast (2005–), Fraser has developed a research programme in natural product therapies, with a focus on providing new ideas for the management of patients with abdominal aortic aneurysm and aberrant wound healing responses, where there are limited pharmacological treatment options.

Emma Senior

MSc Academic and Professional Learning, BSc (Hons) Promoting Practice Effectiveness (Public Health/Health Visiting), DipHE Nursing Studies (Adult), Registered Nurse (RN), Registered Specialist Community Public Health Nurse (SCPHN), Registered Teacher (NMC), Fellow (FHEA). Senior Lecturer, Northumbria University.

Emma is an NMC registered teacher, nurse and health visitor with over 10 years of experience in the NHS and 10 years teaching experience with Northumbria University. She began her nurse career in theatres specialising in women's and children's health before qualifying as a health visitor in 2006. She then went on to work as a sexual health advisor across North Yorkshire where she was able to work collaboratively with a range of services and organisations which included the military, primary care and secondary education. Emma joined higher education in 2009, taking her first post as a senior lecturer/practitioner implementing a workforce development initiative called Northumbria Integrated Sexual Health Education (NISHE) for postqualified nurses across County Durham and Darlington and then project managed delivery across the south west of England with the University of West England. This involved the development and delivery of e-learning educational materials along with supporting academic staff and students in their practice setting. In 2012, Emma joined the pre-registration nurse team where she has been able to introduce, develop and co-ordinate e-learning packages on the programme. Along with teaching pre-registration healthcare, Emma has maintained her postregistration nurse teaching within sexual health, safeguarding and public health within the Specialist Community Public Health Nurse programme. During her time at Northumbria University, Emma was part of the workforce development team working in collaboration with external partners to create education packages to develop the workforce. In 2015, Emma became involved with and is programme lead for Northumbria University's innovative programme for professional non-surgical aesthetic practice which has been a trailblazer nationally. Emma's key areas of interest are public health, sexual health, military families and technology-enhanced learning. She has published widely in journals and is a fellow of the Higher Education Academy.

Lena Solanki**DipHe Paramedic Practice. Paramedic Clinical Tutor.**

Lena's career began in 1998 with the Lancashire Ambulance Service as a call taker. After a brief spell adjusting to life as a new mum, she started training with the London Ambulance Service in 2010 as a student paramedic. She joined the clinical education and standards department in 2018 and trained as a clinical tutor, achieving her teaching qualification in 2020. Lena has enjoyed her career with the London Ambulance Service and finds it immensely rewarding. Lena likes to help others especially during their times of need and supports them in achieving their goals.

Tanya Somani**MSc. Registered Paramedic.**

Tanya began her career in paramedicine in 2008 practising in metropolitan and regional NSW Australia. Tanya completed a Bachelor Paramedicine (University of Tasmania) and undertook volunteer work in Papua New Guinea. She developed an interest in infection control, attaining a graduate certificate in clinical redesign (University of Tasmania), with a focus on environmental cleaning of ambulances, and an infection prevention and control qualification from the Australian College of Infection Prevention and Control. Tanya worked as part of the Sydney Metropolitan Ambulance Infrastructure program as program manager for the Make Ready Model and as station officer. Tanya has been the recipient of the Safety Thinker Award 2021 for NSW Ambulance, International Woman of the Year award 2021 from Council Ambulance Authorities and received a Commissioner Citation in 2021. Currently she is health relationship manager for NSW Ambulance. Tanya is passionate about patient and paramedic safety with a focus on systems improvement and project management.

Olivia Thornton**BEnvSc, Dip Pre-hospital Care, MPharm (Dist), AACPa, MSHPA. Pharmacist – Accredited Consultant.**

Olivia began her career as a paramedic with the New South Wales Ambulance Service. During her 10 years of service as a paramedic, she worked at multiple sites in NSW, including metropolitan and regional areas. Olivia undertook a master's in pharmacy through the University of Newcastle, graduating with distinction. Her pharmacy career has included working in community pharmacy, hospital pharmacy, consultancy work and as a clinical associate lecturer for an undergraduate pharmacy program. She has an interest in improving medication safety for people with complex chronic health conditions throughout their medical journey, including during hospital admissions, aged care/disability care or at home. Her clinical interest areas are pre- and postsurgical admission, diabetes, Parkinson disease and mental health pharmacology.

Charlotte White**BSc (Hons) Paramedic Science and PGCert Medical Healthcare Education. Education Centre Manager.**

Charlotte has worked in paramedicine since 2012. Previously, she worked within a learning disability and dementia setting, then moved into clinical settings in numerous hospitals. Charlotte has enjoyed mentoring students during her operational duties, which sparked her passion to move into a formal education working environment, where she is currently undertaking a secondment. Charlotte enjoys the dynamic and challenging work education can bring, always striving for continuous developmental practice.

Dean Whiting**RN, BN (Hons), BSc (Hons), PgCAP, PgDip(ACP), MSc, FHEA. Principal Lecturer in Advanced Clinical Practice, University of Hertfordshire. Advanced Clinical Practitioner, Berryfields Medical Centre, Buckinghamshire. Advanced Clinical Practitioner, London Scottish RFC.**

Dean began his career in the British Army as a combat medical technician and then studied at the Royal Centre for Defence Medicine and the University of Portsmouth to become a registered nurse. During his time in the military, he mainly specialised in trauma and critical care nursing and was fortunate enough to work all over the UK and around the world. Since 2012, Dean has worked in higher education and pursued a clinical career in general practice and sports nursing. He now leads the MSc in Advanced Clinical Practice at the University of Hertfordshire.

Carol Wills

MSc Multidisciplinary Professional Development and Education, PGDip Advanced Practice, Bsc (Hons) Specialist Community Public Health Nursing (SCPHN) (Health Visiting), DipHE Adult Nursing, Registered Nurse (RN), Enrolled Nurse (EN), Registered Health Visitor (HV), Community Practitioner Prescriber (NP), Registered Lecturer/Practice Educator (RLP), Senior Fellow (SFHEA), Subject and Programme Leader Non-Medical Prescribing at Northumbria University.

Carol began her career undertaking enrolled nurse training in 1983 at Hexham Hospital in Northumberland. She then worked within neurotrauma at Newcastle General Hospital and then for several years in coronary care and intensive care at Hexham Hospital. This experience and additional training to complete registered nurse qualification then stimulated her to focus on primary care and prevention of ill health. Carol worked as a practice nurse and nurse practitioner in Newcastle city centre and as a staff nurse within Northumberland community nursing teams before going on to complete a health visiting degree and working in Newcastle as a health visitor for several years. During this time, she undertook several leadership and teaching roles including immunisation training co-ordinator, community practice teacher and trust lead mentor. Carol has been a senior lecturer at Northumbria University since 2002 and has led several postgraduate professional programmes including MSc Education in Professional Practice (NMC Teacher programme), PGDip SCPHN and the Non-Medical Prescribing programme. She has also undertaken national roles including Policy Advice Committee member and Treasurer for the UK Standing Conference SCPHN Education and subject expert for several quality approval panels and external examiner roles. Her key areas of interest and research are around developing learning and teaching and advanced level practice.

Barbara C. Wimmer

BPharm (Hons), MSc (Clin Pharm), PhD. Lecturer.

Barbara brings together experience in community and hospital pharmacy and clinical research in Europe and in Australia. She worked in community pharmacies as pharmacist in charge and is an approved hospital pharmacist. Barbara has experience teaching pharmacology to nursing students and oversaw quality assurance in a hospital setting in Austria. Following on from her master of clinical pharmacy at the University of Strathclyde, Scotland, she returned to Steyr Hospital in Austria to lead the service for drugs information and clinical pharmacy. Barbara's PhD studies at Monash University in Melbourne focused on factors associated with medication regimen complexity. She joined the University of Tasmania in 2016 and teaches clinical pharmacokinetics to undergraduate students.

Paul Younger

MClinRes, PGCert (Medical Ultrasound), PGCE, BSc(Hons), BA(Hons), DipPUC, FCPara. Advanced Paramedic Practitioner. North East Ambulance Service.

Paul joined the North East Ambulance Service in 2002, completing his paramedic training in 2005. He has a master's in clinical research from Newcastle University, a PGCE, and a postgraduate qualification in medical ultrasound. He studied non-medical prescribing at Northumbria University, becoming one of the first paramedics in the UK to complete their training. He works clinically as an advanced practitioner for the North East Ambulance Service. A member of the College of Paramedics council and board since 2010, he has held various posts including regional and alternative regional representative for the North East, vice and deputy chair before being appointed as vice president in 2021. For his work with the profession and the college, Paul was made a fellow of the College of Paramedics in 2016. He has presented on paramedic practice at conferences around the world, including the UK, USA, Canada, Australia, Finland and The Netherlands.

Preface

The key aim of *Fundamentals of Pharmacology for Paramedics* is to provide the reader with an understanding of the essentials associated with pharmacology and paramedic practice so as to enhance patient safety and patient outcomes. This book can help readers improve and expand their expertise and self-confidence within the field of paramedicine and enable them to recognise and respond appropriately to the needs of those they offer care and support to, wherever this may be. The contributors to the text are all experienced clinicians and academics who have expertise in their sphere of practice.

Pharmacology is the study of how drugs, medicines and substances work together with the body when they are being used for the management of illness, disease, pain relief and other conditions. This can be everything from drugs that are used in respiratory care to the action of medications used as a vaccine.

The paramedic scope of practice at the point of registration continues to be developed within pre-registration programmes of study around the world, ensuring that the newly qualified paramedic has the required knowledge and skills to provide best practice healthcare to patients. In many countries, this also includes ensuring that pre-registration paramedic students are 'prescriber ready' once they have successfully completed their undergraduate programme of study.

If undergraduate paramedic students are to offer care that is safe and effective, then they must be prepared in such a way that they become accountable practitioners who are able to carry out their role in a meaningful manner that adheres to professional standards and aligns with the law. *Fundamentals of Pharmacology for Paramedics* will help paramedics add to their repertoire of skills as they gain appropriate pharmacological knowledge. Whilst there is a need to ensure that emphasis is placed on the principles of safe drug administration in undergraduate curricula, there is also a need to ensure that students are provided with the pharmacological foundations associated with the bigger issues related to medicines management. Knowing how to study this subject effectively is about developing an effective workable learning strategy. *Fundamentals of Pharmacology for Paramedics* provides the reader with an overview of the key issues that can support them as they begin to understand and apply the complexities associated with pharmacology as well as the exciting challenges that are ahead of them.

The text integrates comprehensive knowledge of pharmacology enabling the reader to formulate a plan of care that can improve the overall health and wellbeing of the patient. When advising on and dispensing or administering medicines, this must be done within the limits of the individual's education, training and competence, professional body guidance and other relevant policies and regulations. It is essential to ensure that you keep to the laws of the country in which you are practising.

The paramedic must know the names, mechanism of action, indications, contraindications, complications, routes of administration, side-effects, interactions, dose and any specific administration considerations for a range of medications. They have to understand relevant pharmacology as well as the administration of therapeutic medications.

The chapters in this book offer a range of teaching and learning resources that can help you come to terms with the often complex area of pharmacology and paramedicine. The book can be used in a number of ways; for example, you may choose to read Chapters 1–7 first and then dip in and out of the remaining chapters as you need them. Trying to learn everything at once has the potential to cause confusion which can eventually result in a loss of confidence, affecting your ability to learn and assimilate. Avoid trying to learn large volumes of information and copious amounts of detail all at once; focus instead on only those details that can help you achieve your aims.

Often pharmacology modules, as part of the wider curriculum, will require the student to safely administer the appropriate medication, correctly monitor medicated patients in accordance with established protocols/policy, understand the drug's mechanism of action, indication for use, routes

of administration, how the drug is absorbed, distributed, metabolised and eliminated, contraindications, drug interactions and a lot more. Recognising each drug you use and learning the differences and similarities between drugs is key to understanding the fundamentals of pharmacology. Pharmacology is an important subject and it is vital that you effectively learn the various drugs, their categories, mechanisms of action, pharmacodynamics and pharmacokinetics. The 17 chapters in this book will help you come to terms with what is often seen as a complex and sometimes terrifying subject.

The paramedic scope of practice at the point of registration continues to be developed within pre-registration programmes of study, ensuring that the newly qualified paramedic is fit for practice. The scope of practice for specialist, advanced and consultant paramedics is being defined and refined around the world. A sound understanding of the fundamentals of pharmacology related to paramedicine will help you attain the goals that you set today.

We hope you enjoy using this book as you develop personally and professionally. Having a detailed understanding of how drugs work and why they are given has the potential to help you become a great paramedic.

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Suzanne Evans, Newcastle, New South Wales, Australia

Lisa Clegg, New South Wales, Australia

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Prefixes, suffixes and abbreviations

Prefix: A prefix is positioned at the beginning of a word to modify or change its meaning. Pre means 'before'. Prefixes may also indicate a location, number, or time.

Suffix: The ending part of a word that changes the meaning of the word.

Prefix or suffix	Meaning	Example(s)
a-, an-	not, without	analgesic, apathy
ab-	from; away from	abduction
abdomin(o)-	of or relating to the abdomen	abdomen
acous(io)-	of or relating to hearing	acoumeter, acoustician
acr(o)-	extremity, topmost	acrocrany, acromegaly, acroosteolysis, acroposthia
ad-	at, increase, on, toward	adduction
aden(o)-, aden(i)-	of or relating to a gland	adenocarcinoma, adenology, adenotome, adenotyphus
adip(o)-	of or relating to fat or fatty tissue	adipocyte
adren(o)-	of or relating to adrenal glands	adrenal artery
-aemia	blood condition	anaemia
aer(o)-	air, gas	aerosinusitis
-aesthesi(o)-	sensation	anaesthesia
alb-	denoting a white or pale colour	albino
-alge(si)-	pain	analgesic
-algia, -alg(i)o-	pain	myalgia
all(o-)	denoting something as different, or as an addition	alloantigen, allopathy
ambi-	denoting something as positioned on both sides	ambidextrous
amni-	pertaining to the membranous fetal sac (amnion)	amniocentesis
ana-	back, again, up	anaplasia
andr(o)-	pertaining to a man	android, andrology
angi(o)-	blood vessel	angiogram
ankyl(o)-, ancyl(o)-	denoting something as crooked or bent	ankylosis
ante-	describing something as positioned in front of another thing	anteartum
anti-	describing something as 'against' or 'opposed to' another	antibody, antipsychotic
arteri(o)-	of or pertaining to an artery	arteriole, arterial

Prefix or suffix	Meaning	Example(s)
arthr(o)-	of or pertaining to the joints, limbs	arthritis
articul(o)-	joint	articulation
-ase	enzyme	lactase
-asthenia	weakness	myasthenia gravis
ather(o)-	fatty deposit, soft gruel-like deposit	atherosclerosis
atri(o)-	an atrium (especially heart atrium)	atrioventricular
aur(i)-	of or pertaining to the ear	aural
aut(o)-	self	autoimmune
axill-	of or pertaining to the armpit (uncommon as a prefix)	axilla
bi-	twice, double	binary
bio-	life	biology
blephar(o)-	of or pertaining to the eyelid	blepharoplast
brachi(o)-	of or relating to the arm	brachium of inferior colliculus
brady-	'slow'	bradycardia
bronch(i)-	bronchus	bronchiolitis obliterans
bucc(o)-	of or pertaining to the cheek	buccolabial
burs(o)-	bursa (fluid sac between the bones)	bursitis
carcin(o)-	cancer	carcinoma
cardi(o)-	of or pertaining to the heart	cardiology
carp(o)-	of or pertaining to the wrist	carpal tunnel
-cele	pouching, hernia	hydrocele, varicocele
-centesis	surgical puncture for aspiration	amniocentesis
cephal(o)-	of or pertaining to the head (as a whole)	cephalalgia
cerebell(o)-	of or pertaining to the cerebellum	cerebellum
cerebr(o)-	of or pertaining to the brain	cerebrology
chem(o)-	chemistry, drug	chemotherapy
cholecyst(o)-	of or pertaining to the gallbladder	cholecystectomy
chondr(i)o-	cartilage, gristle, granule, granular	chondrocalcinosis
chrom(ato)-	colour	haemochromatosis
-cidal, -cide	killing, destroying	bacteriocidal
cili-	of or pertaining to the cilia, the eyelashes	ciliary
circum-	denoting something as 'around' another	circumcision
col(o)-, colono-	colon	colonoscopy
colp(o)-	of or pertaining to the vagina	colposcopy
contra-	against	contraindicate
coron(o)-	crown	coronary
cost(o)-	of or pertaining to the ribs	costochondral
crani(o)-	belonging or relating to the cranium	craniology

Prefix or suffix	Meaning	Example(s)
-crine, -crin(o)-	to secrete	endocrine
cry(o)-	cold	cryoablation
cutane-	skin	subcutaneous
cyan(o)-	denotes a blue colour	cyanosis
cyst(o)-, cyst(i)-	of or pertaining to the urinary bladder	cystotomy
cyt(o)-	cell	cytokine
-cyte	cell	leukocyte
-dactyl(o)-	of or pertaining to a finger, toe	dactylogy, polydactyly
dent-	of or pertaining to teeth	dentist
dermat(o)-, derm(o)-	of or pertaining to the skin	dermatology
-desis	binding	arthrodesis
dextr(o)-	right, on the right side	dextrocardia
di-	two	diplopia
dia-	through, during, across	dialysis
dif-	apart, separation	different
digit-	of or pertaining to the finger (rare as a root)	digit
-dipsia	suffix meaning '(condition of) thirst'	polydipsia, hydrodipsia, oligodipsia
dors(o)-, dors(i)-	of or pertaining to the back	dorsal, dorsocephalad
duodeno-	duodenum	duodenal atresia
dynam(o)-	force, energy, power	hand strength dynamometer
-dynia	pain	vulvodinia
dys-	bad, difficult, defective, abnormal	dysphagia, dysphasia
ec-	out, away	ectopia, ectopic pregnancy
-ectasia, -ectasis	expansion, dilation	bronchiectasis, telangiectasia
ect(o)-	outer, outside	ectoblast, ectoderm
-ectomy	denotes a surgical operation or removal of a body part; resection, excision	mastectomy
-emesis	vomiting condition	haematemesis
encephal(o)-	of or pertaining to the brain; also see cerebr(o)-	encephalogram
endo-	denotes something as 'inside' or 'within'	endocrinology, endospore
enter(o)-	of or pertaining to the intestine	gastroenterology
epi-	on, upon	epicardium, epidermis, epidural, episclera, epistaxis
erythr(o)-	denotes a red colour	erythrocyte
ex-	out of, away from	excision, exophthalmos
exo-	denotes something as 'outside' another	exoskeleton
extra-	outside	extradural haematoma
faci(o)-	of or pertaining to the face	facioplegic
fibr(o)	fibre	fibroblast

Prefix or suffix	Meaning	Example(s)
fore-	before or ahead	forehead
fossa	a hollow or depressed area; trench or channel	fossa ovalis
front-	of or pertaining to the forehead	frontonasal
galact(o)-	milk	galactorrhoea
gastr(o)-	of or pertaining to the stomach	gastric bypass
-genic	formative, pertaining to producing	cardiogenic shock
gingiv-	of or pertaining to the gums	gingivitis
glauc(o)-	denoting a grey or bluish-grey colour	glaucoma
gloss(o)-, glott(o)-	of or pertaining to the tongue	glossology
gluco-	sweet	glucocorticoid
glyc(o)-	sugar	glycolysis
-gnosis	knowledge	diagnosis, prognosis
gon(o)-	seed, semen; also, reproductive	gonorrhoea
-gram, -gramme	record or picture	angiogram
-graph	instrument used to record data or picture	electrocardiograph
-graphy	process of recording	angiography
gyn(aec)o-	woman	gynaecomastia
haemangi(o)-	blood vessels	haemangioma
haemat(o)-, haem-	of or pertaining to blood	haematology
halluc-	to wander in mind	hallucinosi
hemi-	one-half	cerebral hemisphere
hepat- (hepatic-)	of or pertaining to the liver	hepatology
heter(o)-	denotes something as 'the other' (of two), as an addition, or different	heterogeneous
hist(o)-, histio-	tissue	histology
home(o)-	similar	homeopathy
hom(o)-	denotes something as 'the same' as another or common	homosexuality
hydr(o)-	water	hydrophobe
hyper-	denotes something as 'extreme' or 'beyond normal'	hypertension
hyp(o)-	denotes something as 'below normal'	hypovolaemia
hyster(o)-	of or pertaining to the womb, the uterus	hysterectomy
iatr(o)-	of or pertaining to medicine, or a physician	iatrogenic
-iatry	denotes a field in medicine of a certain body component	podiatry, psychiatry
-ics	organised knowledge, treatment	obstetrics
ileo-	ileum	ileoocaecal valve
infra-	below	infrahyoid muscles
inter-	between, among	interarticular ligament

Prefix or suffix	Meaning	Example(s)
intra-	within	intramural
ipsi-	same	ipsilateral hemiparesis
ischio-	of or pertaining to the ischium, the hip joint	ischioanal fossa
-ismus	spasm, contraction	hemiballismus
iso-	denoting something as being 'equal'	isotonic
-ist	one who specialises in	pathologist
-itis	inflammation	tonsillitis
-ium	structure, tissue	pericardium
juxta- (iuxta-)	near to, alongside or next to	juxtaglomerular apparatus
karyo-	nucleus	eukaryote
kerat(o)-	cornea (eye or skin)	keratoscope
kin(e)-, kin(o)-, kinesi(o)-	movement	kinaesthesia
kyph(o)-	humped	kyphoscoliosis
labi(o)-	of or pertaining to the lip	labiodental
lacrim(o)-	tear	lacrimal canaliculi
lact(i)-, lact(o)	milk	lactation
lapar(o)-	of or pertaining to the abdomen wall, flank	laparotomy
laryng(o)-	of or pertaining to the larynx, the lower throat cavity where the voice box is	larynx
latero-	lateral	lateral pectoral nerve
-lepsis, -lepsy	attack, seizure	epilepsy, narcolepsy
lept(o)-	light, slender	leptomeningeal
leuc(o)-, leuk(o)-	denoting a white colour	leukocyte
lingu(a)-, lingu(o)-	of or pertaining to the tongue	linguistics
lip(o)-	fat	liposuction
lith(o)-	stone, calculus	lithotripsy
-logist	denotes someone who studies a certain field	oncologist, pathologist
log(o)-	speech	logopaedics
-logy	denotes the academic study or practice of a certain field	haematology, urology
lymph(o)-	lymph	lymphoedema
lys(o)-, -lytic	dissolution	lysosome
-lysis	destruction, separation	paralysis
macr(o)-	large, long	macrophage
-malacia	softening	osteomalacia
mammill(o)-	of or pertaining to the nipple	mammillitis
mamm(o)-	of or pertaining to the breast	mammogram
manu-	of or pertaining to the hand	manufacture