Seminar One: Study Guide

Scientific Foundations.

Clarity Education Systems I www.PMHNPtesting.com

PMHNP Certification Review Manual

Seminar One Student Study Guide

Clarity Education Systems

Book Cover by Canva Images

Illustrations by Canva

First Edition 2023

John Rossi Digitally signed by John Rossi Date: 2023.08.30 22:04:15 -06'00'

Seminar One Student's Manual

The odds are in your favor:

	Tested	Passed	Renewed	Total Certified	Percentage Passed
Psychiatric-Mental Health Nurse Practitioner (across the life span)	6,109	5,312	1,970	24,316	Approx. 87%
Family Nurse Practitioner	7,339	6,387	12,914	84,674	Approx. 87%

Note. Adapted from Johnson, K., & Vanderhoef, D. (2016). *Psychiatric-mental health nurse practitioner review and resource manual* (4th ed.). American Nurses Association.

Key Documents to Collect

- All transcripts (Official/unofficial)
- Validation of Education (VOE)
- GAP Analysis Form (post-grad/doc)
- Final official transcript - certified with awarded degree

American Nurses Credentialing Center (ANCC) Information (ANCC, 2022)
Introduction to ANCC psychiatric mental health nurse practitioner (PMHNP) Certification Examination

- Updated content format completed in April, 2023
- 175 questions on the exam
- 150 are scored questions and 25 are pretest questions (questions are included to determine how well these questions will perform before they are used on the scored portion of the exam) - cannot distinguish between questions that are counted for total score and those that are for future testing consideration
- The exam is worth a total of 500 points. You will need a minimum of 350 points to pass the exam (this equates to 70%; 105/150 questions)

The Five Domains (ANCC, 2022)

- **Scientific Foundation**
    - Advanced pathophysiology

- Advanced pharmacology (e.g., contraindications, interactions, adverse effects)
- Advanced psychopharmacology (e.g., pharmacokinetics, pharmacodynamics, extrapyramidal symptoms [EPS], neuroleptic malignant syndrome [NMS])
- Neurodevelopment
- Neuroanatomy
- Neurophysiology
- Psychogenomics (e.g., gene-drug interactions, heritability)
- Advanced physical assessment

- **Advanced Practice Skills**

  - Clinical interviewing (e.g., open-ended questions, nonverbal communication, motivational interviewing)
  - Health promotion and disease prevention (e.g., models, strategies)
  - Mental health screening tool selection and interpretation (e.g., PHQ-9, GAD-7,
  - Vanderbilt ADHD)
  - Mental status exam
  - Psychiatric emergency management (e.g., suicidal ideation, homicidal ideation)
  - Psychoeducation (e.g., presentation method, topic selection)
  - Recovery and resilience promotion
  - Risk assessment
  - Substance use screening tool selection and interpretation (e.g., Alcohol Use Disorders Identification Test [AUDIT], Drug Abuse Screening Test [DAST], Clinical Institute Withdrawal Assessment Alcohol Scale [CIWA], Clinical Opiate Withdrawal Scale [COWS])

- **Diagnosis and Treatment**

  - DSM-5-TR diagnostic criteria
  - Complementary and alternative treatments
  - Diagnostic and laboratory test selection and interpretation
  - Diagnosis (including differentials)
  - Evidence-based practice (e.g., medication dosing, off-label use, psychotherapy selection)
  - Psychopharmacotherapeutic management (e.g., selection, monitoring)
  - Pharmacotherapeutic management (e.g., selection, monitoring)

- **Psychotherapy and Related Theories**

  - Psychotherapy principles (e.g., cognitive behavioral therapy, humanistic, interpersonal, behavioral)
  - Change theories (e.g., Transtheoretical Model, Lewin's Change Theory)
  - Developmental theories
  - Family theories (e.g., structural, narrative)
  - Therapeutic alliance development and management (e.g., empathy, boundaries, psychotherapy facilitation, trauma-informed approach)

- **Ethics, Legal Principles, and Cultural Care**

    - Patient's Bill of Rights (e.g., informed consent, treatment options)
    - Scope of confidentiality (e.g., release of information, duty to warn)
    - ANA Scope and Standards of Practice: Psychiatric-Mental Health Nursing
    - Cultural and spiritual competence (e.g., differences in belief systems,
    - Existentialism, social determinants of mental health, risk factors, barriers)
    - Equity, diversity, and inclusion (e.g., specific populations, sexual orientation, gender identity)
    - Ethics in clinical decision making (e.g., involuntary treatment, least restrictive care, decision making capacity, bioethical principles)
    - Patient advocacy (e.g., educational accommodations, disabilities accommodations, FMLA)

How to succeed!

Be Confident

- You have or will be graduating from a graduate degree
- You know things! You may need to focus and regroup, but you KNOW things!

Begin Your Review

- Focused study using the ANCC Test Content Outline
- Gather resources and practice tests

Create a Study Plan

- ANCC recommends six months out
- Six weeks of daily prep or two-week crash course
- Adapt based on your personal preferences
- Write the plan out – or use ours – look at it regularly, take breaks, and stay motivated
- Microsoft Teams private virtual study rooms to work together – whatever it takes!!!
- Use a wide variety of study materials – flashcards, videos, podcasts…
- You do not know everything – you never will, focus on content missed and learning how to answer what is being asked
- Learn to refine and refocus

Test Taking Strategies

- Select an answer that is focused on the client
- Watch for key points: age, gender, diagnosis, length of illness, specific s/s…
- Be careful with always, never, all, every, only, must, no, except, and none

- Be aware of key words: first, best, priority, assess, intervene…
- Read the question, try to answer it before reading the choices, and then look through the options – trust yourself, answer it – then LEAVE IT ALONE!!! If you need to leave a question unanswered and marked for review later, that is fine, but once you answer it – LEAVE IT!
- ASSUME NOTHING!!! If it is not in the question stem, it is NOT part of the problem – DO NOT interject any additional information or ideas
- It is OK to answer the ones you know first and circle back to harder questions later – but you MUST answer all questions. Do not leave anything unanswered, it will count against you!
- Narrow down to two possible right answers
- Culture is important when considering nursing care
- Quality of care is a goal in nursing
- Conflict management is a goal in nursing
- See the root action (e.g., assessing or intervening) then match the answers to that action
- Critical thinking is paramount
- If asked to refer to or consult with someone else, then it is most likely not the right answer...unless the provider needs expert opinions (i.e., substance abuse, pregnancy, neurology...)
- Safety for the patient and others is usually the right answer (however, it does not take priority over airway, breathing, and circulation [ABC])
- If you see "initially" in the stem of the question, then refer to the ADPIE process (assessment, diagnosis, planning, implementation, and evaluation)
- Evidence-based is always correct as long as it addresses the question fully
- Use the Prometric's tools (underline and scratch out unwanted answers)
- Interprofessional collaboration is always encouraged
- Delegation is often the wrong answer. Do not “pass the buck” unless it goes outside your expertise and is a safety concern (most of the time it will not)
- Do not “do nothing” – you always do something
- If you read an option and you have never heard of it before – do not choose it
- When choosing between patients, choose the one most unstable (i.e., most critical, most likely to die, most likely to suffer further injury if no immediate action is taken)
- You can assume staffing in your certification question is unlimited
- Restraints are always the last option – choose the least invasive choice first
- Never delay treatment
- Look for commonality between answers if you do not know the answer. When two or more answers are alike (saying the exact same thing, just with different wording), move to the other answer choices (this is only applied when you DO NOT know the answer or have NO IDEA [best guess option])
- If the question includes "severe" or "acute" when referring to something specific, choose the answer that fixes the specific issue
- When possible, rephrase the question and put the question into your own words
- If you have an initial “hunch” ... go with it
- Read each question carefully

- What is the question really asking?
- Are there any keywords?
- What information is relevant to answering the stem?
- How would I ask the question in my own words?
- How would I answer the question in my own words?
- Is there an option that is like my personal answer, and does it answer the question most completely?

The Day Before the Exam

This is your "Rest and Focus" day. DO NOT spend the day studying all the material. Take a pause, look at the information that you do not "know" (P.S., you know most of it) and only review those topics. You should not be studying all day. Let the information you have been absorbing settle in. Take a long walk, go to the gym, go see a movie, hang out with the family you probably have not seen for the last three to six years while in your program. Take time for yourself. You have been on a marathon and the final stretch is tomorrow. Take a breath, hydrate, eat a good meal.

Trust in yourself! I say again, trust in yourself. What is the worst thing that could happen – let's go there for a moment. Let yourself accept all the realities. The worst thing is failing to pass the exam, right? WRONG – the worst thing is doubting your ability. If you do not pass the exam, you get a redo!!! Hallelujah. This is a process and a journey. Sometimes the journey takes an unexpected turn, but the destination has not changed. As we discussed at the beginning, the odds are in your favor (you can pass this exam), but if you do not pass the first time, it is not the end of the road. You can take it again...and again...and again if necessary. So, take a moment to celebrate the fact that you have arrived at the *day-before-the-exam day* and give yourself a break before you tackle it. Finally, go to bed early.

The Day of the Exam

If possible, take the day off from work or from other responsibilities. Ask for help from family, friends, and/or co-workers. Wake up early. You do not want to feel rushed – no matter what time you are taking the exam. Eat and drink products that will benefit you and power your brain and body (amend based on your personal food allergies):

- Overnight oats, oatmeal, toast, and other whole grains
- Berries, especially blueberries
- Red beans, pinto beans, and black beans
- Artichokes
- Prunes
- Apples and other fresh fruits
- Omega-3 options (cold-water fatty fish, such as salmon; flaxseed, chia seeds, pecans, and walnuts; plant oils [such as flaxseed oil, soybean oil, and canola oil])
- Lean meats – Canadian bacon or turkey bacon

- Eggs
- Soy foods – soy milk, soy protein meat substitutes
- Milk – low-fat milk
- And most importantly – WATER, lots and lots of water!

Try your best to avoid looking at any more of your study materials. That time has passed. Your brain needs to focus on the task at hand. Remember, TRUST IN YOURSELF. If you need a good cry, let it out – and then refocus and never look back. Wear loose, comfortable clothing and bring a jacket or sweater with you to the exam. Give yourself plenty of time beforehand, both at home and at the Prometric testing site. The last thing you want to do is feel rushed. Review testing site or at home testing instructions supplied by Prometric. Before you begin, take a pause, practice controlled-breathing for one minute, say a personal prayer or meditate internally to center your thoughts and attention...and then begin. Trust in yourself.

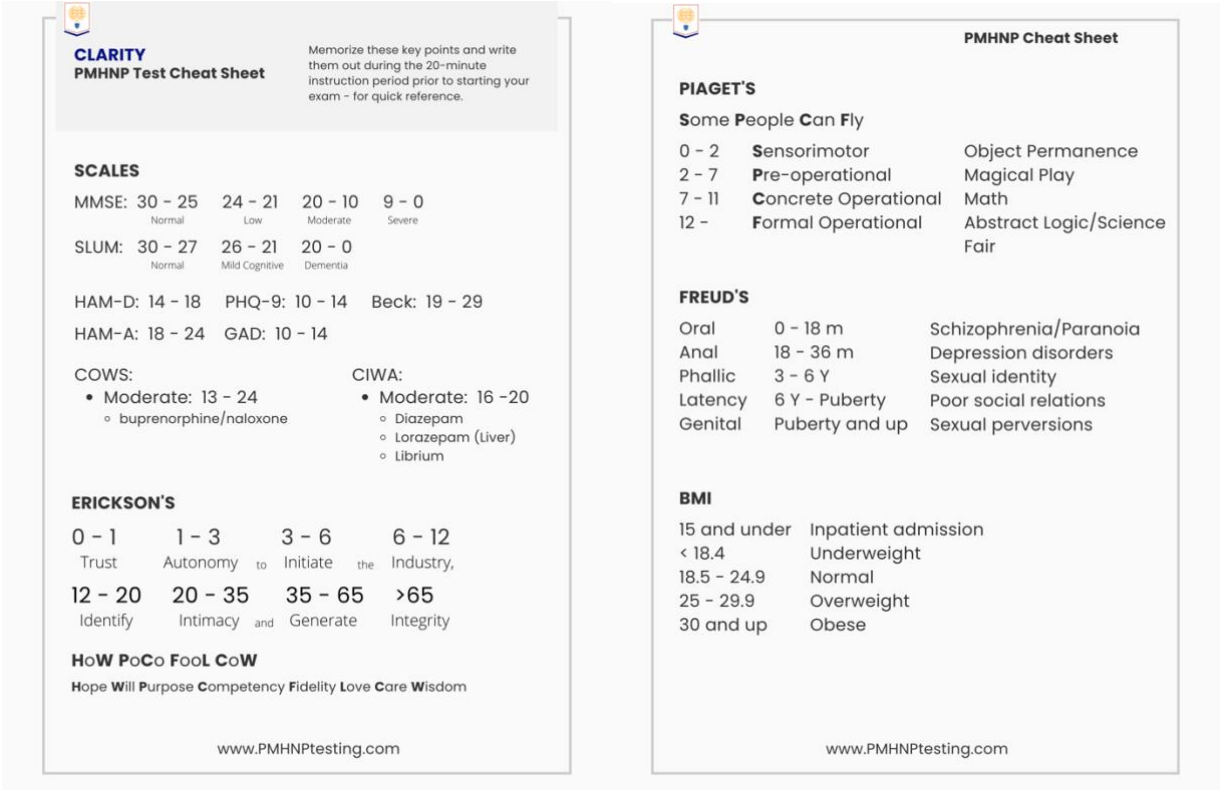
The Prometric Testing Site: https://www.prometric.com/anccr

- Offered only at *on-site* testing centers (February 2023 and later)
- Testing occurs in a large room with other students separated by cubicles at individual computers
- You will be required to store all belongings and you are allowed a jacket (must be either worn or placed on the back of your chair – it may not be placed on your lap). The hospitality of Prometric administrators varies as does cleanliness
- You will be searched and photographed prior to entering the testing area
- You will be given a dry erase marker and whiteboard (boards may differ by location) to use as a scratchpad. All notes are destroyed after the exam
- You are allowed time at the beginning of the exam to read through the instructions. This time does not count towards your total time. This is a good time to make your pre-exam notes (*The Cheat Sheet*)
- You can mark questions throughout the exam, cross out answers, and highlight words in the question text body
- A timer will count down from 3.5 hours. You are allowed to use the restroom and take a break at your desk, however, the time will continue
- Once your test is complete, it will ask you MULTIPLE times if you are ready to finish the exam
- Your passing results will display immediately (you will get a message saying you passed, but not a final score or breakdown). If you do not pass, there will be instructions explaining when you should expect a section breakdown to help prepare for retaking the exam
- Once you pass, you will receive your *gorgeous* green check via email within an hour

The Cheat Sheet

After you start your exam, you will have 20 minutes to go through the exam instructions. These instructions go over the length of the exam, timing of the exam, how to progress through each

page, hotkeys, and testing tools (highlighting, crossing out, skipping a question...). It will not take more than 20 minutes to read through the instructions. Once you have finished reading, and before progressing to the first question, take a moment to write down any notes on your whiteboard or digital scratch pad. To help facilitate this we have designed *The Cheat Sheet*. This information sheet will quickly guide you through many of the exam question topics. The completed cheat sheet is shown below. You will learn about each of these topics during the seminars. Each section on *The Cheat Sheet* is condensed and concise. In the back of this workbook, you will find a completed and blank cheat sheet. Memorize *The Cheat Sheet* and then practice filling it out using the fill-in-the-blank form. Once you are comfortable with the information, practice writing it without any prompts until you have the entire cheat sheet memorized and can write it out within a couple of minutes. You will refer to *The Cheat Sheet* many times during the exam to help you quickly trigger your memory and answer questions in less than 30 seconds. Have a printed copy with you throughout each seminar as we will refer to it often.



CLARITY
PMHNP Test Cheat Sheet

Memorize these key points and write them out during the 20-minute instruction period prior to starting your exam - for quick reference.

SCALES

MMSE: 30 - 25 (Normal) 24 - 21 (Low) 20 - 10 (Moderate) 9 - 0 (Severe)

SLUM: 30 - 27 (Normal) 26 - 21 (Mild Cognitive) 20 - 0 (Dementia)

HAM-D: 14 - 18 PHQ-9: 10 - 14 Beck: 19 - 29

HAM-A: 18 - 24 GAD: 10 - 14

COWS:
- Moderate: 13 - 24
  - buprenorphine/naloxone

CIWA:
- Moderate: 16 -20
  - Diazepam
  - Lorazepam (Liver)
  - Librium

ERICKSON'S

0 - 1	1 - 3	3 - 6	6 - 12
Trust	Autonomy to	Initiate the	Industry,
12 - 20	20 - 35	35 - 65	>65
Identify	Intimacy and	Generate	Integrity

HoW PoCo FooL CoW

Hope **W**ill **P**urpose **C**ompetency **F**idelity **L**ove **C**are **W**isdom

www.PMHNPtesting.com

PMHNP Cheat Sheet

PIAGET'S

Some **P**eople **C**an **F**ly

0 - 2	**S**ensorimotor	Object Permanence
2 - 7	**P**re-operational	Magical Play
7 - 11	**C**oncrete Operational	Math
12 -	**F**ormal Operational	Abstract Logic/Science Fair

FREUD'S

Oral	0 - 18 m	Schizophrenia/Paranoia
Anal	18 - 36 m	Depression disorders
Phallic	3 - 6 Y	Sexual identity
Latency	6 Y - Puberty	Poor social relations
Genital	Puberty and up	Sexual perversions

BMI

15 and under	Inpatient admission
< 18.4	Underweight
18.5 - 24.9	Normal
25 - 29.9	Overweight
30 and up	Obese

www.PMHNPtesting.com

Schedule

This schedule will help you organize your time and prevent you from getting "stuck" in the process. If you need to alter or augment to fit your personal schedule, please do so. Everyone's journey is different, and it is important to make sure that you are comfortable moving forward with your study plan.

Six Week Plan								
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
Week 1	Practice Exam 1 (Review Exam 1 Answers & Rationales Manual)	Seminar (SR) 1	Review SR 1 and Exam 1 Answers & Rationales Manual	Seminar 2	Review SR 2 and Exam 1 Answers & Rationales Manual	Practice Exam 1 (Review Exam 1 Answers & Rationales Manual)	Rest	
Week 2	Practice Exam 2 (Review Exam 2 Answers & Rationales Manual)	Seminar 3	Review SR 3 and Exam 2 Answers & Rationales Manual	Seminar 4	Review SR 4 and Exam 2 Answers & Rationales Manual	Practice Exam 2 (Review Exam 2 Answers & Rationales Manual)	Rest	
Week 3	Practice Exam 3 (Review Exam 3 Answers & Rationales Manual)	Purple Book (Ch. 2, 3, & 4) Review SR 1 and Exam 3 Answers & Rationales Manual	Purple Book (Ch. 5 & 6) Review SR 2 and Exam 3 Answers & Rationales Manual	Purple Book (Ch. 10, 11, & 12) Review SR 3 and Exam 3 Answers & Rationales Manual	Purple Book (Ch. 13 & 14) Review SR 4 and Exam 3 Answers & Rationales Manual	Practice Exam 3 (Review Exam 3 Answers & Rationales Manual)	Rest	
Week 4	Practice Exam 4 (Review Exam 4 Answers & Rationales Manual)	Review SR 1 and Exam 4 Answers & Rationales Manual	Review SR 2 and Exam 4 Answers & Rationales Manual	Review SR 3 and Exam 4 Answers & Rationales Manual	Review SR 4 and Exam 4 Answers & Rationales Manual	Practice Exam 4 (Review Exam 4 Answers & Rationales Manual)	Rest	
Week 5	Practice Exam 1	Complete a focused review of SRs 1 and 2	Practice Exam 2	Rest	Complete a focused review of SRs 3 and 4	Rest	Rest	
Week 6	Just-In-Time (JIT)	Review JIT content	Practice Test 3	Review JIT content	Review JIT content	Practice Test 4	Rest	Exam

Just-In-Time Two Week Plan								
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
Week 1	Practice Exam 1 (Review Exam 1 Answers & Rationales Manual)	Purple Book (Ch. 2, 3, & 4) and Exam 1 Answers & Rationales Manual	Purple Book (Ch. 5 & 6) and Practice Exam 2	Purple Book (Ch. 10, 11, & 12) and Exam 2 Answers & Rationales Manual	Purple Book (Ch. 13 & 14) and Practice Exam 3	Just-In-Time (JIT) and Exam 3 Answers & Rationales Manual	Rest	
Week 2	Review JIT content	Review JIT and complete Practice Exam 4	Review JIT and Exam 4 Answers & Rationales Manual	Review JIT content	Review JIT (focused)	Review JIT content	Rest	Exam

Utilize studyguides and flashcards during the designated review days

Recommended Additional Resources

- Review & Resource Manual PMHNP 4th Edition (Purple Book)
- Memorable Psychopharmacology
- Memorable Psychiatry
- Memorable Neurology
- Clinical Psychopharmacology Made Ridiculously Simple
- Psych Notes Clinical Pocket Guide

The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) Classifications

We will not look at every disorder classification or unspecified categories in this review. Additionally, *disorders due to another medical condition or substance use* are not listed. Sexual dysfunction will be primarily covered as medication side effects. All areas are available for further review in the DSM-5. The following disorders are referenced from (APA, 2022) and other sources as indicated throughout:

1. Neurodevelopmental Disorders

   Intellectual Disabilities – usually present at birth and can affect a patient's physical, intellectual, and emotional development

   - **Intellectual Disability (Intellectual Developmental Disorder [IDD]) –** occurs during the developmental period of life, and includes both intellectual and functional deficits in reasoning, problem-solving, and academics, with communication challenges, poor social interaction, and difficulties with independent living
   - **Global Developmental Delay –** assigned to children under the age of 5 because clinical significance is not easily assessed. The child fails to meet developmental milestones in both intellectual and functional areas of life. Ongoing assessment is required

2. Communication Disorders

    - **Language Disorder –** difficulties in spoken, written, and other forms of language due to comprehension or function deficits. This results in reduced vocabulary, inability to form sentences, and impaired communication structure
    - **Speech Sound Disorder** (previously Phonological Disorder) **–** challenges with clear articulation used to make verbal communication and results in limited social participation, school engagement, and/or job performance. This disorder includes complications for both understanding sound and being able to coordinate movement for sound (use of jaw, tongue, lips...)
    - **Childhood-Onset Fluency Disorder (Stuttering) –** disruptions in fluency and patterns of speech that occur in both syllable and sound repetition, prolongation of consonants and vowels, inappropriate pausing between words, using word substitutions to avoid harder words, excessive physical force to speak, and stumbling over single syllables (repetitious use, for example: I-I-I-I-I do not...)

3. Autism Spectrum Disorder

    - **Autism Spectrum Disorder (ASD) –** defined by impairments in social communication and restricted/repetitive interests and activities. Other signs include speech delays and inability to use or understand nonverbal or verbal communication, being overly literal, and difficulties with reciprocity, taking turns, and sharing. They perform restricted or repetitive patterns of behavior, interests and activities, and can become fixated on certain topics. They often demonstrate stereotyped or repetitive movements, such as lining up objects in a specific order or flapping their hands repeatedly. Autistic patients can have hypersensitivity to different stimuli (sounds or textures) and present with abnormal motor signs (poor coordination and/or a strange gate)

4. Attention-Deficit/Hyperactivity Disorder

    - **Attention-Deficit/Hyperactivity Disorder (ADHD) –** ADHD encompasses two major areas: inattention and hyperactivity and is marked by poor school performance and disruptive behavior at school or at home. Inattention makes it challenging to focus on specific objects or tasks in the presence of other stimuli. Symptoms include distractibility, task avoidance, ignoring details or instructions, easily misplacing or losing things, becoming hyper-focused, poor organizational skills, and/or failing to finish or accomplish a given task. The hyperactivity is shown in unintentional and disruptive behavior, hyperactive/energetic actions, constantly interrupting (intrusive communication or answering questions too early), speaking or behaving in loud or unruly ways, putting off responsibilities (delaying), and being unable to sit still

5. Motor Disorders

    - **Tourette Syndrome –** marked by sudden, rapid, recurrent movements and sounds. Must include both multiple motor and at least one vocal tic. The tics may come and go in frequency, but must have persisted for more than a year, and have occurred before the age of 18
    - **Persistent (Chronic) Motor or Vocal Tic Disorder –** a single or multiple motor or vocal tic, but the two variations must not be present at the same time.
    - **Provisional Tic Disorder –** a single or multiple motor tics with or without a vocal tick that has been present for less than one year and has occurred before the age of 18

6. Schizophrenia Spectrum and Other Psychotic Disorders

    - **Delusional Disorder –** one or more delusions (a false belief), lasting one month or longer without marked impairment and bizarre or odd behavior. If the patient is experiencing hallucinations, they must not be prominent and must be associated with the manifested delusion. The criteria for schizophrenia must not be assigned in order to receive this diagnosis
    - **Brief Psychotic Disorder –** presentation of one or more delusions, hallucinations, disorganized and/or incoherent communication patterns, and disorganized or catatonic (disrupted awareness) behavior that has lasted at least one day, but less than a month. After the symptoms subside, the patient returns to normal functioning
    - **Schizophreniform Disorder –** the presence of two or more delusions, hallucinations, disruptive communication patterns, disorganized or catatonic behaviors, and the presence of negative-type (emotional withdrawal, avolition) symptoms for a persistent amount of time during a one-month timeframe
    - **Schizophrenia –** a situation in which a patient is unable to distinguish reality from falsehood. Schizophrenia is divided into two separate groups: positive symptoms and negative symptoms. Positive symptoms include delusions, hallucinations, disorganized speech, and catatonic behavior - in other words, symptoms that are present for the patient, but are absent for others around them. Negative symptoms involve diminished emotional expression. A patient must have two or more presenting symptoms for a period of at least six months to receive this diagnosis
    - **Schizoaffective Disorder –** characterized by presenting symptoms associated with schizophrenia and accompanying symptoms related to a mood disorder such as mania and/or depression (National Alliance on Mental Illness [NAMI], 2022b)

7. Bipolar and Related Disorders

    - **Bipolar Disorder (BD) –** a disorder that involves both manic highs and depressive lows and is marked by extreme mood swings between the two. Mania is an excessive elevation of mood or energy, and symptoms include irritability, distractibility, impulsivity, grandiosity, flight of ideas (quick, erratic, and

excessive thought patterns that “jump” form one idea to the next), increased activity levels, an overall decrease in the need to sleep, and excessive talkativeness. The patient must have at least three of seven symptoms, lasting one week (with symptoms present for most of the day), to qualify for a manic episode – with at least one of them being increased goal-directed activity. The patient needs to have "one fun week" versus "two blue weeks" of depression. Bipolar I Disorder requires the presence of at least one manic episode, with or without the presence of a major depressive episodes and Bipolar II disorder requires that the patient have least one hypomanic (a milder form of mania that lasts for a shorter duration of time) and one major depressive episode (Datto et al., 2016; Heldt, 2021)

- **Cyclothymic Disorder** – having at least a two-year history of hypomanic symptoms, which do not meet the threshold for a full hypomanic episode, with periods of depressive symptoms that are also not categorized as a major depressive episode in the DSM-5.

8. Depressive Disorders

- **Disruptive Mood Dysregulation Disorder (DMDD)** – a childhood condition (age 6 and older with onset before the age of 10) marked by persistent irritability, anger, and extreme temper outbursts (either verbal or behavioral) that are disproportional to the situation that preceded the action(s)/mood (Findling et al., 2022). The patient cannot be diagnosed with both DMDD and BD
- **Major Depressive Disorder (MDD)** – major depression involves a marked change in depressed mood (anhedonia) with symptoms of sleep disturbances; feelings of guilt or hopelessness; decreased interest in previously enjoyed activities; decreased energy, concentration, and appetite; retardation of speech and physical movement; and suicidal ideation. The patient must have at least five of these symptoms for two or more weeks – “two blue weeks”
- **Persistent Depressive Disorder (Dysthymia)** – a milder form of depression that lasts for at least two years. The patient has at least two of the depressive symptoms listed above during the two-year period with symptoms lasting more than two months at a time. This disorder may be assigned if MDD has been present continuously for a two-year period

9. Anxiety Disorders

- **Generalized Anxiety Disorder (GAD)** – a state of persistent worry that can be both acute or chronic and can manifest in both physical and physiological symptoms with changes in vital signs and mental stability. Symptoms include sweating, uneasiness, tachycardia, nausea, shortness of breath, loss of control, chest pain, muscle tension, irritability, decreased sleep, decreased energy, restlessness, and decreased attention span. Generalized anxiety occurs more days than not for at least six months with the patient finding it difficult to control the

worry (with at least three of the aforementioned symptoms present for more days than not during the six-month timeframe)

- **Separation Anxiety Disorder** – excessive fear or anxiety when separated from an attached individual such as a parent or other caregiver that results in distress, worry, seclusion, sleep disturbance, nightmares about the separation, and physical manifestations (stomach aches, nausea, vomiting, tachycardia, headaches, and so on)
- **Selective Mutism** – failure to speak in social situations that normally require communication, such as in school, work, or in interpersonal interactions. Failure to speak is not related to another underlining condition that prevents spoken language
- **Social Anxiety Disorder** (Social Phobia) – increased fear or worry when placed in social situations where it is believed the patient can be judged or scrutinized by other individuals or groups. The anxiety is disproportional to the actual threat that is posed within the social or sociocultural environment, and the avoidant behavior lasts for six months or more
- **Panic Attack** – a brief period of marked intense mental and physical discomfort which is activated by the fear response. Symptoms include sweating, shaking, dizziness, disassociation, tachycardia, nausea, shortness of breath, fear of dying or going crazy, chest pain, and/or chills
- **Panic Disorder** – recurrent panic attacks with persistent concern or worry about having additional panic attacks for at least a month
- **Agoraphobia** – fear or panic that occurs when a patient is placed in a public or crowded place for which they believe cannot be escaped. These patients will avoid going out in public or placing themselves in a crowded situation (Balaram & Marwaha, 2022)

10. Obsessive-Compulsive and Related Disorders

- **Obsessive-Compulsive Disorder (OCD) –** the presence of persistent and reoccurring thoughts, urges, or ideas that are unwanted, distressing, and mind-based. Obsessive thoughts are resistant, despite efforts to ignore, or suppress the obsession. These obsessional thoughts are extremely distressing and can be seen by the patient as extremely inappropriate, disheartening, or even immoral. Patients are often able to recognize that, although these thoughts are reoccurring in their mind, they do not necessarily reflect their own true desires. Compulsions are considered a counterbalance for obsessions and are used to reduce the distress that is caused by obsessive and intrusive thoughts. Compulsions can include repetitive behaviors like washing hands, turning lights on and off, and opening and closing a door multiple times. These obsessions and compulsions are time-consuming and disturb daily life
- **Body Dysmorphic Disorder –** preoccupation with one's defects or physical flaws (even though others around them do not see the same issues), and result in repetitive behaviors, such as constantly checking on oneself in the mirror, excessively combing hair, picking at the skin, and comparing oneself to others regarding appearance

- **Hoarding Disorder –** overwhelming difficulty discarding or trashing personal possessions, because of a desire to save them. This condition has nothing to do with concern over the monetary value of the possessions but is based on the distress of losing them. This situation results in an overabundance and accumulation of clutter, that significantly impairs social and occupational functioning
- **Trichotillomania** (Hair-Pulling Disorder) **–** recurrent pulling out of hair that results in significant hair loss, despite repeated attempts to stop the behavior
- **Excoriation** (Skin-Picking) Disorder **–** marked by recurrent skin picking that results in lesions. The patient demonstrates clinically significant distress in both social and occupational settings, despite repeated attempts to stop the picking

11. Trauma- and Stressor-Related Disorders

- **Reactive Attachment Disorder** – when a child is unable to form healthy emotional bonds with caretakers, often because of emotional neglect or abuse at an early age and the child becomes emotionally withdrawn and rarely seeks comfort or attention when in a stressful situation. The child may have experienced multiple caregivers at different periods of time (foster care)
- **Post-traumatic Stress Disorder (PTSD) –** associated with trauma related to a violent or life-threatening event, that results in intense feelings and emotions such as fear, helplessness, and terror. Symptoms must not have been present prior to the traumatic experience. The event must have been life threatening or a physical and/or sexually violent act. PTSD patients experience flashbacks of the event and can have moments of disassociation. Reexperiencing can also occur in nightmares. Patients can develop an increased awareness (hyperarousal) or become hypervigilant. Fear, helplessness, reexperiencing, and anxiety make it difficult for patients to function in both social and occupational settings and signs and symptoms following the traumatic event must be present for at least a month. PTSD patients will often avoid people, places, and situations that may be associated with traumatic memory to prevent a flashback. It is not uncommon for PTSD to have a delayed onset
- **Acute Stress Disorder –** occurs when a patient is exposed to a traumatic event, either witnessing or experiencing the event in person or watching it occur to someone else (close friend or family member), followed by intrusive thoughts of the situation; nightmares or distressing dreams; flashbacks; depression; disassociation and/or dissociative amnesia; avoidance of thoughts, memories, or feelings pertaining to the event; sleep disturbances; and/or irritability. Associated symptoms last between three days to one month after the traumatic event with symptoms beginning immediately after the trauma
- **Adjustment Disorders –** feelings of sadness, hopelessness, worry, and anxiety that develop within three months in response to a known and identifiable stressor. The emotional and behavioral symptoms cause significant social and/or occupational challenges

12. Dissociative Disorders

- **Dissociative Identity Disorder (DID) –** associated with consistent patterns of derealization, depersonalization, and memory lapse culminating into a complete and separate identity state with identity fragmentation – where the patient feels like they are a completely different person from one situation to the next (two or more distinct personality states). Lapses in memory are recurrent, and may include inability to recall personal information, daily activities, or other significant events that are not attributed to simply forgetting
- **Dissociative Amnesia –** episodic, retrograde amnesia of autobiographical content (personal information) that occurs in conjunction with or around the same time as a traumatic event. Information recalled before and after the specific traumatic time period is still present

13. Somatic Symptom and Related Disorders

- **Somatic Symptom Disorder –** major distress, worry, anxiety, or alterations in normal functioning as a result of significant focus on physical conditions or symptoms (such as pain)
- **Conversion Disorder (Functional Neurological Symptom Disorder) –** a situation in which a patient is experiencing physical symptoms (motor or sensory), such as numbness, blindness, deafness, seizures, or other manifestations, yet has no underlining neurologic or medical diagnosis that would cause the somatic presentations
- **Factitious Disorder**

    - *Imposed on Self –* a false medical or psychiatric condition, where the patient deceives or misrepresents an illness or injury, in order to deceive (gain something in return)
    - *Imposed on Another* (previously known as Munchhausen syndrome by proxy) **–** falsifying the physical or psychological symptoms, disease, or injury of another person, in order to deceive or mislead. The other person is considered a "victim" and in an abusive situation in which the perpetrator intentionally harms the other

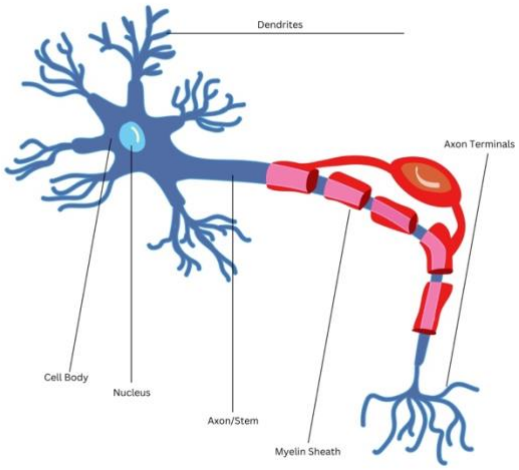
The Human Nervous System

The human nervous system is the homeland for all thoughts, feelings, and actions. It is important to understand the physiological and chemical components of the nervous system to fully appreciate mental health conditions, and how medications interact for treatment. Primarily, the nervous system functions to transfer data or information from one point to the other. Specifically, from a source location on or within the body to the brain.

The Neuron

- The basic cellular component of the nervous system. The primary function of a neuron is to communicate with other cells throughout the body. This includes communication with other cells, such as muscles and endocrine cells. The neuron is composed of

    - **Cell body (gray matter)** – also known as the soma, the cell body, houses the nucleus, mitochondria, and endoplasmic reticulum, as well as other organelles
    - **Stem (axon; white matter)** – signal transmission is performed via the axon. This portion of the neuron looks like a tail and is responsible for passing the **action potential** to other cells. Axons are often coated in **myelin**, a fatty substance that protects the nerves and potentiates the speed of the signal (action potential). At the end of the axon, there is a **terminal** that is responsible for the release of neurotransmitters. This release results and diffusion across the space between cells known as the **synapse**. When the neurotransmitter crosses the synapse, it binds to receptors located on the dendrites of proximal neurons, resulting in activation and a new action potential. The signal then passes from one presynaptic neuron to the next postsynaptic neuron
    - **Dendrites (gray matter)** – spinal processes that extend from the cell body and are designed to receive an action potential, from other neurons



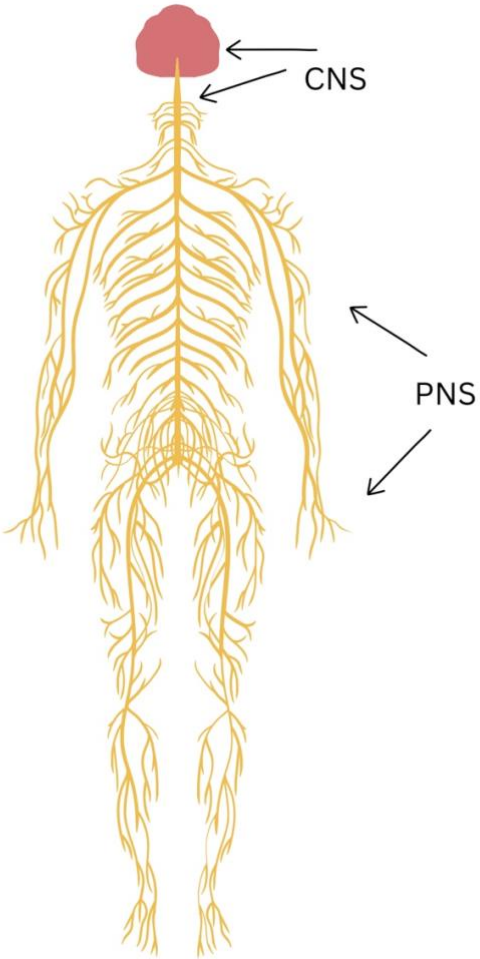
The Nervous System

- As described, neurons are the smallest portion of the human nervous system. When bunched together, they are known as nerves. All the neurons in the body form the nervous system, which is composed of two individual parts

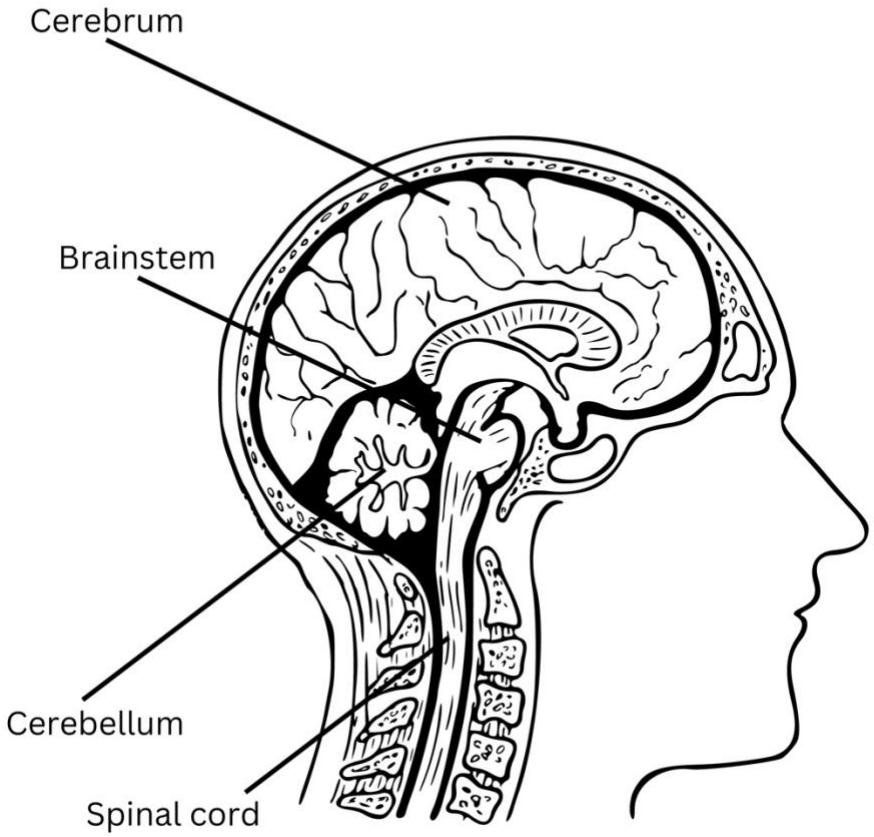
    - **Central Nervous System (CNS)** – nerves within the CNS are located within the brain and spinal cord

- **Peripheral Nervous System (PNS)** – all neurons outside of the CNS. The PNS is further divided into the **somatic nervous system**, which includes both sensory and motor nerves, and the **autonomic nervous system**, responsible for regulation of vital system functions, such as heartbeat, respirations, digestion, urination, and other bodily processes that are unconsciously controlled. The PNS connects muscle and endocrine cells to the CNS

    - The autonomic nervous system is also divided into two distinct systems: the **sympathetic nervous system (fight or flight)** and the **parasympathetic nervous system (rest and repose)**



The Brain



- The primary organ. It is divided into three parts: the cerebrum, cerebellum, and the brain stem. Beyond the main structure, continues the spinal cord. These components make up the CNS

    - **Cerebrum** – largest part of the brain and responsible for all higher order functions (learning, memory, communication, sensation, and movement)

        - The cerebrum is divided into a **left and right hemisphere** by the **longitudinal fissure**. This runs down the middle of the brain. The **corpus callosum** connects the two left and right hemispheres and allows for communication (essential for normal functioning)

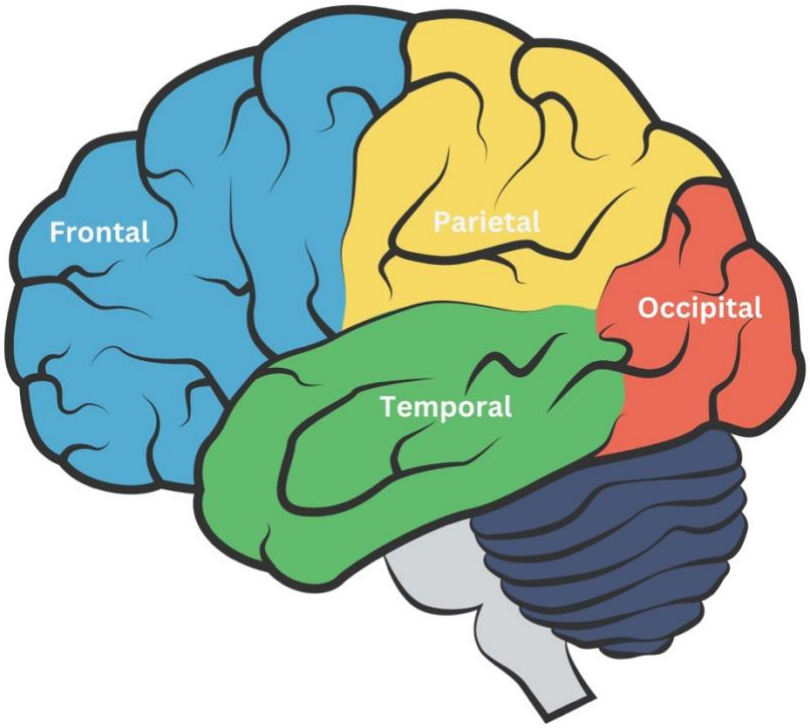
            - Left hemisphere – dominant for most people and controls right-side functions
            - Right hemisphere – controls most of the left-sided functions of the body

- **Cerebral cortex -** outer most layer of the cerebrum and is made up of neuron cell bodies (made up of mostly gray matter [cell bodies] and is responsible for many of the human "higher functions"). The cerebral cortex is divided into four lobes, known as FPOT: the frontal lobe, the parietal lobe, the occipital lobe, and the temporal lobe
- **Cerebellum** – located behind the cerebrum, it is often referred to as the "little brain" and is responsible for coordination of complex movements, balance, and posture. A dysfunctional cerebellum will cause a patient to have erratic and uncoordinated movements
- **Brainstem** – composed of three parts: the **midbrain**, **pons**, and **medulla oblongata**. The brainstem and its individual parts are responsible for the most basic and vital human functions such as breathing, maintaining a heartbeat, sleeping, and other primitive functions

    - ***Midbrain*** – a relay system; plays an important role in vision and hearing as well as motor control, sleep/wake cycles, alertness, and temperature regulation
    - ***Pons*** – connects the medulla oblongata and the thalamus. Responsible for relaying impulses from the motor cortex to the cerebellum, medulla, and thalamus
    - ***Medulla oblongata*** – responsible for autonomic functions (heartbeat, blood pressure; reflexes – vomiting, swallowing, and sneezing). It also regulates the respiratory system via chemoreceptors that can detect changes in blood chemistry (i.e., during acidosis, the medulla oblongata will signal for increased respiratory rate)

- **Spinal cord -** the main connection for neurons traveling between the brain and all other organs throughout the body

    - Nerves traveling from the brain cross to the brainstem and travel down the spinal cord to the level of their target organ. Once they have arrived at the level of the target, the nerves exit the spinal cord as peripheral nerves. Any trauma caused by external forces or pathological reasons (disease), along this delivery system, will affect and hinder functions at and below the location



- Both the left and right hemisphere are divided into 4 lobes. Each has distinctive functions:
    - **Frontal lobe**
        - Think of the frontal lobe as the "brainiest" part of the brain. It includes a region known as the **prefrontal cortex** and is responsible for executive functioning (decision making, e.g., when you are trying to buy a new house, and you are debating the upside and downside of a larger house with a more expensive mortgage or a smaller home that is more affordable and will leave more money in your checking account). The prefrontal cortex also acts as the "parent" to other parts of the brain. For example, when you sit down at the table for Thanksgiving, the hypothalamus will trigger hunger signals, encouraging you to immediately start eating the turkey. However, when you notice everyone else is still sitting down to get ready, the prefrontal cortex will inhibit the impulse and help to control the behavior. *Individuals who have damage to their frontal cortex often do not have this checkpoint, and they rely on the more basic instincts and can be impulsive with inappropriate and even strange behavior*. The anterior portion of the frontal lobe contains the **primary motor cortex** which controls voluntary movements, such as giving a thumbs up, or shooting a

basketball. The signal produced for these movements does not translate directly into muscle signaling but will first be clarified and reworked within the basal ganglia.
    - The frontal lobe contains **Broca's area** and is responsible for language production. *Damage to this area can result in expressive aphasia*

- **Temporal lobe**

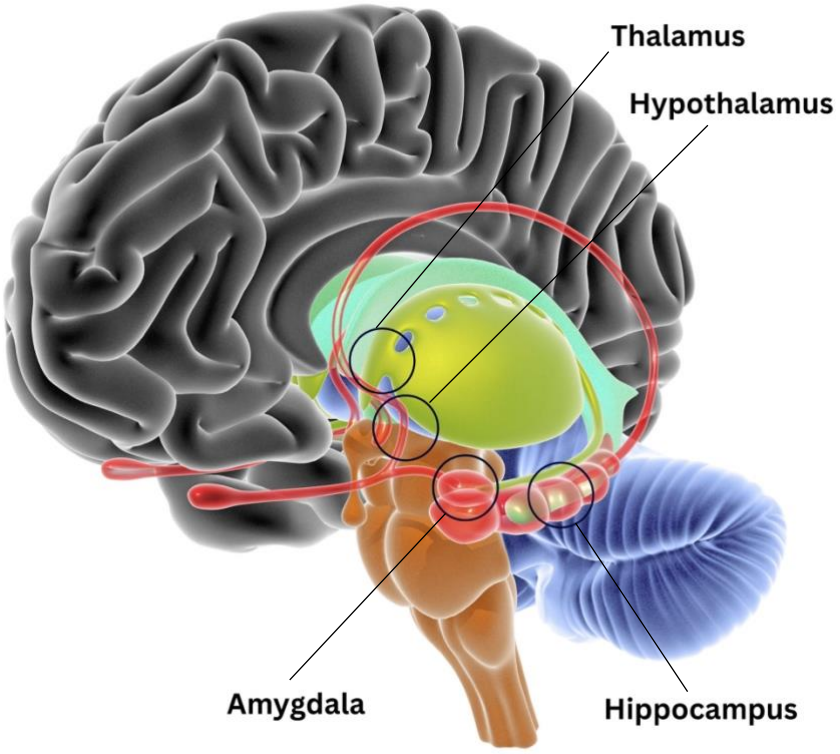
    - The temporal lobe is located on the lower side of the cerebrum, just above the ears. This is the **auditory cortex**. Auditory sensory information from the ears is processed within the auditory cortex
    - **Wernicke's area** is located here - responsible for receptive speech or language comprehension. *Damage to this area can result in receptive aphasia*
    - Memory formation and emotion also occur in this area. *Complications within the temporal lobe can result in hallucinations, aphasia, and amnesia*

- **Occipital lobe**

    - The smallest of the four lobes is in the back of the brain. It is the **primary visual cortex**. In other words, sensory information coming from the eyes will travel to the occipital cortex and will be processed into what we see (this contrasts with the sensory information received from the body [touch] as it is processed in the parietal cortex). *Problems in the occipital lobe can lead to visual field deficits, blindness, and visual hallucinations*

- **Parietal lobe**

    - Located just behind the frontal lobe and separated by the central sulcus, the parietal cortex is involved in processing sensory information within the somatosensory cortex. Functions include taste, reading, and writing. *Complications within the parietal lobe could cause sensory-perceptual disturbances in perceptions resulting in increased, decreased, or distorted hearing; vision; touch sensation; smell or kinesthetic responses to stimuli*



- The Limbic System – essential for the regulation of emotion, memory, motivation, and behavior

    - **Hypothalamus** – appetite, hunger, thirst, water balance, circadian rhythms, body temperature regulation, libido, and hormone regulation
    - **Thalamus** – smell and flow of sensory information; regulates emotions, memory, and related affective behaviors
    - **Hippocampus** – converts short-term memory into long-term memory. Regulates motivation, stress, emotion, and learning
    - **Amygdala** – mediates mood, emotional memories, fear, anxiety, anger, stress, emotion, and aggression

        - Increased levels of corticotropin releasing hormones in the amygdala, hippocampus and locus coeruleus increases anxiety

Key points

- The cerebral cortex is responsible for higher cognitive function, and divided in the four lobes: FPOT
- The frontal lobe contains the primary motor cortex
- The parietal lobe is primary somatosensory cortex

- The occipital lobe is the visual cortex and responsible for integration of visual and other senses
- The temporal lobe is the auditory cortex

    - **F**rontal – think, plan, solve, decide, emotional behavior
    - **P**arietal – perception, spelling, object, classification, numbers, visuospatial
    - **C**erebellum – gross and fine motor, balance, hand-eye coordination
    - **O**ccipital – vision, visual, processing, color
    - **B**rainstem – all the primitive stuff: body temperature, heart rate, swallowing, breathing...
    - **T**emporal – memory, language comprehension, facial recognition, hearing, and speech. Easy mnemonic to help remember

        - "**F**ather, **p**lease **c**lean **o**ut **B**rian's **t**oilet!"

- Amygdala – emotional response to stimuli and long-term emotional memories: "*Amy*, she's pretty emotional"
- Hippocampus – forms new memories and recalls old ones
- Broca's aphasia (expressive aphasia)

    - Can occur due to a stroke, brain tumor, or brain trauma
    - A patient may have difficulty producing speech. They can understand and know what they want to say, but are not able to form words used in verbal communication

- Wernicke's aphasia

    - Can happen as a result of hemorrhagic or ischemic stroke
    - A patient may speak clearly and produce speech, but their speech has no meaning and may have difficulty understanding language

Cranial Nerves

- **O**lfactory: Cranial Nerve I (CN 1)

    - Sense of smell and patency of the nasal passages

- **O**ptic: CN II (CN 2)

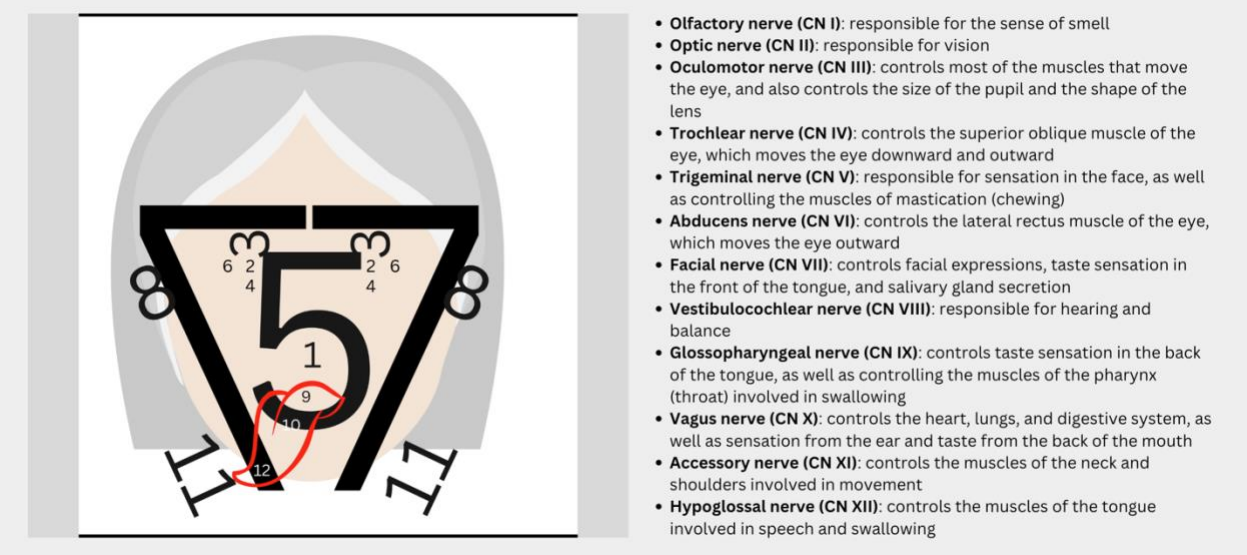
    - Vision

- **O**culomotor: CN III (CN 3)

    - Motor – adjust and coordinate eye position during movement. Move and blink eyes; pupils: reactions to light and accommodation; corneal reflex

- **T**rochlear: CN IV (CN 4)
    - Motor – innervates superior oblique muscle to lift the eyes to look down. The nerve also enables the eyes movement toward the nose or away from it
- **T**rigeminal: CN V (CN 5)
    - Sensations in face and cheeks, taste and jaw movements; biting, chewing and swallowing, and facial and scalp sensations
- **A**bducens: CN VI (CN 6)
    - Motor – innervates the ipsilateral lateral rectus muscle with partially innervation of the contralateral medial rectus muscle to produce lateral eyeball movement
- **F**acial: CN VII (CN 7)
    - Facial expressions and sense of taste
- **V**estibulocochlear: CN VIII (CN 8)
    - Sense of hearing and balance
- **G**lossopharyngeal: CN IX (CN 9)
    - Ability to taste and swallow
- **V**agus: CN X (CN 10)
    - Elevation of uvula and gag reflex; taste
- **A**ccessory: CN XI (CN 11)
    - Shoulder and neck muscle movement
- **H**ypoglossal: CN XII (12)
    - Ability to move the tongue, make noises with mouth (clicking sounds)

- Easy mnemonic to help remember all CNs:
    - **O**n **O**ccasion, **O**ur **T**rusted **T**ruck **A**cts **F**unny – **V**ery **G**ood **V**ehicle **A**ny **H**ow



- **Olfactory nerve (CN I)**: responsible for the sense of smell
- **Optic nerve (CN II)**: responsible for vision
- **Oculomotor nerve (CN III)**: controls most of the muscles that move the eye, and also controls the size of the pupil and the shape of the lens
- **Trochlear nerve (CN IV)**: controls the superior oblique muscle of the eye, which moves the eye downward and outward
- **Trigeminal nerve (CN V)**: responsible for sensation in the face, as well as controlling the muscles of mastication (chewing)
- **Abducens nerve (CN VI)**: controls the lateral rectus muscle of the eye, which moves the eye outward
- **Facial nerve (CN VII)**: controls facial expressions, taste sensation in the front of the tongue, and salivary gland secretion
- **Vestibulocochlear nerve (CN VIII)**: responsible for hearing and balance
- **Glossopharyngeal nerve (CN IX)**: controls taste sensation in the back of the tongue, as well as controlling the muscles of the pharynx (throat) involved in swallowing
- **Vagus nerve (CN X)**: controls the heart, lungs, and digestive system, as well as sensation from the ear and taste from the back of the mouth
- **Accessory nerve (CN XI)**: controls the muscles of the neck and shoulders involved in movement
- **Hypoglossal nerve (CN XII)**: controls the muscles of the tongue involved in speech and swallowing

Neurotransmitters

A neurotransmitter is a chemical substance that is released at the end of a nerve terminal by the arrival of a nerve impulse and, by diffusing across the synapse or junction, causes the transfer of the impulse to another nerve.

- **Norepinephrine**: produced in the **locus coeruleus** and medullary reticular formation; body's "fight or flight" response and is involved in regulating attention, arousal, and mood
- **Serotonin**: produced in the **raphe nuclei** of the brainstem; plays a key role in regulating mood, appetite, and sleep
- **Dopamine**: produced in the **substantia nigra, nucleus accumbens, and ventral tegmental area (VTA)**; plays a role in motivation, reward, and pleasure
- **Acetylcholine**: synthesized by the **nucleus basalis of Meynert**; involved in the transmission of nerve impulses in the nervous system, and is associated with muscle contraction, learning, and memory
- **γ-Aminobutyric acid (GABA)**: the **most abundant inhibitory neurotransmitter**. This is **the calming neurotransmitter. A decrease in GABA will increase anxiety**

    - Benzodiazepines are used to bind with GABA to "calm" a patient (given for anxiety)

- **Glutamate: the most abundant excitatory neurotransmitter**. **Too much glutamate will cause anxiety**

Pharmacological Concepts and Principles

Pharmacokinetics and pharmacodynamics

- **Pharmacokinetics** – how the body interacts with administered medications – what the BODY does to the drug

- **Pharmacodynamics** – how a drug (via molecular, biochemical, and physiologic effects or actions) affects the body – what the DRUG does to the body

Agonist effect

- When a drug binds to a receptor and ACTIVATES or opens the ion channel

Inverse agonist effect

- When a drug causes the OPPOSITE EFFECT of an agonist: binding and closing an ion channel

Partial agonist effect

- When a drug DOES NOT FULLY ACTIVATE the ion channel (less effective than an agonist)

Antagonist effect

- When a drug binds to a receptor and it DOES NOT ACTIVATE a biological response

Half-life and Steady State

- The *half-life* is the amount of time it takes for a drug's active substance to be reduced by half
- The steady state is the point at which the amount of drug eliminated from the body between doses is approximately equal to the dose administered

    - Medications are administered once every *half-life* in order to achieve steady state
    - It takes roughly **five *half-lives*** to achieve steady state and **five *half-lives* to eliminate a medication from the system** (Wadhwa & Cascella, 2022)

Drug-to-drug Interactions

Simply put, a drug-to-drug interaction is a change in a medication's effect on the body when taken with a second medication. A drug-drug interaction can cause

- Delayed, decreased, or enhanced absorption of either drug
- This can decrease or increase the action of either or both drugs
- Cause adverse effects

Interactions can occur the following ways

- The two medications have similar effects on the body and are too strong in combination

    - ❖ Example: Serotonin Syndrome – two medications (SSRIs) that both increase serum serotonin levels resulting in serotonergic stimulation

- One medication changes the metabolism of the other, resulting in changes in how a medication

    1. Enters the body
    2. Diffuses throughout the bloodstream
    3. Exerts its intended effects on a target organ – usually the brain with psychotropic medications

    - ❖ Example: A patient is taking sertraline (Zoloft) and begins taking a mood stabilizer, carbamazepine (Tegretol), a known inducer. The inducer speeds up the metabolism of the other drug. So, sertraline metabolism INCREASES, resulting in an overall DECREASE in drug effectiveness

- ❖ Opposite Example: The same patient begins taking ritonavir (Norvir; a HIV retroviral), a strong inhibitor, resulting in DECREASED metabolism of Zoloft and an overall INCREASE in the amount of sertraline (Zoloft) in the system

Physical causes

- Liver disease
    - Can impact enzyme activity and first pass metabolism
        - Reducing drug clearance
        - Reducing the synthesis of plasma proteins and causing changes in liver blood flow and medication distribution
        - Resulting in TOXIC (high) drug levels (this can vary based on the chemical characteristics of the medication and severity of liver disease)
- Kidney disease
    - Although, a majority of psychotropics are metabolized by the liver, kidney disease can also be a factor
    - Reduction in kidney clearance can be caused by medications and can INCREASE drug serum concentrations resulting in symptoms such as confusion, tremors, slurred speech, and vomiting (NAMI, 2022a; Think: LITHIUM)
        - NSAIDS (ibuprofen [Advil or Motrin] and naproxen [Naprosyn or Aleve])
        - Thiazides (bumetanide [Bumex], ethacrynic acid [Edecrin], furosemide [Lasix])
        - ACE Inhibitors (lisinopril [Prinivil or Zestril])
- Old age can greatly affect the way medications interact due to
    - DECREASED intracellular water - the concentration of drugs within the cells can increase. This can cause an increase in the efficacy of some drugs, as they can more readily reach their target within the cell. However, it can also increase the toxicity of other drugs, as they can accumulate within the cell and cause damage
    - DECREASED protein binding capabilities (not necessarily caused by old age, but by the disease processes seen with aging)
    - DECREASED (low) muscle mass - reduced muscle mass can result in altered drug distribution, which can lead to higher concentrations of drugs in the bloodstream, potentially leading to toxicity or adverse drug reactions
    - DECREASED metabolism

Inducers and Inhibitors

- ♦ Inducers – DECREASE serum drug levels = Subtherapeutic

- ♦ Inhibitors – INCREASE serum drug levels = Supratherapeutic

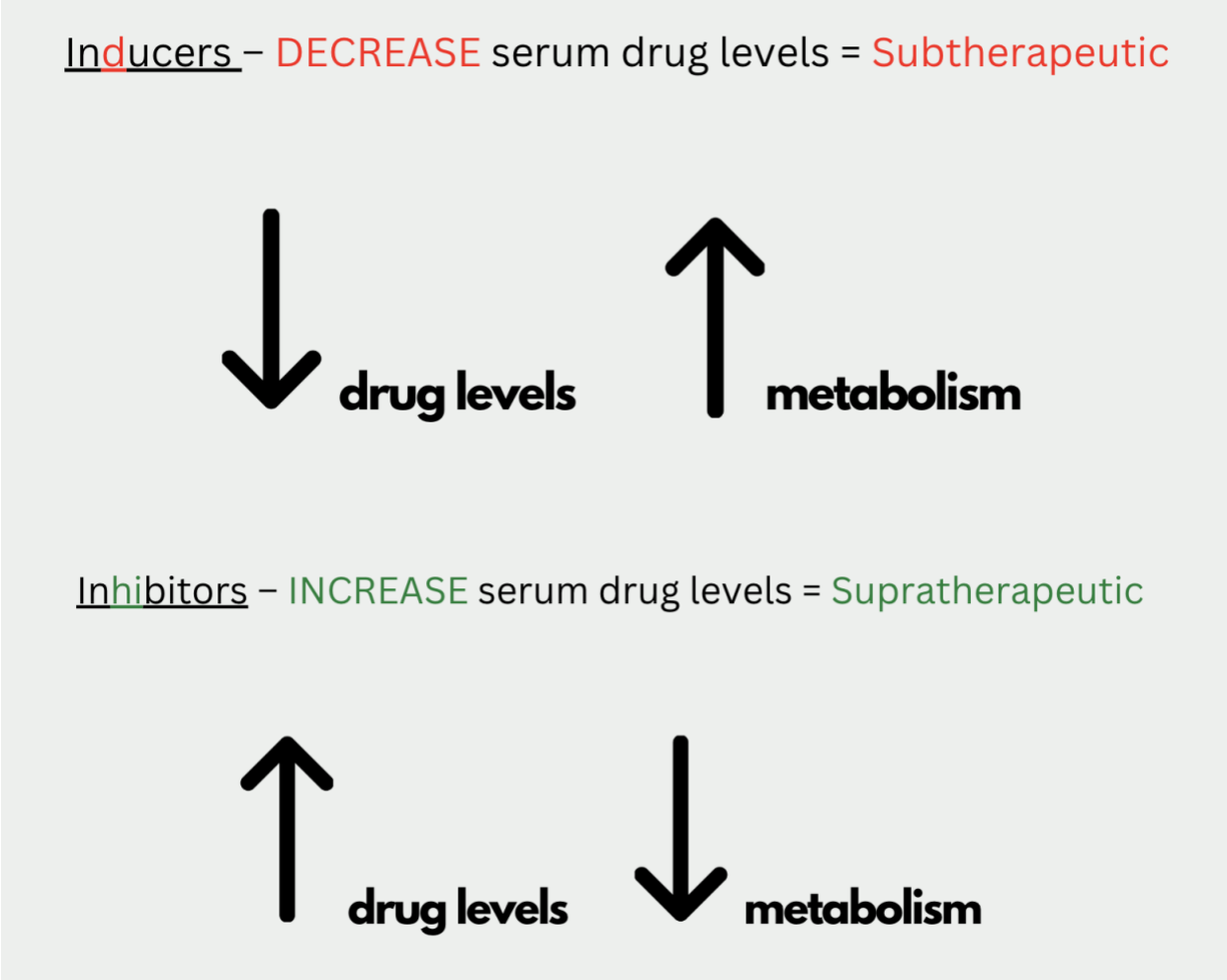
Key component to understanding drug interactions is comprehending the enzymatic processes.

- **Cytochrome P-450 (CYP)** enzymes are responsible for the metabolism of many psychotropic medications and can be inhibited or induced by certain drugs, resulting in significant drug-to-drug interactions and adverse reactions
    - Enzymes are encoded by P-450 genes
    - Expressed as membrane bound proteins
    - Mostly found in the endoplasmic reticulum of the liver
    - ***First-pass metabolism*: process by which the drug is metabolized by P-450 enzymes in the intestines and liver prior to going to systemic circulation**

- There are multiple P-450 enzymes involved with hepatic metabolism. The most common:

CYP	Substrates	Inducers	Inhibitors
1A2	caffeine, TCAs, clozapine, haloperidol, duloxetine, mirtazapine, olanzapine	phenobarbital, carbamazepine, phenytoin, tobacco	fluvoxamine, fluoxetine, paroxetine, sertraline
2C9	warfarin, losartan, NSAIDs, glipizide, ARBs	carbamazepine, rifampin	valproic acid, fluoxetine
2C19	SSRIs (citalopram), benzodiazepines (BZDs), PPIs, amitriptyline	carbamazepine, valproic acid, phenobarbital, phenytoin	fluvoxamine, fluoxetine
2D6	amitriptyline, sertraline, haloperidol, TCAs, risperidone, tramadol, venlafaxine, duloxetine, aripiprazole, β-blockers, codeine, antiarrhythmics	None	bupropion, fluoxetine, paroxetine, duloxetine
3A4	acetaminophen, BZDs, amlodipine, atorvastatin, buspirone, sertraline, venlafaxine, mirtazapine, haloperidol, trazodone	carbamazepine, phenytoin, phenobarbital, Saint John's Wort, rifampin	fluvoxamine, nefazodone, clarithromycin, erythromycin, fluconazole

Note. Adapted from English, B. A., Dortch, M., Ereshefsky, L., & Jhee, S. (2012). Clinically significant psychotropic drug-drug interactions in the primary care setting. Current Psychiatry Reports, 14(4), 376-390. https://doi.org/10.1007/s11920-012-0284-9



The main inducers and inhibitors to know for the exam:

- Inducers: **B**ull **S**hark **CRAP GPS+**

  - **B**arbiturates
  - **S**t John's Wart

  - **C**arbamazepine
  - **R**ifampin

- **A**lcohol
- **P**henytoin

- **G**riseofulvin
- **P**henobarbital
- **S**ulfonylureas
- **+** smoking and the pill; Methadone, Antiretrovirals, Cyclosporine

    - As an example, smoking is an inducer and medication may need to be increased if the patient is a smoker. However, if they stop smoking, the clinician needs to remember to adjust or decrease the dose of medication since it is no longer being induced (if not, there will be too much medication in the system)

- Inhibitors: *can cause* "**B**ig **F**reaking **P**roblems"

- **B**upropion
- **F**luoxetine
- **P**aroxetine

IMPORTANT CONCEPT - When a potent enzyme inhibitor is combined with potent inducer, the inhibition will tend to predominate and the inducing medication will need to be altered.

Medications and Classes: Advanced pharmacology/pharmacological management/dopamine pathways

Antipsychotics

- Antipsychotics are used in the treatment of the following disease processes and are primarily dopamine antagonists
    - Schizophrenia
    - Psychotic episodes occurring in depression and dementia
    - Bipolar disorder
    - Delusional disorder
    - Anxiety/agitation...and others

- Although many patients being treated with antipsychotics can be cared for on an outpatient basis, hospitalization may be required, and patient status must be closely monitored
- Prior to selecting an antipsychotic medication, a complete medication reconciliation, past medical and psychiatric history, and physical assessment (to include assessing the patient's motor state) is warranted
- Both the efficacy and the known side effects of antipsychotics are attributed to blockage (antagonism) of dopamine receptors. However, dopamine receptors are not the only ones involved in anti-psychotic interactions. You can remember them all by utilizing the mnemonic block-**MASH**
    - **M**uscarinic acetylcholine receptors – constipation, urinary retention, blurry vision, dry mouth, tachycardia, and cognitive impairment
    - **A-**1 norepinephrine receptors – found all over the body, including the peripheral vascular system: orthostatic hypotension and reflex tachycardia
    - **S**erotonin receptors – modulation of these receptors may be the reason for improvement in treating depression and other bipolar disorders; however, they can also cause sedation and weight gain
    - **H**istamine receptors – sedation, weight gain, insulin resistance, diabetes, and hyperlipidemia

- Antipsychotic Treatment: **Dopamine Blockage within the Dopamine Pathways**
    - Blockage in the **mesolimbic pathway** results in a decrease in hallucinations, delusions, and other ***positive symptoms*** typically seen in schizophrenia or other psychotic conditions
    - Blockage in the **mesocortical pathway** results in ***negative symptoms*** or diminished energy, lack of motivation, restrictions and emotions, and alterations in social engagements
    - Blockage in the **nigrostriatal pathway** may lead to ***extrapyramidal symptoms*** (EPS), such as tardive dyskinesia, parkinsonian like symptoms (i.e., tremors, muscle rigidity, and difficulty starting and stopping movement)

- Blockage in the **tuberoinfundibular pathway** results in ***decreased follicle stimulating hormone (FSH) and an increase in prolactin***, resulting in amenorrhea, gynecomastia, galactorrhea, and/or sexual dysfunction

- Extrapyramidal (EPS) Side Effects

  - Akathisia = the "Ants in 'yo pants" effect

    - Restless
    - Pacing motions
    - Difficulty standing still
    - Feet are constantly in motion
    - Rocking

      - Akathisia is commonly measured using the Barnes Akathisia Rating Scale (BARS) or the Extrapyramidal Symptom Rating Scale (ESRS)
      - Akathisia is often mistaken for increased anxiety

    - Available treatment options for akathisia:

      - Beta blockers (caution must be taken; beta blockers can result in bronchospasms, do not give to a patient if they are already on a bronchodilator)
      - benztropine (Cogentin; anticholinergic)
      - Benzodiazepines

  - Akinesia = the absence of movement; cannot initiate motion or has a lack of motivation to move

    - Akinesia is often mistaken for laziness or having a lack of interest

      - Pharmacological management of akinesia is benztropine (Cogentin; anticholinergic)

  - Pseudo-parkinsonism = a reaction to antipsychotic medication and imitates the signs and symptoms of Parkinson's Disease:

    - Stooped posturing
    - Shuffling gait
    - Rigidity
    - Bradykinesia
    - Tremors while at rest
    - Pill-rolling hand motions

        - Is caused by the blockage of dopamine-2 (D2) receptors either pathologically or due to antipsychotic medication use
        - Pharmacological treatment is benztropine (Cogentin; anticholinergic)

- Acute Dystonia = possibly caused by dopaminergic-cholinergic imbalance in the basal ganglia (Lewis & O'Day, 2022). Symptoms may or may not be reversible. They can occur after taking a dopamine receptor blocking medication or after increasing a dose:

    - Facial grimacing
    - Involuntary upward eye movement
    - Muscle spasms of the tongue, face, and/or neck
    - Laryngeal spasms

        - Has been mistaken for agitation or unusual stereotypical movements associated with schizophrenia

    ☹ Oculogyric Crises

        - A rare presentation of acute dystonia, which can lead to permanent eye injury due to involuntary upward deviation of the eyes – bilaterally

        ☺ Can be treated with benztropine (Cogentin; anticholinergic)

- Tardive Dyskinesia = iatrogenic movements caused by the blockade of dopamine receptors (Vasan & Padhy, 2022):

    - Rolling and protruding of the tongue
    - Sucking and/or smacking of the lips
    - Chewing motions
    - Facial dyskinesia
    - Involuntary movement of the extremities

        - It can take up to one to two years for tardive dyskinesia to present itself; however, it can always occur acutely at the start of medication treatment or present chronically at any point after treatment

    - Treatment options for tardive dyskinesia:

        1. Reduce the medication dose
        2. Stop the offending medication
        3. Or switch to clozapine (Clozaril; atypical antipsychotic)

        - deutetrabenazine (Austedo; selective vesicular monoamine transporter 2 [VMAT2] inhibitor) and valbenazine (Ingrezza; VMAT2 inhibitor) are also FDA approved to treat tardive dyskinesia

    - ☹ **In a patient with tardive dyskinesia, benztropine (Cogentin; anticholinergic) should be AVOIDED because it is known to worsen tardive dyskinesia**

    - ☹ metoclopramide (Reglan; antiemetic agent) is known for causing tardive dyskinesia (involuntary puckering/pursing of lips and sticking out of the tongue)

- The first generation or *typicals* block almost all dopamine (1 through 5) receptors in the brain

- Second generation or *atypicals* block **both D2 receptors and 5-HT2A (serotonin) receptors**. The blockage of 5-HT2A may increase levels of dopamine in areas of the brain that are in need and often are deprived of dopamine when using a typical anti-psychotic and can reduce side effects

    - First generation *Typical* Antipsychotics – see flashcards

        - haloperidol (Haldol)
        - fluphenazine (Modecate)
        - chlorpromazine (Thorazine)

    - Second generation *Atypical* Antipsychotics – see flashcards

        - clozapine (Clozaril)
        - paliperidone (Invega)
        - brexpiprazole (Rexulti)
        - cariprazine (Vraylar)
        - olanzapine (Zyprexa)
        - quetiapine (Seroquel)
        - risperidone (Risperdal)
        - ziprasidone (Geodon)
        - aripiprazole (Abilify)
        - lurasidone (Latuda)

- Specific medications for disorders will be discussed individually as part of the treatment options in later topics

- The three second generation antipsychotics with fewer instances of weight gain:
    - ziprasidone (Geodon)
    - aripiprazole (Abilify)
    - lurasidone (Latuda)

- Neuroleptic Malignant Syndrome (NMS) – caused by adverse reactions to antipsychotic use – fluphenazine (Modecate) and haloperidol (Haldol) are particularly notorious
    - More common with first generation antipsychotics
    - Causes **extreme muscle rigidity and mutism**
    - The provider will need to **monitor laboratory values**
        - Increased CPK (caused by muscle destruction)
        - Myoglobinuria (caused by rhabdomyolysis)
        - Increased white blood cells (WBCs; leukocytosis)
        - Increased aspartate aminotransferase (AST) and alanine transaminase (ALT) on a liver function test (LFT)
    - ☹ Presents with a characteristic pattern of symptoms (FEVER)
        - Fever
        - Encephalopathy
        - Vital sign instability
        - Elevated WBC and CPK
        - Rigidity
- Pharmacological management of NMS
    1. Administer bromocriptine (dopamine [D2] agonist)

2. Administer dantrolene (Dantrium; skeletal muscle relaxant) for extreme muscle rigidity

☺ Easy way to remember what to administer: "BRO, you've got NMS! DAN, relax, I'll be fine"

Antidepressants

- Antidepressants are used in the treatment of depressive disorders and work to improve the following symptoms: sadness, despair, anhedonia, low self-esteem, apathy, negative thinking, irritability, suicidal ideation, guilt, and/or indecisiveness
- Common classes of medications used to treat depression:
    - **Selective serotonin reuptake inhibitors (SSRIs)** – see flashcards; designed to increase the availability of serotonin within the synaptic cleft
        - fluoxetine (Prozac)
        - paroxetine (Paxil)
        - sertraline (Zoloft)
        - fluvoxamine (Luvox)
        - citalopram (Celexa)
        - escitalopram (Lexapro)
    - **Serotonin-norepinephrine reuptake inhibitors (SNRIs)** – see flashcards; designed to increase the availability of serotonin and norepinephrine within the synaptic cleft
        - desvenlafaxine (Pristiq)
        - duloxetine (Cymbalta; can also treat anxiety and chronic pain)
        - levomilnacipran (Fetzima)
        - venlafaxine (Effexor XR can also treat anxiety and panic disorders)
            - SNRIs can be used for neuropathic pain. So, if the patient presents with depression and neuropathic pain, consider using a SNRI
    - **Tricyclic antidepressants (TCAs)** – see flashcards; oldest form of antidepressant. Side effects can be extreme. They are very effective due to their ability to increase serotonin and norepinephrine
        - amitriptyline (Elavil)
        - doxepin (Silenor)
        - imipramine (Tofranil)
        - nortriptyline (Pamelor)

        - TCAs can cause

            → Dry mouth
            → Slight blurring of vision
            → Constipation
            → Urinary complications
            → Drowsiness
            → Dizziness
            → Weight gain
            → Excessive sweating (especially at night)

    - Even though they are effective for both depression and neuropathic pain, SSRIs and SNRIs should be tried first (at least for the exam) since they are considered "safer"

- **Monoamine oxidase inhibitors (MAOIs)** – see flashcards; inhibit the enzyme that is responsible for breaking down neurotransmitters – monoamine oxidase – while antagonizing acetylcholine and histamine, via inhibition of sodium and calcium ion channels. This prevents the break down and removal of norepinephrine, serotonin, and dopamine

    - tranylcypromine (Parnate)
    - selegiline (Emsam)
    - isocarboxazid (Marplan)

    ☹ **Hypertensive crisis may occur when taking an MAOI in conjunction with foods containing tyramine**

        - Avoid tyramine products

            → Strong or aged cheeses (aged cheddar, Swiss and Parmesan; blue cheeses such as Stilton and Gorgonzola; and Camembert)
            → Cured meats (summer sausages, pepperoni, and salami)
            → Smoked or processed meats (hot dogs, bologna, bacon, corned beef or smoked fish)
            → Pickled or fermented foods (sauerkraut, kimchi, caviar, tofu or pickles)
            → Sauces (shrimp sauce, fish sauce, miso, and teriyaki sauce)
            → Soybeans
            → Dried or overripe fruits
            → Yeasted products
            → Alcoholic beverages (tap or home-brewed beer; red wine, sherry, and liqueurs; (Mayo Clinic, 2018)

- ☹ Hypertensive crisis is a life-threatening condition that cannot be reversed unless the body makes more MAO

- ☹ Symptoms of hypertensive crisis:

    - Elevated blood pressure
    - Explosive headaches
    - Facial flushing
    - Heart palpitations
    - Pupillary dilation
    - Excessive sweating
    - Fever

- ☺ Hypertensive crisis treatment plan:

    1. Discontinue the offending agent
    2. Administer phentolamine (Regitine; α-adrenergic agonist)

- **Atypical antidepressants** – see flashcards

    - bupropion (Wellbutrin; norepinephrine-dopamine reuptake inhibitor [NDRI])

        - If a patient presents with comorbid depression, low energy, and fatigue, they can be given bupropion (Wellbutrin)
        - **bupropion (Wellbutrin) is contraindicated with a patient history of seizures (bupropion [Wellbutrin] can decrease the seizure threshold, causing a seizure) or for a patient with an eating disorder (bulimia or anorexia nervosa; due to electrolyte abnormalities, the individual may be at risk for seizures, and it can be exacerbated with bupropion [Wellbutrin])**
        - Sexual dysfunction = take bupropion (Wellbutrin). If a patient presents with a history of sexual dysfunction, bupropion can be an appropriate alternative or can be used as augmentative treatment for a patient taking a SSRI and experiencing sexual dysfunction as a side effect

    - mirtazapine (Remeron; α-2 receptor antagonist)
    - trazodone (Molipaxin; serotonin modulator): **warning - can cause a priapism (prolonged erection)**

- Serotonin Syndrome

    - Occurs when there is too much serotonin in the system. Usually caused by taking too much medication or due to a drug-to-drug interaction
    - Drug combinations that can cause Serotonin Syndrome:

- SSRIs taken with MAOIs
- Taking more than one SSRI at a time
- Drug and herbal interactions. Some examples include ginseng, St. John's wort, Syrian rue, Garcinia cambogia (HCA), 5-HTP, SAMe, and nutmeg

☹ Symptoms of Serotonin Syndrome:

- Hyperreflexia (overactive body reflexes)
- Myoclonic jerks
- Sweating
- Fever
- Extreme headaches
- Confusion
- Tachycardia (heart rate > 100 beats per minute in adults)
- Agitation

☺ Serotonin Syndrome treatment plan:

1. Discontinue the offending agent
2. Administer cyproheptadine (Periactin, antihistamine)

When switching from a SSRI to a MAOI, will need to **wait 14 days**
When switching from fluoxetine (Prozac) to a MAOI, will need to **wait 5 to 6 weeks**
When switching from a MAOI back to fluoxetine (Prozac), will need to **wait two weeks**

- Serotonin Discontinuation Syndrome
  - Occurs when a patient stops taking a SSRI or SNRI abruptly

☹ Symptoms of Serotonin Discontinuation Syndrome:

- Myoclonic jerks
- Flu-like symptoms (worse with TCAs)
- Fatigue
- Myalgia (muscle aches and pain)
- Decreased concentration
- Nausea and vomiting
- Ataxia (an unsteady gait)
- Impaired memory
- Agitation
- Hyperreflexia

  - Patients should be educated to not stop a SSRI/TCA/MAOI abruptly and without provider recommendation/oversight

- **Some Key points**

    - Never use an SSRI with a MAOI
    - SSRIs can increase lithium and carbamazepine serum levels

Bipolar Disorder Medications (mood stabilizers)

- As discussed earlier, BD is marked by alterations in mood that include manic, hypomanic, and depressive states. Mood stabilizers treat BD by improving the signs and symptoms associated with the disorder (**d**istractibility, **i**mpulsivity, **g**randiosity, **f**light of ideas, increased **a**ctivity, decreased need for **s**leep, and **t**alkativeness [**DIG FAST**])

- Common classes of medications used to treat:

    - Bipolar Mania – see flashcards

        - lithium carbonate (Eskalith; antimanic)
        - carbamazepine (Tegretol; anticonvulsant)
        - divalproex (Depakote; anticonvulsant)
        - oxcarbazepine (Trileptal; anticonvulsant)

    - Bipolar Depression – see flashcards

        - lamotrigine (Lamictal; anticonvulsant)
        - lurasidone (Latuda; atypical antipsychotics)
        - olanzapine-fluoxetine combination (Symbyax; combination atypical antipsychotic and SSRI)
        - quetiapine (Seroquel; atypical antipsychotics)

        ☹ Side effects of mood stabilizers:

            - lamotrigine (Lamictal; anticonvulsant) = **Stevens-Johnson Syndrome** – STOP taking with these signs

                → Fever
                → Sore throat
                → Facial and tongue swelling
                → Severe rash
                → Skin sloughing
                → Painful mucus membranes

            - carbamazepine (Tegretol; anticonvulsant) = **BLACK BOX WARNING**

→ Agranulocytosis (extremely low WBCs-type) and aplastic anemia (pallor, fatigue, headache, fever, nose, bleeds, bleeding gums, skin, rash, and shortness of breath)

★ **The provider must <u>screen for the HLAB-1502 allele</u> before starting an <u>Asian patient on carbamazepine (Tegretol; anticonvulsant)</u>, because of increased risk for carbamazepine-induced Stevens-Johnson Syndrome**

- Always, ALWAYS perform a pregnancy test (HCG) and check pregnancy status BEFORE starting a female patient of child-bearing years (12-51) on a mood stabilizer due to increased risk of neural tube defects

Anxiolytics

- Anxiolytics treat a wide variety of anxiety and worry-based symptoms (stress, panic, social anxiety, obsessive-compulsion...) – see flashcards
  - GAD
    - SSRIs
    - Buspirone (Buspar)
    - Pregabalin (Lyrica; anticonvulsant)
  - Stress-related Anxiety
    - diazepam (Valium; benzodiazepine)
    - lorazepam (Ativan; benzodiazepine)
    - alprazolam (Xanax; benzodiazepine)
    - clonazepam (Klonopin; benzodiazepine)
    - hydroxyzine (Atarax or Vistaril; antihistamine)
  - Panic Disorder
    - lorazepam (Ativan; benzodiazepine)
    - alprazolam (Xanax; benzodiazepine)
    - clonazepam (Klonopin; benzodiazepine)
    - Antidepressants
  - Social Phobia
    - propranolol (Inderal; beta blocker)
    - venlafaxine (Effexor; SNRI)
    - SSRIs

- Stress-related Insomnia
    - zolpidem (Ambien; sedative-hypnotic)
    - eszopiclone (Lunesta; sedative-hypnotic)
    - temazepam (Restoril; sedative-hypnotic)
- Nightmares
    - Prazosin (Minipress; α-1 receptor antagonist)

OCD Medications

- First-line treatment of OCD includes serotonergic agents, antidepressants, and combination behavior therapy – see flashcards
    - SSRIs
        - fluoxetine (Prozac)
        - sertraline (Zoloft)
        - fluvoxamine (Luvox)
        - citalopram (Celexa)
        - escitalopram (Lexapro)
        - Vilazodone (Viibyrd)

Borderline Personality Disorder Medications

- Medications are not treating personality disorders directly but used to target and improve the symptoms. Patients with BPD present in a variety of ways and medication treatment should be tailored based on specific presenting symptoms – see flashcards
    - Impulsivity/anger control/feelings of loneliness or sensitivity
        - SSRIs
        - Atypical antipsychotics
    - Schizotypal-type
        - Low dose antipsychotic (olanzapine and risperidone)
    - Emotional instability
        - lithium carbonate (Eskalith; antimanic)
        - divalproex (Depakote; anticonvulsant)
        - Atypical antipsychotics

ADHD Medications

- The most common type of pharmacological treatment for ADHD is overwhelmingly the use of stimulants. Fast acting stimulants must be used with caution and monitored due to the chance of misuse and abuse and chemical dependency – see flashcards

    - Stimulants

        - methylphenidate (Ritalin and Concerta)
        - dexmethylphenidate (Focalin and Dexedrine)
        - lisdexamfetamine (Vyvanse)
        - d- and l-amphetamine (Adderall)

    - Anti-depressants

        - bupropion (Wellbutrin; NDRI)
        - atomoxetine (Strattera; SNRI)

    - α-Adrenergic Agonists

        - clonidine (Catapres)
        - guanfacine (Intuniv)

Aggression Medications

- Irritable, hostile, and violent behavior is a symptom of many disorders, such as ADHD, Antisocial Personality Disorder, BPD, conduct disorder, dementia, schizophrenia, and many others. Often, the provider will target aggressive behaviors by way of treating the underlying disorder. Clinically significant aggressive behavior is commonly treated using psychotherapy and antipsychotics. It is vital that the nurse practitioner consider the potential side effects when collaborating with the patient on treatment options – see flashcards

    - Antipsychotics
    - divalproex (Depakote; anticonvulsant)
    - propranolol (Inderal; beta blocker)
    - buspirone (Buspar; anxiolytics)
    - clonidine (Catapres; α-adrenergic agonist)
    - lithium carbonate (Eskalith; antimanic)
    - SSRIs

Eating Disorders Medications

- Currently, there is no medication treatment specifically for anorexia nervosa, however, atypical antipsychotics (olanzapine; Zyprexa) can reduce delusional thinking associated with the need to lose weight. Bulimia nervosa can be treated with antidepressants – see flashcards

    - fluoxetine (Prozac; SSRI) - for bulimia nervosa ONLY

PTSD Medications

- First-line treatment for PTSD continues to be psychotherapy. Medication management can be helpful in reducing depression, panic, and other presenting symptoms. Evidence states that SSRI antidepressant treatment is the most beneficial and efficacious. Short course antipsychotic treatment may be utilized for any psychotic or intrusive symptoms

    - First-line Pharm Treatment (U.S. Department of Veterans Affairs [VA], n.d.): – see flashcards

        - sertraline (Zoloft; SSRI)
        - paroxetine (Paxil; SSRI)
        - fluoxetine (Prozac; SSRI)
        - venlafaxine (Effexor; SNRI)

Over-the-Counter (OTC) and Dietary Supplements

- The U.S. Food and Drug Administration (FDA) does not oversee dietary supplements and no federal standards or regulations exist. Complementary and alternative medicines (CAMs) continue to grow in popularity, and some evidence does support efficacy. However, patient education is vital and thorough medication reconciliations must be completed by the provider due to potentially life-threatening drug-to-to drug interactions that can occur with CAMs

    - Omega-3 fatty acids (ADHD, dyslexia, cognitive impairment, dementia)

        - Can interact with warfarin (Coumadin) resulting in increased anticoagulation. Patient education should include stopping before a surgery

    - Sam-e (depression)

        - May cause hypomania, hyperkinesia, and can interact with SSRIs (and other antidepressants) resulting in serotonin syndrome

    - Tryptophan (depression, obesity, and insomnia)

        - Is found in high concentrations in turkey. Can interact with SSRIs, MAOIs, and St. John's wort resulting in serotonin syndrome

    - Vitamin E (neurological disorders)

        - Can interact with warfarin, increasing anticoagulation

    - Melatonin (insomnia)

        - Can interact with aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs), beta blockers, corticosteroids, valerian, kava kava, and alcohol
        - May inhibit ovulation (large doses)

    - Fish oil (BD)

        - Can interact with warfarin, aspirin, NSAIDs, garlic, and ginkgo (Johnson & Vanderhoef, 2016)

Drug Schedules

- **Schedule I**

    - Nonmedicinal substances and have a high potential for abuse – heroin, lysergic acid diethylamide (LSD), marijuana (cannabis), 3,4-methylenedioxymethamphetamine (ecstasy), methaqualone, and peyote (U.S. Drug Enforcement Agency, 2022)

- **Schedule II**

    - Medicinal use
    - High potency for abuse and dependency
    - Written prescription only, no telephone orders allowed no refills allowed

- **Schedule III**

    - Medicinal use
    - Less potential for abuse, but still present
    - Telephone orders allowed if followed by a written prescription
    - Must be renewed every six months with a limit of five refills

- **Schedule IV**

    - Medicinal use
    - Less abusive potential

Medications that can cause mania:

- Steroids (can also cause psychosis)
- disulfiram (Antabuse; one of three drugs approved by the FDA to treat alcohol dependence by preventing the liver from metabolizing alcohol by binding to aldehyde dehydrogenase; Stokes & Abdijadid, 2021)
- isoniazid (INH; antituberculosis agent)
- Antidepressants when taken by patient with BD

Medications that can cause depression:

- Steroids
- isotretinoin (Accutane; retinoid – can also cause birth defects)
- Beta blockers
- interferon (Intron; cytokine)
- Retrovirals
- Antineoplastics
- Benzodiazepines
- progesterone (Prometrium; progestin [female hormone])
    - Some medications can render mood stabilizers ineffective:
        - fluticasone (Flonase; corticosteroid)
        - prednisone (Rayos and Prednisone Intensol); corticosteroid)

Teratogenic Risks of Common Psychiatric Medications

- lithium carbonate (Eskalith; antimanic) = Ebstein anomaly (heart defect; tricuspid valve abnormality resulting in blood leakage back though the valve)
- Benzodiazepines = floppy infant syndrome (decrease muscle tone) and cleft palate (malformation of the mouth with an opening in the pallet that can result in difficulty communicating and feeding)
- carbamazepine (Tegretol; anticonvulsant) = neural tube defects (complications of the brain, spine, and/or spinal cord that can cause paralysis, urinary and bowel complications, blindness, deafness, developmental, intellectual disabilities, and death (NIH, 2018a)
- divalproex (Depakote; anticonvulsant) = neural tube defects and spina bifida (spinal cord that does not develop properly and can be seen on the skin above the spinal defect; CDC, 2020c)

Lithium (Eskalith; antimanic)

- Lithium is considered at toxic levels when equal to or greater than 1.5 mEq per liter

- **The GOLD standard for treating mania**
- There is strong evidence supporting the fact that **lithium has an anti-suicidal effect**
- Baseline labs should be taken before starting lithium:
    - **Thyroid stimulating hormone (TSH)**
    - **Serum creatinine and blood urea nitrogen (BUN)** – if these are high, the patient could have kidney disease and would result in lithium toxicity
    - **Pregnancy test** – child-bearing years (12-51 years of age)
    - **Electrocardiogram (ECG)** for patients older than 50
- Side effects of lithium treatment:
    - Hypothyroidism
    - **Coarse hand tremors**
    - **Maculopapular rash**
    - Diarrhea, vomiting, and cramps
    - Anorexia
    - **T-wave inversion as noted on ECG**
    - **Leukocytosis (increased WBCs)**

Clozapine (Clozaril; atypical antipsychotic)

- **Increased risk for neutropenia and agranulocytosis** when taking clozapine (Clozaril). This is monitored by the **absolute neutrophil count (ANC)** only and not in conjunction with WBCs. **Neutropenia is defined as an ANC of less than 1500/µL** (Moga et al., 2022)
    - Discontinue clozapine (Clozaril) with an ANC less than 1000/µL due to neutropenia
    - Discontinue clozapine (Clozaril) with a WBC of 2000-3000 per mcL due to agranulocytosis
    - Monitor patients for signs of infection (sudden fever, chills, sore throat, weakness…) and discontinue clozapine (Clozaril) and check laboratory values

Folic Acid

- **Supports neural tube development** during the first trimester of pregnancy
- It is important to recommend that all women **planning or capable of becoming pregnant take 0.4 to 0.8 mg of folic acid daily**
- Key Point: if a manic female patient is also promiscuous or hypersexual, the provider should recommend folic acid because of the chance she could become pregnant

Pediatric/Adolescent Considerations

- There are several psychotropic medications that have special instructions for use in adolescents:

    - **SSRIs**: These medications are commonly used to treat depression and anxiety disorders in adolescents. However, they have been associated with an increased risk of suicidal thoughts and behavior in this population. As a result, the FDA requires that all SSRIs carry a black box warning about this risk
    - **Stimulants**: Stimulant medications, such as Ritalin and Adderall, can have side effects such as increased heart rate and blood pressure, which may be more pronounced in this age group. Close monitoring is recommended
    - **Antipsychotics**: Antipsychotic medications, such as Risperdal and Abilify, are sometimes used to treat conditions like bipolar disorder and schizophrenia in adolescents. These medications can cause weight gain, metabolic changes, and other side effects that may be more problematic in this age group. Regular monitoring of weight and metabolic parameters is recommended
    - **Benzodiazepines**: Benzodiazepines, such as Xanax and Klonopin, are sometimes used to treat anxiety disorders in adolescents. However, these medications can be habit-forming and may lead to dependence if used long-term. They should be used with caution and only for short periods of time - not a good choice for the exam

It is important for PMHNPs to closely monitor adolescents who are taking psychotropic medications and to discuss the risks and benefits of these medications with their patients and their families. Adolescents should also be encouraged to report any changes in mood or behavior while taking these medications

- There are several dosing considerations for adolescent populations taking psychotropic medications:

    - **Weight and Body Mass Index (BMI)**: Adolescent populations can vary significantly in terms of their weight and BMI, and this can impact the appropriate dosing of medications, some medications may need to be adjusted based
    - **Age and Developmental Stage**: Adolescent populations can range from 12 to 18 years old, and this can impact the appropriate dosing of medications. For example, younger adolescents may require lower doses of certain medications than older adolescents to avoid adverse effects
    - **Renal and Hepatic Function**: Some psychotropic medications are metabolized by the liver or excreted by the kidneys, so renal and hepatic function can impact dosing. Adolescents with impaired renal or hepatic function may require lower doses of these medications to avoid toxicity
    - **Concurrent Medications**: Some medications can interact with psychotropic medications, and this can impact dosing. For example, medications that inhibit or induce the metabolism of psychotropic medications may require dosage adjustments

- **Patient Response**: Adolescent populations can vary significantly in terms of their response to medications. PMHNPs should closely monitor patients for adverse effects or lack of response to medication and adjust dosing accordingly

Drug (class)	Trade names	Indication
Methylphenidate (stimulant)	Ritalin, Concerta and others	ADHD
Amphetamines (stimulants)	Dexedrine, Adderall and others	ADHD
Guanfacine (alpha-2A adrenergic agonist)	Tenex, Intuniv	ADHD
Clonidine (alpha-2 adrenergic agonist)	Catapres, Kapvay	ADHD
Atomoxetine (SNRI)	Strattera	ADHD
Fluoxetine (SSRI)	Prozac	MDD
Escitalopram (SSRI)	Lexapro	MDD

Note. Adapted from "A Guide to Psychopharmacology for Pediatricians"
Note. Adapted from "22 Psychiatric Medications for Monitoring in Primary Care"

Medication	Common adverse events	Less common adverse events	Rare events	Monitor
Stimulants: Methylphenidate, dextroamphetamine, amphetamine salts	Insomnia, appetite suppression, headache, and stomachache	Cognitive dulling, irritability, exacerbation of tics (controversial)	Growth retardation, hallucinations (visual or tactile, auditory less common), and arrhythmia in those with preexisting cardiac disease or family history	BP, P, BMI
Alpha-2adrenergic agonists: Guanfacine and clonidine	Somnolence	Dry mouth, headache, nausea, and decreased blood pressure	Elevated blood pressure, nervousness, headache, and confusion	BP, P
SNRI: Atomoxetine	Dry mouth, insomnia, nausea, and decreased appetite	Increased heart rate and blood pressure, palpitations, dizziness, sweating, dysuria, and weight change	None	BMI, BP, HR
SSRIs: Fluoxetine and escitalopram	"Activation" (restlessness, insomnia, impulsiveness, talkativeness — usually occurs early in treatment) without mood elevation, gastrointestinal upset, nausea, and diarrhea	Diaphoresis, mydriasis, flushing, sinus tachycardia, hypertension, decreased libido, delayed ejaculation, and akathisia	Serotonin syndrome, agitation, ataxia, diaphoresis, diarrhea, hyper-reflexia, mental state changes, myoclonus, shivering, tremor, hyperthermia neuroleptic malignant syndrome, suicidal thinking or behavior, and true mania emergence and usually by 4th week of treatment	BMI, suicidality, and activation**

Note. Adapted from "A Guide to Psychopharmacology for Pediatricians"

Medication	Warnings/Precautions/Adverse Events	Comments
Class: SSRI		
Fluvoxamine *Indications:* Child/Adolescent: OCD (10-17 years) *Uses*: Anxiety, OCD *Monitoring:* Same as other SSRIs	***Boxed Warnings***: Suicidality *Warnings and Precautions:* Similar to other SSRIs *Adverse Events:* Similar to other SSRIs	No FDA indication for MDD or any anxiety disorder

Medication	Warnings/Precautions/Adverse Events	Comments
Class: TCA		
Clomipramine *Indications:* Child/Adolescent: OCD (8-17 years) *Uses*: Refractory OCD *Monitoring*: Orthostatic BP, HR, blood levels, EKGs to rule out prolonged QTc, suicidality	***Boxed Warnings***: Suicidality *Warnings and Precautions:* Seizures, orthostatic decreases in BP and increases in HR, psychosis, confusion, mania or hypomania, hepatic enzyme increases, hematologic changes, hyperthermia, sexual dysfunction, weight gain, and withdrawal symptoms with abrupt discontinuation *Adverse Events*: Gastrointestinal, including dry mouth, constipation, nausea, dyspepsia, and anorexia; nervous system complaints, including somnolence, tremor, dizziness, nervousness, and myoclonus; genitourinary complaints, including changed libido, ejaculatory failure, impotence, and micturition disorder; and other miscellaneous complaints, including fatigue, sweating, increased appetite, weight gain, and visual changes	The most selectively serotonergic of the TCAs, clomipramine is used for refractory OCD

Note. Adapted from "22 Psychiatric Medications for Monitoring in Primary Care"

Medication	Warnings/Precautions/Adverse Events	Comments
Class: Second Generation Antipsychotic (SGA)		
Risperidone *Indications:* Child/Adolescent: Schizophrenia (13-17 years), acute manic or mixed episodes (10-17 years), "irritability" associated with autistic disorder (5-16 years) *Uses:* Schizophrenia spectrum disorders, bipolar spectrum disorders, "irritability" in autism *Monitoring:* HT/WT, glucose, HbA1c, total, LDL, HDL cholesterol, triglycerides, abnormal involuntary movements	*Boxed Warnings:* None *Warnings and Precautions:* Neuroleptic malignant syndrome, tardive dyskinesia, hyperglycemia and diabetes mellitus, hyperprolactinemia, orthostatic hypotension, leucopenia, neutropenia and agranulocytosis, potential for cognitive and motor impairment, seizures, dysphagia, priapism, TTP, disruption of body temperature regulation, antiemetic effect, and suicidality *Adverse Events:* Most common adverse reactions in clinical trials (≥10%): somnolence, increased appetite, fatigue, insomnia, sedation, parkinsonism, akathisia, vomiting, cough, constipation, nasopharyngitis, drooling, rhinorrhea, dry mouth, abdominal pain upper, dizziness, nausea, anxiety, headache, nasal congestion, rhinitis, tremor, and rash	Along with the other SGAs, is most commonly used to treat bipolar spectrum disorders. It is generally effective and safe for short-term use but there are concerns about adverse effects of long-term use, such as obesity, diabetes, metabolic syndrome and tardive dyskinesia
Quetiapine *Indications:* Child/Adolescent: Schizophrenia (13-17 years), manic episodes associated with bipolar I disorder (10-17) *Uses:* Schizophrenia & bipolar spectrum disorders *Monitoring:* HT/WT, glucose, HbA1c, total, LDL, HDL cholesterol, triglycerides, abnormal involuntary movements	***Boxed Warnings***: Suicidality with antidepressant drugs *Warnings and Precautions:* Neuroleptic malignant syndrome, hyperglycemia and diabetes mellitus, hyperlipidemia, weight gain, tardive dyskinesia, orthostatic hypotension, increased blood pressure, leucopenia, neutropenia and agranulocytosis, and cataracts *Adverse Events:* Somnolence, dizziness, fatigue, increased appetite, nausea, vomiting, dry mouth, tachycardia, and weight increased	Quetiapine is associated with more somnolence than other SGAs

Note. Adapted from "22 Psychiatric Medications for Monitoring in Primary Care"

Medication	Warnings/Precautions/Adverse Events	Comments
Class: Second Generation Antipsychotic (SGA)		
Aripiprazole *Indications:* Child/Adolescent: Schizophrenia (13-17 yrs), manic or mixed episodes (10-17 yrs), "irritability" associated with autistic disorder (6-17 yrs) *Uses:* Schizophrenia & bipolar spectrum disorders, "irritability" in autism *Monitoring:* HT/WT, glucose, HbA1c, total, LDL, HDL cholesterol, triglycerides, abnormal involuntary movements	***Boxed Warnings:*** Suicidality with antidepressant drugs *Warnings and Precautions:* Neuroleptic malignant syndrome, tardive dyskinesia, hyperglycemia and diabetes mellitus, orthostatic hypotension, leucopenia, neutropenia and agranulocytosis, seizures/convulsions, potential for cognitive and motor impairment *Adverse Events:* Most common adverse reactions in clinical trials in children and adolescents (incidence ≥5% and twice placebo): somnolence, extrapyramidal disorder, fatigue, nausea, akathisia, blurred vision, salivary hypersecretion, dizziness, tremor, sedation, fatigue, and drooling	Associated with less weight gain than other SGAs except ziprasidone
Olanzapine *Indications:* Child/Adolescent: Schizophrenia (13-17 years), manic or mixed episodes of bipolar I disorder (13-17 years) *Uses:* Schizophrenia & bipolar spectrum disorders *Monitoring:* HT/WT, glucose, HbA1c, total, LDL, HDL cholesterol, triglycerides, abnormal involuntary movements	***Boxed Warnings:*** None *Warnings and Precautions:* Suicide, neuroleptic malignant syndrome, hyperglycemia, hyperlipidemia, weight gain, tardive dyskinesia, orthostatic hypotension, leucopenia, neutropenia and agranulocytosis, seizures, potential for cognitive and motor impairment, and hyperprolactinemia *Adverse Events:* Most common adverse reactions in clinical trials of adolescents (≥5% and at least twice that for placebo): sedation, weight increased, headache, increased appetite, dizziness, abdominal pain, pain in extremity, fatigue, and dry mouth	Associated with more weight gain and related metabolic side effects in adolescents than other SGAs

Note. Adapted from "22 Psychiatric Medications for Monitoring in Primary Care"

Medication	Warnings/Precautions/Adverse Events	Comments
Class: Mood Stabilizers		
Lithium (Element of the alkali-metal group) *Indications:* Child/Adolescent: Appears to have "grandfathered" indication for mania for ages >12 *Uses:* Acute mania in bipolar disorder, also maintenance therapy *Monitoring:* Pregnancy testing, serum levels, ECG, CBC, thyroid functions, and renal function	***Boxed Warnings:*** Toxicity closely related to serum levels; can occur close to therapeutic dose levels *Warnings and Precautions:* Very high risk of toxicity: significant cardiovascular or renal disease, severe debilitation, dehydration, sodium depletion when taken with diuretics or angiotensin converting enzyme (ACE) inhibitors. Encephalopathic syndrome (i.e., weakness, lethargy, fever, tremulousness and confusion, leukocytosis, extrapyramidal symptoms, elevated serum enzymes, BUN and FBS) may occur with lithium and a neuroleptic, like haloperidol *Adverse Events:* >1.5 mEq/L: early signs of toxicity-diarrhea, vomiting, drowsiness, muscular weakness and lack of coordination. At higher levels: giddiness, ataxia, blurred vision, tinnitus, large output of dilute urine; At >3.0 mEq/L: complex clinically with multiple organs and organ systems	Its indication for 12-17 year-olds is not based on safety and efficacy data. Unpopular with children and adolescents because of common side effects and the need for repeated venipunctures for serum level monitoring

Note. Adapted from "22 Psychiatric Medications for Monitoring in Primary Care"

☺ Take a breath, you made it!

References

American Cancer Society. (2020, June 9). *Normal weight ranges: Body mass index (BMI)*. Information and Resources about for Cancer: Breast, Colon, Lung, Prostate, Skin. https://www.cancer.org/healthy/cancer-causes/diet-physical-activity/body-weight-and-cancer-risk/adult-bmi.html

American Psychiatric Association. (2022). *Diagnostic and statistical manual of mental disorders (5th ed., text rev.)*. Digital Object Identifier System. https://doi.org/10.1176/appi.books.9780890425787

American Nurses Credentialing Center. (2022). Test content outline. American Nurses Association. https://www.nursingworld.org/~4abaca/globalassets/certification/certification-specialty-pages/resources/test-content-outlines/exam-35-pmhnp-tco-08-23-2022-for-webposting-11102022.pdf

ANCC. (2021). *2021 ANCC Certification Data*. American Nurses Association. https://safe.menlosecurity.com/doc/docview/viewer/docN41728F8870BE4c38620898f1215eeb481ae3f14e30b80d48f3169b22101320b302fb5fa68f33

Balaram, K., & Marwaha, R. (2022, June 7). *Agoraphobia - StatPearls - NCBI bookshelf*. National Center for Biotechnology Information. https://www.ncbi.nlm.nih.gov/books/NBK554387/

Basli, A., & Bounaas, J. (2022). Pathophysiological mechanism and natural preventive and therapeutic strategies of Alzheimer's disease. *Nutrition and Health*, 026010602211371. https://doi.org/10.1177/02601060221137104

Björklund, A., Bloem, B. R., Brundin, P., & Federoff, H. (2021). Repairing the Parkinsonian brain. *Journal of Parkinson's Disease*, *11*(s2), S123-S125. https://doi.org/10.3233/jpd-219901

Caminero, F., & Cascella, M. (2021, October 30). *Neuroanatomy, mesencephalon Midbrain - StatPearls - NCBI bookshelf*. National Center for Biotechnology Information. https://www.ncbi.nlm.nih.gov/books/NBK551509/

Centers for Disease Control and Prevention. (2020, September 3). *What is spina bifida?*https://www.cdc.gov/ncbddd/spinabifida/facts.html

Centers for Disease Control and Prevention. (2021, November 10). *Prion diseases*. https://www.cdc.gov/prions/index.html

Centers for Disease Control and Prevention. (2022, April 11). *Behavior or conduct problems in children*. https://www.cdc.gov/childrensmentalhealth/behavior.html

Datto, C., Pottorf, W. J., Feeley, L., LaPorte, S., & Liss, C. (2016). Bipolar II compared with bipolar I disorder: Baseline characteristics and treatment response to quetiapine in a pooled analysis of five placebo-controlled clinical trials of acute bipolar depression. *Annals of General Psychiatry*, *15*(1). https://doi.org/10.1186/s12991-016-0096-0

English, B. A., Dortch, M., Ereshefsky, L., & Jhee, S. (2012). Clinically significant psychotropic drug-drug interactions in the primary care setting. *Current Psychiatry Reports*, *14*(4), 376-390. https://doi.org/10.1007/s11920-012-0284-9

Findling, R. L., Zhou, X., George, P., & Chappell, P. B. (2022). Diagnostic trends and prescription patterns in disruptive mood dysregulation disorder and bipolar

disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, *61*(3), 434-445. https://doi.org/10.1016/j.jaac.2021.05.016

Heldt, J. (2021). *Memorable psychiatry* (2nd ed.). R. R. Bowker.

Janzen, M., Cheung, C. C., Steinberg, C., Lam, P., & Krahn, A. D. (2019). Changes on the electrocardiogram in anorexia nervosa: A case control study. *Journal of Electrocardiology*, *56*, 64-69. https://doi.org/10.1016/j.jelectrocard.2019.07.006

Johnson, K., & Vanderhoef, D. (2016). *Psychiatric-mental health nurse practitioner review and resource manual* (4th ed.). American Nurses Association.

Johnson, K., & Vanderhoef, D. (2016). *Psychiatric-mental health nurse practitioner review and resource manual* (4th ed.). American Nurses Association.

Kumral, E., & Özgören, O. (2017). Major vascular neurocognitive disorder: A reappraisal to vascular dementia. *Turkish Journal Of Neurology*, *23*(1), 1-8. https://doi.org/10.4274/tnd.98250

Lewis, K., & O'Day, C. S. (2022, July 26). *Dystonic reactions - StatPearls - NCBI bookshelf*. National Center for Biotechnology Information. https://www.ncbi.nlm.nih.gov/books/NBK531466/

Mayo Clinic. (2018, December 18). *Avoid the combination of high-tyramine foods and MAOIs*. https://www.mayoclinic.org/diseases-conditions/depression/expert-answers/maois/faq-20058035

Mitra, P., & Sharman, T. (2022, October 20). *HIV neurocognitive disorders - StatPearls - NCBI bookshelf*. National Center for Biotechnology Information. https://www.ncbi.nlm.nih.gov/books/NBK555954/

Moga, S., Teodorescu, A., Ifteni, P., Petric, P., & Miron, A. (2022). Clozapine and Neutropenia in patients with schizophrenia and SARS-Cov-2 infection. *Neuropsychiatric Disease and Treatment, 18*, 977-983. https://doi.org/10.2147/ndt.s361405

National Alliance on Mental Illness. (2022). *Medication frequently asked questions*. NAMI: National Alliance on Mental Illness. https://www.nami.org/FAQ/Mental-Health-Medication-FAQ/My-doctor-recently-started-me-on-lithium-and-told

National Alliance on Mental Illness. (2022). *Schizoaffective disorder*. NAMI: National Alliance on Mental Illness. https://www.nami.org/About-Mental-Illness/Mental-Health-Conditions/Schizoaffective-Disorder

National Institutes of Health. (2018, August 17). *What are the symptoms of neural tube defects?*https://www.nichd.nih.gov/. https://www.nichd.nih.gov/health/topics/ntds/conditioninfo/symptoms

National Institutes of Health. (2021, April 19). *Medication treatment for autism*. https://www.nichd.nih.gov/. https://www.nichd.nih.gov/health/topics/autism/conditioninfo/treatments/medication-treatment

National Institutes of Health. (2021, July 30). *What are Frontotemporal disorders? Causes, symptoms, and treatment*. National Institute on Aging. https://www.nia.nih.gov/health/what-are-frontotemporal-disorders

Stokes, M., & Abdijadid, S. (2021, November 1). *Disulfiram - StatPearls - NCBI bookshelf*. National Center for Biotechnology Information. https://www.ncbi.nlm.nih.gov/books/NBK459340/

Thau, L., Reddy, V., & Singh, P. (2022, October 10). *Anatomy, central nervous system - StatPearls - NCBI bookshelf*. National Center for Biotechnology Information. https://www.ncbi.nlm.nih.gov/books/NBK542179/

U.S. Department of Veterans Affairs. (n.d.). *Veterans affairs*. PTSD: National Center for PTSD Home. https://www.ptsd.va.gov/understand_tx/meds_for_ptsd.asp

U.S. Drug Enforcement Agency. (2022). *Drug scheduling*. DEA. https://www.dea.gov/drug-information/drug-scheduling

Vasan, S., & Padhy, R. K. (2022, August 16). *Tardive dyskinesia - StatPearls - NCBI bookshelf*. National Center for Biotechnology Information. https://www.ncbi.nlm.nih.gov/books/NBK448207/

Wadhwa, R. R., & Cascella, M. (2022, March 9). *Steady state concentration - StatPearls - NCBI bookshelf*. National Center for Biotechnology Information.