

# PSYCHO PHARMACOLOGY

**A mental health  
professional's guide  
to commonly used  
medications**

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**A mental health  
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to commonly used  
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Herbert Mwebe

First published in 2018 by Critical Publishing Ltd

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British Library Cataloguing in Publication Data  
A CIP record for this book is available from the British Library

ISBN: 978-1-912096-04-6

This book is also available in the following e-book formats:

MOBI ISBN: 978-1-912096-03-9

EPUB ISBN: 978-1-912096-02-2

Adobe e-book ISBN: 978-1-912096-01-5

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Cover design by Out of House Limited  
Text design by Greensplash  
Project Management by Out of House Publishing Solutions  
Printed and bound in Great Britain by

Critical Publishing  
3 Connaught Road  
St Albans  
AL3 5RX  
[www.criticalpublishing.com](http://www.criticalpublishing.com)



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# Meet the author

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**Herbert Mwebe** is a lecturer in mental health in the School of Health and Education at Middlesex University. Within the department of mental health, Herbert delivers physical health training for both undergraduate and postgraduate programmes. He leads on continuing professional development courses focusing on developing mental health professionals' knowledge and skills in relation to improving physical health in serious mental illness and medication management in adult mental health settings.

Prior to entering academia, Herbert worked in both inpatient and community settings providing mental health care to people with serious mental illness; most recently in general practice, Herbert led on a mental health project in City and Hackney commissioned by NHS England to provide timely management of people presenting with mental illness in primary care.

Herbert also works with the Care Quality Commission (CQC) in the capacity of specialist clinical advisor, supporting CQC health and social care provider inspections.

# Acknowledgements

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In writing this book, I would like to acknowledge the following people.

Third year mental health nursing students whose feedback in the earlier stages of this project provided valuable insight in the writing and planning of the book.

I am grateful to all those who kindly agreed to review the book, and especially Dr Geeta Patel for always providing me with personal and professional guidance.

Nobody has been more important to me in the pursuit of this project than the members of my family. I would like to thank my parents, whose love and guidance are with me in whatever I pursue. They are the ultimate role models. Most importantly, I wish to thank my loving and supportive wife, for her ongoing support and words of encouragement. Thank you for giving time to review and edit the book draft.

Finally, I would like to thank God, for without His presence in my life I would not be what I am today.

Herbert Mwebe

# Foreword

---

I met Herbert in 2014, and at that time he was leading an innovative GP-based mental health project in a busy urban setting in East London, at the front line of psychiatric care and forming a vital bridge between primary and secondary mental health services.

Herbert brought his secondary care experience into the heart of primary care. He was located in the GP practices, seeing patients, advising the primary care team, bringing mental health expertise to where it was needed most. I was also working in that gap between primary and secondary care as a primary care liaison psychiatrist, and although I was secondary care mental health trust employed and Herbert was primary care employed, we had a similar ethos and worked together to care for patients.

I have been a consultant psychiatrist in East London since 2009 and took up the role of lead consultant for primary care liaison in 2015. Primary mental health care is vitally important, not just for common mental disorders and first episode presentations to primary care professionals, but increasingly for long-term management of people with chronic but stable severe and enduring mental health problems discharged from secondary care services.

Herbert's skill in the assessment and management of mental health issues was readily apparent, and his wisdom in knowing when and how to intervene was invaluable. He was able to contain complex situations at the GP surgery, without referring and waiting for secondary care appointments. For patients, his input in the less stigmatising and more familiar environment of their family GP's surgery was hugely welcome. For GPs, having Herbert's knowledge and advice so readily available in the surgery was 'just what the doctor ordered'. He helped many patients through crises, not just with medication but providing holistic care and using psychosocial interventions with patients at the centre of their care. His real forte was in the management of physical health conditions in people with long-term mental health conditions. He reviewed the care of many patients on long-term depot antipsychotics who had been discharged back to primary care, making dose changes and ensuring physical health monitoring was prioritised. His expertise in balancing medication to optimise efficacy for mental health symptoms while minimising unwanted physical and metabolic side effects gave confidence to GPs to make dose reductions and substitutions, without the need for re-referral back to secondary care.

I remember a particular patient in his late 50s who had been on depot medication for more than 20 years, without the need for secondary care input for at least ten years, whose dose had not changed since his discharge from the psychiatry clinic. He had been invited to come to the surgery for annual reviews but had tended to avoid coming. He

needed some encouragement and more assertive outreach. Herbert managed to engage with him and over a series of supportive contacts managed to get his co-operation in having physical health screening tests. An ECG picked up a significant issue with QT prolongation and Herbert spent several sessions with the patient discussing options and helping him to make an informed choice about his treatment. With the patient's wishes established, and with liaison discussions between myself, Herbert and the GP, we arranged for his depot to be reduced and stopped and to have a much lower dose of a different oral antipsychotic. The patient, having been invited to make active choices about his treatment, was more motivated to take the lead in decisions about his own recovery and later took up the offer of gym membership through 'exercise on prescription'. His GP felt supported and empowered to make decisions about longstanding antipsychotic medication, changes that the GP would have previously been hesitant to initiate without secondary care management.

It is no surprise, given the significant training aspect of his role in primary care that Herbert went on to further develop his teaching portfolio, becoming a lecturer in mental health in the School of Health and Education at Middlesex University, where he focuses on physical health training and medication management on the undergraduate and post-graduate programs.

This useful and practical textbook provides a concise and informative resource covering the psychotropic medications most commonly used in clinical practice. Background information about neurotransmitters and the pharmacological mechanism of action is presented clearly, balanced with practical and clinical applications. It explores how medication can be used to help people presenting with mental health symptoms and, in keeping with Herbert's practice as a clinician, it demonstrates how medication is just one tool in a range of possible interventions. He keeps the patient at the centre, with case discussions and real-life case examples as well as a focus on safety.

The book will be helpful for anyone working at the front line of mental health care, in primary or secondary care, including GPs, junior doctors and psychiatrists, practice and mental health nurses and professionals working in liaison services. Those undertaking educational health courses with a mental health focus will find this book useful. The summary at the end of each chapter would be particularly useful for students and non-medical prescribers, with learning outcomes and study activities laid out as a useful revision aid. This is a book designed for clinical use, with an emphasis on physical health and the impact of prescribing not just on mental health symptoms but on all systems, considering a holistic approach.

I see this book as an essential learning tool and practical reminder for anyone treating people with mental health symptoms. It is firmly established on my bookshelf already.

Dr Caroline Methuen  
Consultant Psychiatrist  
East London NHS Foundation Trust

# What the reviewers say

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I would recommend this book to all mental health nurse prescribers, nurses and students. The book layout is brilliant with a concise summary and questions at the end of each chapter, which makes the reader reflect on the content read in each chapter. Case discussion makes it more interesting and enhances your knowledge of each group of medication. The book, with the study activities, is very well written and a very useful resource for practitioners and learners.

Dr Geeta, Patel  
GP with specialist interest in psychiatry  
Latimer Health Centre, City and Hackney CCG

The author has clearly put a lot of work in writing this book and I like the ethos, how medication is looked at as a tool and how a reduction of symptoms may allow for other work to take place. I think it is written in a way to allow difficult concepts to be visualised in a memorable way. I was struck by the amount of information in a short read. The author identifies key points and creatively depicts application in a care setting. I imagine if I was a nurse I would find it a useful resource, but I also think it would be useful for other professionals.

David Rogalski  
Lead Pharmacist, Practice Based Mental Health Team  
Camden and Islington NHS Foundation Trust

I recommend this informative, accessible and easy-to-read book to mental health professionals. It is a clear, concise summary of the use of psychotropic drugs that are commonly used in mental health settings. It is useful for people new to mental health and a good summary for people who are experienced in the field. It is clearly laid out and well researched. It clearly explains concepts such as the pathogenesis of different mental illnesses, neurotransmitters and the biochemistry and pharmacology of different medication. Herbert Mwebe has a great deal of experience in the front line of mental health in various settings including acute psychiatric wards. His years of experience are demonstrated in this book. It is clearly laid out with relevant case examples that are commonly experienced. Under each chapter a drug group is discussed with a summary of learning outcomes set out for the reader at the beginning. Common conditions are discussed for which the specific drug group is indicated, the mechanism of action as well as adverse

effects and/or side effects associated with the drugs. I will recommend this book to my colleagues.

Dr Rachel Gibbons  
Consultant Psychiatrist in Psychiatry and Psychotherapy  
Barnet Enfield and Haringey NHS Mental Health Trust  
Psychoanalyst - Institute of Psychoanalysis

A very well written and well laid out piece. An easy read even for beginners.

Anu Patel  
Community Pharmacist  
Newcare Pharmacy, North West London

This comprehensive resource covers all the commonly used psychotropic drugs in detail, so that readers are fully informed; yet explains things in a clear, memorable and easy-to-understand way. I particularly like the case studies and end of chapter summaries and review questions, which will be very useful for students as a revision aid, but they also provide a succinct refresher for any practicing health professional involved in the care of people with mental health disorders. This is a useful learning resource for all students or qualified health professionals (registered nurses, social workers, psychologists, pharmacists and doctors).

Dr Danielle Roberts  
GP Specialist Trainee  
Health Education England London Deanery

The primary purpose of this book is to inform the reader about the clinical use of psychiatric drugs. It assumes a user-friendly style, with consideration given to learning, revision and testing at the end of each chapter.

The key aspects of psychotropic drugs, their mechanisms of action and safe use are covered, with signposting to drug properties, such as additional safety netting requirements. Clinical applications are supported via useful case studies.

One of the strengths of this book is the patient-centred focus. This has the additional advantage of encouraging an holistic social and medical approach, which is essential to treat and promote mental health. By providing insight into the impact of these drugs upon the individual and into the range of systems to be considered when assessing and managing a patient on psychotropic medications, the reader is able to envisage the whole model of care.

This text should be useful for people at the beginning of their professional journey, as well as for clinicians who require additional knowledge about a psychotropic drug class, or for people undertaking a prescribing course.

Dr Sharon Rees  
Associate Professor Therapeutics and Prescribing  
London Southbank University



# 1

## Mental illness

### CHAPTER AIMS

This chapter covers:

- the brief history of psychiatric drugs and alternative interventions used in mental health settings;
- the aetiology of mental illness;
- neurodevelopment and biochemical theories implicated in the aetiology of mental illness;
- the most common neurotransmitters, their role and function;
- the role of mental health nurses, prescribers and others in medication management;
- clinical decision-making in mental health nursing.

### 1.1 INTRODUCTION

Psychiatric medicine as well as contemporary mental health nursing heavily relies on psychotropic drugs. The phrase 'psychotropic drugs' is a technical term for psychiatric medicines that alter chemical levels in the brain which impact on mood and behaviour. Medications can play a role in treating many mental illnesses and conditions. Psychiatric drugs have been available for more than six decades; also referred to as neuroleptic drugs, they are used to treat and manage symptoms of organic psychoses and mania. Psychiatric drugs just like any other medication have side effects, ranging from minor to more complex and serious adverse effects for the patient. There is now a well-established body of evidence relating to the effects and past as well as current research has focused on the health implications of consuming these pharmaceutical agents. Psychiatric drug use in clinical settings has indeed revolutionised the understanding around theory and practice of mental health nursing. The mental health nurse's role in the monitoring of side effects of psychiatric drugs is therefore a vital step of the patient's care plan. Firstly, the nurse must be able to identify and evaluate side effects of the medication because the side effects may mirror the symptoms of mental conditions; this could present challenges in developing a clearly focused care plan for the patient in relation to their specific needs identified and aligning these with the necessary and most effective interventions.

Medicines are usually more effective when combined with alternative interventions for people with mental illness, these might include but are not limited to cognitive behavioural therapy (CBT), counselling, interpersonal therapy, family therapy, psychoeducation, healthy eating, sleep hygiene, empathetic listening, problem solving, exercise and budgeting. In some cases, medication can reduce symptoms so that other methods of interventions in care planning can become more effective. It is important to explore the usefulness of all interventions (pharmacological and psychosocial treatment strategies) when considering care planning and to not focus on a single intervention. For instance, a commonly used antidepressant called sertraline may lessen some significant symptoms of major depression and CBT may help the patient to change negative attitudes and patterns of thinking. Predicting patient response to medication is not always straightforward as some medications could work better for one person than for another (National Institute for Health and Care Excellence [NICE], 2018b). Prescribers (doctors, nurses and/or pharmacists) should review clinical literature and clinical records to see if there is evidence for recommending one type of medicine over another, for example mirtazapine a common antidepressant may be preferred over citalopram when there is problematic chronic insomnia, this is because it has been shown to enhance sedation and sleep even at lower doses compared to citalopram. Various factors should be considered by prescribers when planning pharmacological interventions, ie side effects, family history, existing physical health conditions, contra-indications, a patient's concordance to medication, lifestyle behaviours, allergies and consideration for other drugs (prescribed or recreational) the patient maybe be taking. The mental health nurse, by working alongside medical and non-medical prescribers, must ensure that patients receiving psychopharmacological interventions are closely monitored in relation to safe medication usage and management.

It is not unusual for the patient to try more than one drug at the initiation of treatment to establish the most appropriate drug, factors such as the patient's symptom profile, side effects and any past or previous response to other drugs should form part of the initial assessment. Patient involvement and active participation in the process of decision-making is vital to create a collaborative working partnership between the healthcare professional and the patient. The success of this shared care partnership is vital for the development of effective care plans. Family members and other carers should also be included in these discussions if the patient gives their consent.

Some drugs used for mental health work quickly. For example, lorazepam, which is used for short-term therapy to relieve anxiety, produces a calming effect and the patient can show improvement within hours. Other drugs may have a slow onset of action, requiring some patients take the medication for several weeks before any improvement is seen. Medication therapy may be a short-term treatment strategy in which medications may be taken for a few weeks to months. In other cases, medication therapy may be a long-term or even life-long treatment strategy. Patients may be afraid that consuming medication may change their personality and lives; however, most patients find that taking the medication allows them to take charge of their situation and enables them to become more independent and actively participate in care planning to further improve their quality of life.

## 1.2 AETIOLOGY OF MENTAL ILLNESS

Mental illness can arise from many different sources. To date, there is no single confirmed or reliable accepted cause established. A common belief is that mental illness arises when genetic vulnerabilities and environmental factors interact, with the latter often acting as a catalyst to expose genetic vulnerabilities. This model has been theorised explicitly by the diathesis-stress model (Sullivan, 2009) and the stress-vulnerability model proposed by Zubin and Spring (1977). To put it simply, when stress factors (ie bereavement, poverty, loss of employment, complex interpersonal dynamics) and vulnerability (ie genetic, chronic physical illness, stressful life events) interact beyond a threshold, mental illness emerges. People with traumatic brain injuries are at greater risk of developing mental health related conditions, and environmental factors surrounding pregnancy and birth complications have also been implicated. Though, it is conceivable that the pregnancy and birth complications may reflect rather than cause mental illness. There is also wider acknowledgement of a strong relationship between complex mental illness and illness in adults and abuse (physical, emotional, sexual) and psychological trauma in early years. As such, psychosocial and interpersonal theories have also become a focus of recovery orientated strategies to understand how factors such as environmental, social, economic and upbringing may affect the course of mental illness.

Research has shown that genes play an important role in the development of mental illness but there has been little progress linking specific genes to specific mental health conditions. It has traditionally been assumed that changes in DNA structure is exclusively accountable for the development of schizophrenia. However, twin studies show that it is also conceivable that an epigenetic mechanism may contribute to the development of schizophrenia. Genetic contribution to the course of mental illness is significant and has been demonstrated by twin, family and adoption studies (MIMS, 2004; Gejman et al, 2010). In relation to schizophrenia and twin studies, psychiatrists frequently report a 45–50 per cent concordance rate for identical twins, compared to only a 10–15 per cent concordance rate for fraternal twins. These figures repeatedly cited in a wider body of scientific and non-scientific literature is largely considered the most significant piece of evidence supporting the biological theory of schizophrenia and seen as modest proof underpinning this theory relating to the course of schizophrenia (Joseph, 2003; Rapp et al, 2003). Nevertheless, the lack of 100 per cent concordance rates in monozygotic twins is also evidence that aetiology is not entirely genetic.

While the cause of depression has not been fully established, several theories have been reported in the pathophysiology of depression. Genetic contribution has been established with twin studies indicating that certain presentations of depressive disorder appear to be genetic. There is a reported increase in risk of bipolar disorder in the relatives of patients with known bipolar disorder. Relatives of both bipolar and unipolar patients are also at increased risk of unipolar depression (Cuellar, Johnson and Winters, 2005). Previous history of a mental illness (depression, schizophrenia, bipolar disorder) may increase the risk of further episodes. Major depressive disorder is also two to three times more common in women, similarly unipolar disorder in women is double that seen in males (Blows, 2011).

Psychoanalytic theories have also been proposed to explain the cause of mental illness. To this end, the theories offer rationality in relation to unresolved internal and interpersonal relational conflicts. Similarly, the attachment theory, which is often applied to understanding psychopathology, is informed by evolutionary psychology approaches that focus on the role early object relations play, ie early care giver–child relationships, and uncovering any tensions (anger, frustration, resentment) and the need to find satisfying positive object relations in adult life. Psychoanalytic theorists incorporate and assimilate the biopsychosocial model in their approach. The biopsychosocial model is now commonly used in the western world but while it emphasises the biological, social and psychological entities with regards to understanding aetiology of disease and illness, psychiatric care in the west continues to be mostly dominated by the medical model (disease model). Distinctions are commonly made between the disease model (focusing on symptoms, absence of symptoms) and social model (recovery model) of mental illness, which aims to homogenise the biopsychosocial understanding of psychopathology by focusing on social derivatives and constructions.

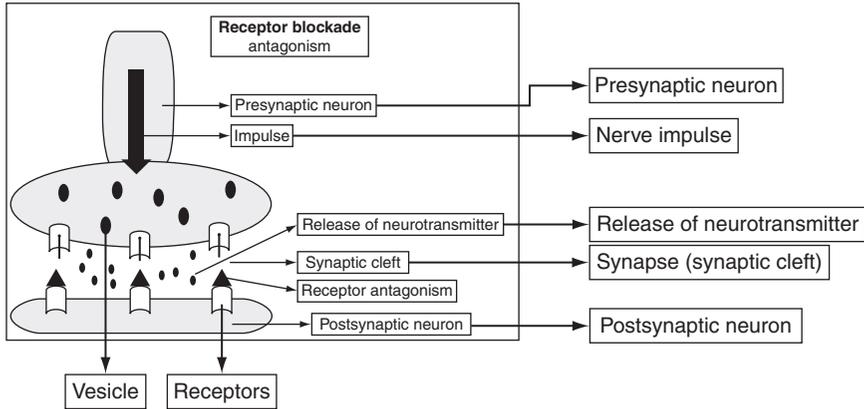
Biochemical theories implicate abnormalities in neurotransmitter circuit systems of dopamine, glutamate, serotonin, gamma-Aminobutyric acid (GABA) and acetylcholine in the causes of mental illness. The next sub-chapters look at this in more detail.

## 1.3 NEURODEVELOPMENTAL THEORIES

Neurodevelopmental theories are supported by abnormalities in the physiology of the brain, its structures and functions in the post-mortem of patients with schizophrenia. When reporting abnormalities, neuro-scientists have discovered both structural and functional changes, ie enlarged lateral and third cerebral ventricles (cavities in the brain filled with cerebrospinal fluid [CSF]) and decrease in whole brain volume are consistent findings. Patients with schizophrenia, including people who have never been treated, have a reduced volume of grey matter in the brain, especially in the temporal and frontal lobes, hippocampus, amygdala and parahippocampal gyrus. In recent times neuroscientists found grey matter loss of up to 25 per cent in some regions of the brain. The loss started in the parietal, or outer, regions of the brain and spread to the rest of the brain over a five-year period. The patients with most brain tissue loss also had the worst symptoms, these included hallucinations, delusions, bizarre and psychotic thoughts, hearing voices and depression (Hata et al, 2003; Brent et al, 2013). Suggested associations between reduced frontal lobe activity and negative (affective) symptoms commonly exhibited by patients have been reported as well as associations linking positive symptoms (delusions, auditory hallucinations) and increases in regional cerebral blood flow in brain language areas (MIMS 2004, Castelnovo et al, 2015).

## Neurons and neurotransmitters

The central nervous system (CNS) controls most functions of the body and mind. It consists of two parts: the brain and the spinal cord. The brain is central to thoughts,



**Figure 1.1** Neurons and neurotransmitter mechanism

emotions, behaviours, understanding and interpreting our external environment, muscle and motor control. Neurons and neurotransmitters play a significant role in moderating all these body processes and thus contribute to our daily well-being. There are between 30–100 neurotransmitter molecule types, with ten of them doing 99 per cent of the work. Neuroscientific research has mainly focused on the following main categories of neurotransmitters: glutamate, GABA, dopamine, serotonin, noradrenaline, acetylcholine, and histamine (National Institute of Mental Health, 2016; Whishaw et al, 2016). Abnormalities in these biochemical neurotransmitter circuit systems of the brain has been the focus of neuroscience research.

Neurons (or nerve cells) are the functional units of the CNS; neurotransmitters are chemical messengers between one neuron to another. The neurotransmitters carry impulses (messages) between neurons at specific junctions called synapses. All nerve impulses or chemical reactions originate within the neuron. Impulses resulting from neurotransmitter transmission travel along the axon of the nerve to initiate one of many actions inside or outside the brain, for example:

- triggering another nerve impulse;
- a muscle contraction;
- a glandular secretion.

In the above illustration, the onset of a nerve impulse excites the release of neurotransmitters from vesicles. The neurotransmitters pass across the synaptic cleft or synapse, bind to special molecules (proteins) called receptors and open channels located on the postsynaptic neuron of the target organ/muscle/nerve cell. The charged particles subsequently enter and trigger a second impulse. This process happens with quick precision and is repeated as the signal or impulse is passed at split-second speed from neuron to neuron (Südhof, 2004). The mechanism by which the neuron releases neurotransmitters has been the focus of considerable research. Scientists found that neurotransmitters are stored in small, bubble-like cubicles called vesicles. Each vesicle will usually hold a single type of neurotransmitter such as,

**Table 1.1** A summary of neurotransmitter types and effects in the body

<b>Neurotransmitter</b>	<b>Key role</b>	<b>Effects of increased</b>	<b>Effects of reduced</b>
<b>Serotonin</b> (excitatory & inhibitory)	Inhibits behaviour and activity, enhances sleep time, temperature regulation, pain perception and mood states	Induces sedation, but if significantly raised can result in mania and hallucinations	Depression, sleep disturbances, irritability and hostile behaviour
<b>Dopamine</b> (excitatory)	Decision-making, thinking, fine muscle movements, integration of emotions and thought processes	Loose associations, disorganised thoughts, stereotypical behaviours, tics and psychosis	Parkinson's disease and movement disorders, depression, fatigue, mood swings
<b>GABA</b> (inhibitory)	Balances and regulates excitatory neurons, regulates and restricts neuro-electric activity and involved in allergies	Excessive drowsiness may induce narcolepsy	Difficulty thinking or concentrating, tremors, stress, loss of motor control, personality changes, anxiety
<b>Noradrenaline</b> (excitatory and inhibitory)	Alertness, capacity to focus, attention, capacity to be orientated, fight or flight (sympathetic response)	Loss of appetite, hypervigilance, anxiety, paranoia	Low energy, dull, depression, low blood pressure, lethargy, inattention
<b>Adrenaline</b> (excitatory)	Adrenal medulla releases adrenaline. Adrenaline causes many physiological changes to prepare the body for fight or flight (eg increased heart rate, pupil dilation, etc.)	Paranoia, mania, weight loss or gain, muscle weakness, depression, anxiety, fatigue, sleep disturbances, excess facial and body hair and/or irregular periods in women	Low energy, dull, depression, fatigue, loss of appetite,

Neurotransmitter	Key role	Effects of increased	Effects of reduced
<b>Acetylcholine</b> (excitatory)	Stimulates muscles, helps in memory function, activates pain responses and regulates endocrine secretions	Self-consciousness, over inhibition, depression, psycho-somatic complaints and anxiety	Anticholinergic effects (eg dry mouth, blurred vision), lack of inhibition, poor memory, euphoria, Parkinsonism, antisocial behaviour, speech problems, manic behaviour
<b>Glutamate</b> (major excitatory neurotransmitter; N-methyl-D-aspartate [NMDA] receptors)	Involved in typical metabolic functions like energy production and ammonia purification in addition to protein synthesis. Neural communication, memory formation, learning, thinking and regulation	Increased levels of glutamate overstimulation leads to further neural death/degeneration which results in poor memory function/learning, Alzheimer's disease	Glutamatergic abnormalities are implicated in schizophrenia due to hypofunction of glutamatergic systems

dopamine, which is associated with memory and other cognitive skills, or serotonin, which helps regulate mood, appetite and aids in digestion. The vesicles travel like foot soldiers towards the end of the discharging neuron where they dock, waiting to be released through the synapse to eventually bind to the receptors of the receiving neuron. After the neurotransmitter binds with the receptor (a site on the postsynaptic nerve cell), the neurotransmitter can either produce two effects: (1) exciting or stimulating the receiving neuron or organ, or (2) inhibition (dampening or block action) of the postsynaptic neuron activity. The neurotransmitter breaks away from the receptor and is either recycled back (re-uptake) into the releasing neuron by a neurotransmitter responder or deactivated by enzymes in the synaptic space (Südhof and Rothman, 2009). Following neurotransmitter release, the neuron recycles the empty vesicles, refilling and reusing them several more times before they are replaced. Changes in functioning of any part of this process – if a neuron fails to do its job properly or if the vesicles release their neurotransmitters at the wrong speed – can result in the development of serious problems. Scientists have discovered that in the brains of people with depression, serotonin, which is responsible for regulating mood and enabling sleep, is low and not transmitted effectively between brain nerves. It is proposed that alteration in the level of function within these neurotransmitters

may offer understanding of the pathogenesis of some psychiatric disorders, such as schizophrenia, depression, anxiety states, attention deficit hyperactivity disorder (ADHD), mood disorders and other neurodegenerative conditions such as dementia and Parkinsonism.

Each neurotransmitter has one or two important roles at the receptor sites; the neurotransmitter either has an excitatory or inhibitory effect or both. Neurotransmitter role and function may include regulating bodily functions such as thinking, feelings, motor and sensory activity, thermoregulation, behavioural control, digestion etc.

## 1.4 CLINICAL DECISION-MAKING IN PRACTICE AND MEDICINE MANAGEMENT

Mental health professionals play a critical role in meeting people's needs to promote care that is of high quality and safe. For example, the Nursing Midwifery Council (NMC) professional code of conduct stipulates that registered nurses are accountable for providing, leading and co-ordinating nursing care informed by the most current evidence tailored to a person's needs and to be compassionate (NMC, 2015). To achieve this, nurses must work collaboratively, involve patients and partner with various healthcare professionals to meet the health care needs of people under their care (Mwebe, 2017; NMC, 2017). The way in which healthcare is provided has undergone various changes since the inception of the National Health Service (NHS) in the late 1940s. Healthcare professionals work in continued cultures of change against a backdrop of challenging environments, growing diversity and rapidly ever-changing complexity of patient needs. The Australian Public Service commission report (2007) used the term 'wicked' in relation to complex societal and individual determinants of health which are often difficult to define and are caused by factors of varying degrees. For example, unhealthy lifestyle behaviours such as smoking, drug and alcohol abuse, unhealthy eating and sedentary lifestyles are significantly more prevalent in people with mental illness than in people without mental illness (Dunstan, 2010; Szatkowsk et al, 2015 BIB<sup>193</sup>). In particular, people with serious mental illness smoke significantly more, have increased levels of nicotine dependency and are therefore at even greater risk of smoking-related harm (Office for National Statistics, 2016; Mental Health Foundation, 2016). Consequently, it is unsurprising that people with serious mental illness die on average 10–20 years earlier than people without mental illness (Action on Smoking and Health, 2018). Among other factors, this disparity is often due to low emphasis on strategies to screen for physical health problems in people with mental illness and inadequate targeted practices such as monitoring for adverse effects of psychotropic drugs and screening for unhealthy lifestyle behaviours (Mwebe, 2017). The rates of metabolic syndrome (a risk factor for developing cardiovascular disease [CVD], diabetes, stroke) are reported to be as high as 60 per cent in people with serious mental illness (Crump et al, 2013).

It is therefore important that mental health professionals providing care for people accessing mental health services are equipped with the right knowledge and skills and are confident to participate in the necessary decision-making processes in practice to

respond to the complex needs of patients. The NMC(2015) expects mental health trainee nurses and registered mental health nurses to act with professionalism, communicate and exhibit relationship building skills when undertaking nursing procedures and clinical decisions needed to screen and respond to patients at risk. Mutsatsa (2015) argues that the nurse must ensure any clinical decision considers the patient at the centre of their care with emphasis on a shared decision-making process between the nurse and the patient to promote shared learning and trust. The ability to reflect and think critically, apply skills and knowledge and deliver specialist nursing care interventions in areas such as medicine management and physical health care therefore lies at the forefront of pre-registration nursing education programmes and equally is a bedrock for all registered within nursing practice. However, mental health nurses' knowledge and skills regarding pharmacological interventions and link to practice has been questioned in research studies (Offredy et al, 2008) and by nurses themselves (Bradley et al, 2006). It is unsurprising that Mwebe (2017) found varying levels of practice and knowledge among inpatient mental health nurses in relation to physical health care needs of people with mental illness. Mental health nursing education in the UK is now more inclusive in that physical health training at both undergraduate and postgraduate levels is becoming part of the curriculum so that registered nurses and student nurses are trained and equipped with the necessary knowledge and skills to be ready and prepared to tackle physical health and other concerns in serious mental illness. All this is vital to empower mental health nurses to confidently make appropriate clinical decisions in practice. For example, mental health nurse prescribers may consider reflecting on the following questions and others when consulting and preparing a prescription for their patient.

- What is the therapeutic effect of the medication? Is it necessary and/or appropriate?
- What is the past and current medical history?
- What are the alternatives?
- What is the patient's view of the clinical benefits of the drug?
- What is the patient's experience?
- What are the patient's expectations from treatment?
- Is there a conflict and do you feel under pressure to prescribe?
- Is their problematic recreational drug use?
- What physical health co-morbidities must I consider?
- What level of engagement is needed to ensure the patient is an active partner in their care planning?

The new proposed pre-registration education and training standards published by the NMC (2017) reflect the future/current needs of the public for expert nursing care, it is expected that revamped educational framework for training nurses in the UK must reflect these needs. The educational standards propose the future nurse should generally be ready and prepared to meet patient and service needs and that at the point of qualifying, nurses should be ready to work in a range of sectors and specialties to provide high quality of care. Among the changes proposed in relation to preparatory nursing training is the ability to participate and take part in non-medical prescribing (Royal Pharmaceutical Society, 2016). For mental health trainee nurses this requires a sound knowledge of the pathology of mental illness, assessment and risk management and

pharmacotherapeutics. In practice, decisions to treat symptoms related to mental illness are not taken lightly and often involve a multidisciplinary team approach to plan for various patient needs including social, environmental, biological and psychological. The future mental health nurse or mental health prescriber must not only appreciate the impact of these factors on a person's health but exercise awareness of different interventions and safely apply these to individual cases adopting a person-centred approach. In particular, decision-making in practice around psychopharmacological interventions requires a sound understanding of pharmacodynamics and kinetics of how psychotropic drugs work in the body and the obligatory monitoring measures to ensure drugs are used safely in line with the current evidence base, clinical guidelines and statutory frameworks to minimise risk of harm to patients. The clinical decisions made by mental health professionals (mental health nurses, social workers, psychologists, psychiatrists) have significant implications on the patient. It is therefore a professional obligation for clinicians to engage, evaluate and incorporate evidence in their day-to-day clinical decision-making and professional judgement.

The Medicines and Healthcare Products Regulatory Agency (MHRA, 2008) defines medicine management as *'the clinical, cost-effective and safe use of medicines to ensure patients get the maximum benefit from the medicines they need, while at the same time minimising potential harm'*. Similarly, the standards for medicine management clearly state that all registered nurses must possess the necessary knowledge and leadership skills to inform the prescriber without delay where adverse effects and contraindications to prescribed medicines are found or when patients develop a reaction to the medicine (NMC, 2015b). Currently the NMC is collaboratively working with the Royal Pharmaceutical Society as they review and update their guidance entitled 'Professional Guidance on Safe and Secure Handling of Medicines in all Care Settings'. It is expected that this could benefit and provide an ideal model for future guidance on medicines management and administration (NMC, 2018). Mental health professionals are responsible for opportunistic screening and continued assessment of patients under their care. As antipsychotic drugs can cause significant physiological changes leading to poor physical health outcomes in patients, mental health nurses have continued responsibility for recognising and acting upon any changes in the patient's physiological parameters. The management and assessment of risk to promote the safe use of medicines should involve a clear and responsive model of inter and intraprofessional working partnerships. The NMC Essential Skills Clusters developed about nurses' fitness to practice at the point of registration emphasise mandatory requirements that pre-registration nurses must demonstrate competency in the medicine administration and calculation domain. Currently, facilitating of student nurse learning and assessment in practice is undertaken by suitably registered mental health nurses to prepare student nurses with the right skills and knowledge to be able to meet NMC pre-registration requirements. While this role under the new NMC practice learning standards is expected to be undertaken by registered nurses and other suitably qualified health professionals, for mental health nursing students in practice, a collaborative effort from different healthcare professionals contributing to the learning and assessment of students is most welcome. Facilitating learning could involve, among other roles, developing the trainee nurse's knowledge and confidence to recognise most commonly used psychiatric drugs, side effects and recommended monitoring.

The example below shows a typical learning scenario in relation to medication administration linking theoretical learning to practice.



## *Case study 1 – Medication administration*

### **Background**

Rose is a second-year mental health nursing student on her third week into a clinical placement on an inpatient mental health unit. Rose has started the morning shift and has been asked to observe a consultation between the junior doctor on the ward and Tom who was admitted to the unit the previous night. Tom has a diagnosis of paranoid schizophrenia. The consultation is in relation to a medication review as it had been alleged by the patient's community mental health team that Tom had stopped taking the medication prescribed to him. On this occasion, Tom is agreeable to resume taking his medication, the doctor starts the patient on olanzapine which is an atypical antipsychotic drug commonly used in mental health settings. The doctor also prescribes other drugs (haloperidol and lorazepam) that can be used when required on the reverse side of Tom's medication chart. Later that day, Tom becomes aroused and agitated in presentation, the team try non-pharmacological de-escalation techniques to manage Tom's presentation but to little effect. The team decide to offer Tom a dose of haloperidol 5 mg and 2 mg of lorazepam to take orally. Tom agrees and takes the medication. A few hours later, Tom reports to Rose that he is experiencing dizziness, light-headedness, drowsiness, headache and muscle stiffness.

### **CLINICAL DECISION-MAKING PROCESS (LINKING THEORY TO PRACTICE)**

Rose immediately recalls theory from a university lecture that antipsychotic medications can induce unwanted physiological effects when administered to patients. Rose offers one-to-one support to Tom and reassures him that the effects reported are likely to be caused by haloperidol which had been administered to Tom earlier. Given her level

of training and experience, Rose informs the nurse in charge about the situation and her own interpretations. The nurse in charge confirms and agrees with Rose and she explains to Tom that the side effects are related to haloperidol which is known for inducing extrapyramidal side effects (muscle spasm/stiffness, shaking/tremor, restlessness, mask-like facial expression and drooling). The nurse in charge offers another medication called procyclidine which is used in clinical settings to mitigate against extrapyramidal side effects induced by mostly older antipsychotic drugs, eg haloperidol, chlorpromazine.

The nurse in charge informs Tom that dizziness and light-headedness can increase the risk of falling, so Tom is advised by both the nurse and Rose to get up slowly when rising from a sitting or lying position. Rose offers to carry out a set of vital signs to assess any changes in blood pressure, pulse and respiratory parameters. Due to the risk of falls, the nurse in charge requests a support assistant to stay with Tom for the remainder of the shift to monitor for any further changes in presentation to ensure Tom's safety while he remains under the care of the ward. The junior doctor is informed about Tom's situation and offers to assess the patient at the next available opportunity but advises the nursing team to not administer haloperidol any further. In Chapter 2, extrapyramidal side effects and other effects associated with the use of antipsychotic medications are covered in detail.

The events in this scenario also demonstrate the opportunity and the need for a multidisciplinary team (MDT) working approach. A MDT is a partnership of specialised and non-specialised social and healthcare professionals who have distinctly different skills, knowledge and expertise, yet work together towards the common goal of providing the best patient care across variable services. The MDT is inextricably connected in the shared objective of providing effective care interventions (screening, monitoring, follow up) and overall care management to promote patients' health and well-being. Pharmacists among others (social workers, psychologists, occupational therapists, activity workers, independent mental health advocates) form part of the wider MDT in both inpatient and community mental health teams. In this scenario, the junior doctor, the registered nurse and the student nurse may consider involving a pharmacist who may provide further advice to address any medication management issues arising from Tom's care.

Generally, to aid clinical decision-making in practice regarding medication management, healthcare professionals have access and may refer to the following resources at their disposal:

- The Maudsley Prescribing Guidelines in Psychiatry.
- British National Formulary (BNF).
- Local NHS Trust Prescribing Formulary.
- National Institute for Health and Care Excellence Clinical Guidelines.
- The Nursing and Midwifery Council Standards for Medicines Management.
- The Mental Health Act 1983 as amended by the 2007 Act.
- United Kingdom Teratology Information Service.
- Medicines and Healthcare Products Regulatory Agency (Antipsychotics e-learning module).
- The electronic Medicines Compendium (eMC) contains up-to-date, easily accessible information about medicines licensed for use in the UK.
- The NHS Specialist Pharmacy Service (SPS) supports medicines optimisation across the NHS.
- MIND (mental health charity).
- HeadMeds, gives young people in the UK general information about medication.
- Choice and Medication and NHS 24 provide advice on mental health conditions and medications.
- Royal Pharmaceutical Society's Competency Framework For All Prescribers (RPS, 2016).

## **CHAPTER SUMMARY**

### **Key points**

- Psychiatric drugs are the mainstay for the treatment and management of moderate to severe mental illness, but the use of psychiatric drugs should not define the role of mental health professionals.
- Treatment and management of mental illness involves a wide range of interventions, these include psychotropic drugs, CBT, counselling, interpersonal therapy, family therapy, psychoeducation, healthy eating, sleep hygiene, empathetic listening, problem solving, exercise, budgeting and others.
- The aetiology of mental illness is an interplay of genetic factors, neurodevelopmental and biochemical abnormalities and environmental factors including social and interpersonal interactions playing a role.
- Biochemical theories implicate abnormalities in the neurotransmitter systems of the brain, ie dopamine, serotonin, noradrenaline, glutamate, GABA, acetylcholine in the aetiology of mental illness.

- Mental health nurses and others must exercise vigilance in addressing various needs of the patient and be up-to-date in knowledge and skills to make appropriate clinical decisions when assessing and monitoring people with mental illness; most importantly, patients who are exposed to psychopharmacological interventions.

## CHAPTER 1 REVIEW QUESTIONS

*Now have a go at answering these questions, you might find it useful to refer to the content of the chapter to locate the correct information for each question.*

1. What are antipsychotic medications?
2. What other name is usually used to refer to antipsychotic drugs?
3. What is the stress-vulnerability model and how does it contribute to the understanding behind the aetiology of mental illness?
4. What is a neuron? Give another name for a neuron.
5. Where do nerve impulses or chemical reactions originate from?
6. What is the space between two neurons called?
7. What do you call the cubicles where neurotransmitters are found?
8. What is the main difference between the presynaptic and postsynaptic neuron?
9. Give an example of a neurotransmitter?
10. Dopamine is found in the brain. True or false?
11. If someone has low serotonin levels in their brain, what are the likely health implications?
12. To understand how psychotropic medicines work, it is important to understand the theory behind neurotransmitter pathways and mechanisms in the brain. True or false?
13. What are the likely health effects of having low glutamate?
14. In Alzheimer's disease, low \_\_\_\_\_ neurotransmitter is likely to lead to poor memory. Fill in the missing word.
15. What does CNS stand for?
16. What might be the effects of having too much glutamate?
17. What might be the effects of having too much dopamine?
18. Name one excitatory and one inhibitory neurotransmitter.
19. The genetic contribution of genes has been demonstrated by what type of studies?
20. What are the clinical uses of lorazepam?
21. There are approximately between \_\_\_\_\_ neurotransmitter molecule types, with \_\_\_\_\_ of them doing 99 per cent of the work. Fill in the missing words.
22. The loss of motor control and changes in personality may occur when there is a lack of what neurotransmitter?

23. Impulses resulting from neurotransmitter transmission travel in the nerve cell may initiate one of many actions inside or outside the brain. Give examples of the actions.
24. What might be the effects of excess serotonin?
25. Give two examples of neurodegenerative conditions.
26. What is the relationship between neurotransmitters and vesicles?
27. What factors should be considered by psychiatrists and mental health nurse prescribers when preparing a prescription of psychotropic drugs?
28. What does CBT stand for? Give a brief description.
29. What condition could result from having low dopamine?
30. In the case scenario about Tom, which medication is responsible for him experiencing dizziness, light-headedness, drowsiness, headache and muscle stiffness?

# Glossary

<b>Abdominal obesity</b>	Also known as central obesity; is when excessive abdominal fat around the stomach and abdomen builds up to the extent that it is likely to have a negative impact on health. People with central obesity are at a high risk of developing diabetes, kidney disease, hypertension, dyslipidaemia and cardiovascular disease.
<b>Acetylcholinesterase inhibitor</b>	A drug that increases the levels of neurotransmitter acetylcholine by inhibiting the actions of acetylcholinesterase (an enzyme that breaks down acetylcholine). These drugs are used in the treatment of dementia.
<b>Action potential</b>	The alteration in electrical charge linked to the passage of an impulse along the membrane of a muscle cell or nerve cell.
<b>Affective disorders</b>	This is a term used to describe a group of mental disorders characterised by changes in mood.
<b>Agonist</b>	A drug or ligand that produces a biological response by binding to and activating a receptor.
<b>Agranulocytosis</b>	A potentially life-threatening condition; a severe and acute reduction in granulocytes (white blood cells – basophils, eosinophils and neutrophil) as an extreme reaction to a drug, resulting in the patient being at a dangerously high risk of infection. Clozapine and Carbamazepine are two examples of drugs that have been known to cause agranulocytosis.
<b>Allergy</b>	Allergies/allergic diseases are various conditions caused by hypersensitivity of the immune system to something (allergen) in the environment or a drug that usually causes little or no problem in most people.

<b>Amyloid cascade theory</b>	This theory proposes that excessive accumulation of a peptide called beta-amyloid in the brain is the key event in the pathophysiology of Alzheimer's disease. This accumulation of beta-amyloid plaques sets in motion a series of events which result in the death of nerve cells and subsequently leads to Alzheimer's disease.
<b>Angioedema</b>	A potentially life-threatening reaction resulting in sudden swelling of the face, neck, lips, tongue, throat, hands, feet, lips or genitals. Angioedema is usually triggered by an allergic reaction to a food, drug or insect bite.
<b>Antagonist (drug)</b>	A drug or ligand that blocks or dampens a biological response by binding to and blocking a receptor (rather than activating it like an agonist).
<b>Anticholinergic drugs</b>	A drug or substance that blocks the actions of the neurotransmitter acetylcholine in the parasympathetic nervous system.
<b>Anticonvulsants</b>	A drug used mainly to prevent or reduce epileptic fits and other seizures. Some anticonvulsants like sodium valproate and carbamazepine are also used to treat and manage patients with bipolar disorder.
<b>Arrhythmias</b>	This term refers to abnormal heart rhythms.
<b>Ataxia</b>	Lack of co-ordination of muscle action, particularly when walking or holding objects.
<b>Barbiturates</b>	A class of sedative and sleep-inducing drugs obtained from barbituric acid.
<b>Benzodiazepines</b>	A class of drugs that act as tranquilisers; used in the treatment and management of moderate to severe anxiety.
<b>Biotransformation</b>	A process by which organic compounds (typically drugs) are chemically changed from one form to another within the body, usually through the action of enzymes.
<b>Bipolar disorder</b>	Bipolar disorder is a common debilitating psychiatric illness characterised by repeated episodes of mania, hypomania or depression with complete inter-episode recovery.
<b>Blood-brain barrier</b>	The blood-brain barrier (BBB) is a highly selective semipermeable membrane barrier that separates the circulating blood

<b>Bradykinesia</b>	<p>from the brain tissues. It protects the brain from harmful substances that may enter the bloodstream.</p> <p>Abnormally slow body movement. Bradykinesia is a key feature of Parkinsonism and is a commonly reported side effect in patients taking antipsychotic drugs.</p>
<b>Cardiac enzymes</b>	<p>These are molecules released into blood circulation because of injury or damage to the heart muscle. Blood tests can detect abnormally high levels of cardiac enzymes (ie troponin, creatine kinase, myoglobin) and are used in the diagnosis of conditions such as myocardial infarction (heart attack) and myocarditis (inflammation of heart muscle).</p>
<b>Cardiomyopathy</b>	<p>Refers to diseases of the heart muscle, where it becomes abnormally enlarged, thick or rigid.</p>
<b>Cardiotoxicity</b>	<p>A condition where there is damage to the heart muscle by harmful chemicals or drugs, and as a result the heart becomes weaker and may be unable to pump blood effectively.</p>
<b>Clozapine</b>	<p>An atypical antipsychotic drug which is mainly used in the treatment of schizophrenia that does not improve after trials of other antipsychotic medications.</p>
<b>Cognitive Behavioural Therapy (CBT)</b>	<p>A psychosocial intervention that uses a systematic approach and goal-oriented therapy to address dysfunctional thoughts, emotions and behaviours. CBT is commonly used to treat anxiety and depression, but can be beneficial for many other mental and physical health problems.</p>
<b>Cytochrome P450 (CYP) enzymes</b>	<p>CYP enzymes, primarily located in the liver, are an essential group of enzymes involved in the metabolism of drugs or other substances. Most drugs are deactivated by CYPs and transformed into a form that is readily eliminated from the body. Other drugs are bioactivated by CYPs to form their active compounds. There are up to 60 CYP enzymes in humans and the majority of these play a central role in drug metabolism.</p>

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<b>Dementia</b>	An umbrella term for a range of progressive disorders of the brain affecting mental processes and functioning, giving rise to symptoms that include memory loss and difficulties with thinking, problem-solving, language and/or behaviour. Dementia is diagnosed when these symptoms are severe enough to affect the person's activities of daily living. There are many different types of dementia including: Alzheimer's disease, vascular dementia, and dementia with Lewy bodies.
<b>Diabetes mellitus</b>	A medical condition in which the body's ability to produce or respond to the insulin hormone is impaired, resulting in elevated levels of glucose in the blood.
<b>Diabetes insipidus</b>	An uncommon disorder characterised by intense thirst (polydipsia) and excretion of large amounts of urine (polyuria). It can be caused by damage to the brain (central diabetes insipidus) or may be due to a problem with the kidneys (nephrogenic).
<b>DNA (deoxyribonucleic acid)</b>	DNA is a self-replicating molecule, containing genetic information, and is present in nearly all living organisms as the main constituent of chromosomes.
<b>Dopamine hypothesis of schizophrenia</b>	The dopamine theory suggests that positive and negative symptoms in schizophrenia result from increased and decreased dopamine neurotransmission in the mesolimbic and mesocortical pathways respectively.
<b>Drug dependence</b>	Also known as substance dependence; develops from repeated dosing or administration such that the person experiences physical withdrawal symptoms upon stopping or withdrawing the agent or drug.
<b>Drug interaction</b>	This is the modification of the activity of a drug by another drug or substance, and can be beneficial or harmful.
<b>Drug tolerance</b>	When a patient develops a diminished response to a drug/substance as a result of frequent use, such that the patient requires increasing doses of the drug over time to achieve the same effect.

**Dual diagnosis**

The term given to a patient who has a mental illness and a comorbid substance abuse problem. These patients have complex needs and require a lot of community support. Co-occurring and complex needs are terms usually used to refer to dual diagnosis patients.

**Dyslipidaemia**

An abnormal amount of lipids (fat) in the blood; namely high levels of triglycerides, total cholesterol or low-density lipoprotein (LDL) cholesterol, and/or low levels of high-density lipoprotein (HDL) cholesterol.

**Dyspnoea**

A state in which the person experiences shortness of breath or difficulty breathing.

**Enzyme inducer**

A type of drug that increases the metabolic activity of an enzyme (typically those involved in drug metabolism, ie cytochrome P450 enzymes), usually resulting in a decrease in the effect of other drugs. Carbamazepine is an example of a drug that is an enzyme inducer.

**Enzyme inhibitor**

A type of drug that decreases the metabolic activity of an enzyme (typically those involved in drug metabolism, ie cytochrome P450 enzymes), usually resulting in an increase in the effect of other drugs, and can lead to drug toxicity. Paroxetine is an example of a drug that is an enzyme inhibitor, as well as some antibiotics such as erythromycin or ciprofloxacin.

**Enzymes**

Proteins that act as biological catalysts within cells; they increase the rate at which chemical reactions occur in the body.

**Extrapyramidal side effects (EPS)**

These are drug-induced movement disorders; physical symptoms resulting from adverse effects of dopamine antagonist agents (principally antipsychotic drugs) blocking dopamine transmission in the nervous system. EPS includes: dystonia, akathisia, Parkinsonism and tardive dyskinesia.

**GABA (gamma-aminobutyric acid)**

The main inhibitory neurotransmitter in the brain; GABA receptors are widely situated throughout cortical and subcortical regions of the brain.

<b>Glutamate hypothesis of schizophrenia</b>	The glutamate theory suggests that hypo-function of glutamate and antagonism of N-methyl-D-aspartate (NMDA) receptors in the brain could contribute to the positive and negative psychotic symptoms reported in schizophrenia.
<b>Half-life</b>	The time it takes for the concentration of a drug in the bloodstream to reduce by half.
<b>Hallucinations</b>	Profound distortions in a person's perception of reality in the context of visual, auditory, tactile and/or olfactory sensory modalities.
<b>Hepatotoxicity</b>	Refers to a drug or chemical that causes adverse effects and damage to the liver.
<b>Hypoglycaemia</b>	Low blood glucose levels.
<b>Hyponatraemia</b>	Low levels of sodium in the blood.
<b>Hypothyroidism</b>	Abnormally low production of thyroid hormone by the thyroid gland; also commonly referred to as 'underactive thyroid'.
<b>Hyperlipidaemia</b>	High levels of lipids (fats, triglycerides and/or cholesterol) in the blood.
<b>Hyperprolactinaemia</b>	Abnormally high levels of prolactin hormone in the blood.
<b>Hypertension</b>	Abnormally high blood pressure.
<b>Limbic System</b>	A complex system of networks in the brain, connecting several subcortical structures associated with instinct, mood and memory. The limbic system controls the basic emotions (fear, pleasure, anger) and drives hunger, sex and dominance.
<b>Lithium</b>	A mood stabilising drug commonly used in the treatment and management of bipolar disorder.
<b>Lorazepam</b>	An intermediate-acting benzodiazepine used in the management of anxiety disorders, insomnia, active seizures and for sedation.
<b>Macroglossia</b>	A medical term used to refer to the severe enlargement of the tongue, which can cause difficulties with breathing, speaking and eating.
<b>Memantine</b>	A NMDA (glutamate) receptor antagonist used in the management of moderate to severe dementia.

<b>Metabolic syndrome</b>	Also known as syndrome X or dysmetabolic syndrome; a cluster of conditions which when combined increase the risk of cardiovascular diseases, stroke and heart attacks. The defining medical conditions that are present in the metabolic syndrome are: abdominal obesity, high blood pressure, high glucose levels and dyslipidaemia or risk factors.
<b>Metabolites</b>	These substances are intermediate products of metabolic reactions, broken down by various enzymes that naturally occur within cells.
<b>Mixed states</b>	In bipolar disorder, mixed states refer to when manic and depressive symptoms are experienced together.
<b>Monoamine hypothesis of depression</b>	This theory postulates that hypofunction in the neurotransmitter pathways of serotonin, noradrenaline and dopamine could reflect the symptoms seen in depression.
<b>Myocarditis:</b>	A medical condition where the heart muscle becomes inflamed.
<b>Neuroleptic malignant syndrome (NMS):</b>	A potentially life-threatening neurological disorder, most often caused by an adverse reaction to antipsychotic drugs, characterised by symptoms of fever, confusion, muscle rigidity, labile blood pressure, sweating and fast heart rate.
<b>Neuroleptics</b>	Another term for antipsychotic drugs; a class of drugs used to treat schizophrenia and other psychotic disorders.
<b>Neuron</b>	A neuron or nerve cell is a basic structure of the nervous system; a specialised cell capable of transmitting nerve impulses.
<b>Neurotransmitter</b>	A chemical by which a neuron communicates with another neuron, or with a muscle or gland.
<b>Neutropenia</b>	A condition of abnormally low levels of neutrophils, leading to increased susceptibility to infection.
<b>Neutrophils</b>	A type of white blood cell that attacks bacteria and other organisms when they invade the body, and so help to fight infection.

<b>Oculogyric crisis</b>	This is a type of dystonic adverse reaction to a drug (eg antipsychotics), characterised by a prolonged involuntary upward deviation of the eyes.
<b>Off-label/unlicensed prescribing</b>	This refers to the prescription of a drug outside the terms of its license (ie for a condition other than which it has been officially approved for). In cases of off-label/unlicensed prescribing, the healthcare professional judges the particular prescription to be in the best interests of the patient on the basis of available evidence.
<b>Orthostatic hypotension:</b>	Also known as postural hypotension; refers to an abnormal drop in blood pressure that occurs when the person stands up after a period of sitting or lying down. Clozapine, risperidone and quetiapine are examples of atypical antipsychotics that can cause orthostatic hypotension.
<b>Palpitations</b>	Refers to when a person's heartbeat suddenly becomes more noticeable; the person may feel that their heart is beating very fast, fluttering, pounding or beating irregularly.
<b>Panic disorder</b>	A mental condition and anxiety disorder that causes the patient to have recurrent unexpected panic attacks. Panic attacks are sudden periods of intense fear, with accompanying symptoms of: breathlessness, palpitations, sweating, shaking, dizziness, chest pain, numbness/tingling in the hands or a feeling that something terrible is going to happen.
<b>Paralytic ileus</b>	A medical term describing the obstruction of the intestine (gut) due to paralysis of the intestinal muscles; food does not pass through the intestine properly, leading to bloating, blockage, constipation and vomiting.
<b>Pharmacotherapy</b>	The use of pharmaceutical products to treat and manage health conditions, as opposed to surgical treatments or psychological therapies.
<b>Polycystic ovary syndrome (PCOS)</b>	This medical condition is a cluster of symptoms resulting from elevated androgens (male hormones) in women. Symptoms

	<p>include: irregular menstrual periods, excess body and facial hair, acne, weight gain and difficulty getting pregnant. Women with PCOS often have enlarged ovaries with many large fluid-filled sacs, which fail to regularly release eggs.</p>
<b>Porphyria</b>	<p>Refers to a group of rare genetic disorders that result from a build-up of substances known as porphyrins in the body, which can lead to nerve or skin problems. Some drugs (eg carbamazepine, amitriptyline) can trigger an acute porphyria attack, characterised by: abdominal pain, chest pain, vomiting, confusion, fever, tachycardia and hypertension.</p>
<b>Prophylaxis</b>	<p>Refers to treatment or action taken to prevent a disease.</p>
<b>Psychoactive</b>	<p>A term used to refer to drugs or compounds that can lead to a profound distortion in a person's reality, behaviour and/or emotional state.</p>
<b>Psychotherapy</b>	<p>The use of non-pharmacological interventions to treat and manage health conditions. Examples include: cognitive behavioural therapy (CBT), interpersonal therapy, family therapy and psychoanalysis.</p>
<b>Psychotropic drugs</b>	<p>A range of pharmaceutical products commonly used in the treatment and management of mental disorders.</p>
<b>QTc prolongation</b>	<p>This is seen as an abnormality on ECG and is a surrogate marker for the risk of developing torsades de pointes (TdP). Patients can present with syncope, palpitations, seizures or cardiac arrest. Many drugs can cause QTc prolongation, including some antipsychotics (eg haloperidol, chlorpromazine) and some antidepressants (eg amitriptyline, imipramine).</p>
<b>Rapid cycling</b>	<p>In bipolar disorder, rapid cycling refers to the occurrence of four or more episodes of mania, hypomania or depression within one year.</p>
<b>Rapid tranquillisation (RT)</b>	<p>The process of administering medication to a person often in an emergency who is behaviourally agitated and, in some cases, exhibiting aggressive behaviour posing a</p>

	<p>risk to themselves and/or others. The purpose and aim of giving the drug is to calm the person quickly and mitigate the risk of aggression and/or violence to themselves and/or others.</p>
<b>Schizophrenia</b>	<p>Eugene Bleuer in 1911 used the term schizophrenia to describe a mental disorder associated with slow progressive deterioration of a person's personality and affect, and which manifests through profound distortions in feelings, thoughts and conduct, and a propensity to withdraw from reality.</p>
<b>Sedation</b>	<p>The act or process of calming following the administration of a drug.</p>
<b>Serotonin (5-hydroxytryptamine, 5-HT)</b>	<p>This is a monoamine neurotransmitter, considered a natural mood stabiliser; serotonin helps in sleeping, eating, mood regulation and digestive processes.</p>
<b>St John's Wort</b>	<p>This is a common and popular non-prescription (over-the-counter) herbal remedy for mild depression that contains the active ingredient <i>Hypericum perforatum</i>.</p>
<b>Suicide</b>	<p>This is a wilful, self-inflicted act that results in the taking of one's own life.</p>
<b>Syncope</b>	<p>Also referred to as fainting; a temporary loss of consciousness, usually caused by a fall in blood pressure or irregular heart rhythm that results in a brief reduction of blood supply to the brain.</p>
<b>Tachycardia</b>	<p>An abnormally fast heart rate.</p>
<b>Tachypnoea</b>	<p>Abnormally fast and shallow breathing.</p>
<b>Teratogen</b>	<p>A drug, agent or factor that can cause malformation in a developing embryo.</p>
<b>Therapeutic index</b>	<p>The therapeutic index of a drug is a comparison of the dose of the drug that causes the desired therapeutic effect with the dose of the drug that causes serious side effects and toxicity. In drugs that have a narrow therapeutic index (eg lithium) there is little difference between therapeutic and toxic doses. Sometimes, the similar term of 'therapeutic window' is used, which refers to the range of doses of the drug that produces the desired therapeutic response without causing any significant adverse effects in patients.</p>

<b>Thyroid dysfunction</b>	A medical condition that affects the function of the thyroid gland, such that it produces abnormally high or abnormally low levels of thyroxine hormone.
<b>Torsades de pointes (TdP)</b>	A rare type of arrhythmia characterised by ventricular tachycardia, which manifests as a fast heartbeat, dizziness, fainting and can potentially be life-threatening.
<b>Tricyclic antidepressants (TCAs)</b>	First discovered in the 1950s, tricyclics are a group of antidepressants used in the management of major depressive disorder.
<b>Tyramine</b>	This is a substance found naturally in some foods. It is especially found in aged and fermented foods, for example: aged cheeses, yeast extracts, red wine, some beers, smoked fish, broad beans, Oxo and Marmite. Prescribers and patients need to be aware of the dangerous potential for interaction between monoamine oxidase inhibitors (a class of antidepressant) and high dietary intake of tyramine, which can result in cardiovascular abnormalities including hypertensive crises, stroke, and even intracerebral haemorrhage and death.
<b>Withdrawal symptoms</b>	A group of symptoms, of variable degree of severity, which occur on stopping or reducing the use of a psychoactive substance that has been taken repeatedly, usually for a prolonged period and/ or in high doses.

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