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CHAPTER FIFTEEN

Medications and the Brain

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Introduction

The last twenty years has seen an unparalleled attempt to reduce the symptomatology of mental illness through increased pharmaceutical use—all evidence tells us that this may well have resulted in increased mental illness, unwanted addictions, reduced libido and perhaps far worse. Some consider this problem to be epidemic in nature (Whitaker, 2010).

For example, recently, in my home state of North Carolina, the Chief Medical Officer for Medicaid/DMA, Dr. Randall Best, stated, "The clinical concern with frequent use of antipsychotic medications in children is nationwide…some states are choosing drastic methods to limit the use of these medications" (Deen, 2011). "In North Carolina, more than 10,00 NC Medicaid recipients under age 13 were prescribed an antipsychotic medication at the cost of more than $19 million" (Deen, 2011).

The purpose of this chapter is to provide a summary of the research and findings, and the problems that may be associated with the use of psychotropic medications and specifically the classes of drugs described below. The side effects of these medications and the withdrawal symptoms will also be addressed. In addition, this chapter will provide a brief summarization chart on the effects of these drug groups on the brain and specifically electroencephalography (EEG).

In an effort to assist my patients who have the interest and desire to reduce the daily amount, wean off, or discontinue the use of psychotropic medications, I prepared a handout that summarizes the core issues addressed in this chapter. This educational material prepares them for the various changes and outcomes that the patient may experience. Antidepressants can be dangerous to reduce or eliminate and some of the benzodiazopines are highly addictive. In each case, and without exception, if a patient requests neurofeedback to assist him or her with medication reduction, withdrawal, or

termination; they are required to work with their personal physician who will guide and supervise their medication use including dosage and frequency.

With or without medication, and before, during, and after participating in neurofeedback, I encourage all patients to understand the importance of making lifestyle changes that include regular exercise, a healthy diet, proper hygiene, and sufficient sleep; all of which will enhance the benefits of neurofeedback, taking medications, etc.

In my experience, patients who have elected to reduce or stop taking medications abruptly, without a doctor's supervision, have generally been unsuccessful, and in the worst-cases, hospitalized. Therefore, I emphasize that a physician must be consulted when a patient decides to reduce the dose or discontinue taking psychotropic medications, and this is especially true with anti-depressants. I put in writing to patients:

> *As a patient, you may decide at some point in time to take yourself, your child, or help a loved one transition down or discontinue taking medications. Below is some information about the key drug groups that you might find helpful. If you decide to transition off or discontinue medication, you must first check with your doctor and your doctor must be agreeable to working with you during the transition period. Depending on the drug, potency, dosage and length of time on the drug, withdrawal symptoms can be severe and, if a person withdraws rapidly or incorrectly, they can have long-term symptoms.*

In this brief chapter, it is not possible to address each class of prescription drugs in detail. The more common classes of psychotropic pharmaceuticals, and within each class, the more popular medications are noted.

What Clinicians Need to Know

During the last few years several books were published that address the research and outcomes on the use of psychotropic medications, (Rosemond, J.K. & Ravenel, B., 2008; Kirsch, I., 2010; Carlat, D., 2010; Whittaker, R., 2010). Since the release of those publications there has been a slow but steady increase in news releases, magazine articles, and television news shows that have also addressed the research, outcomes, and often negative impact from many of these psychotropic medications on the human body and brain (Deen, 2011; Weil, 2012; CBS News/AP 2012; Sroufe; 2012). Psychotropic medications include any medication that is used for, or capable of affecting the mind, emotions, and behavior.

As counselors, therapists, administrators, and advocates for the prevention of sexual abuse I believe it is important for us as professionals, as well as for our patients and clients, to have a basic knowledge and fundamental understanding about the common psychotropic drugs that may be prescribed. These drugs can be of benefit to some, but can have problematic side effects for others. In many cases the individual will receive short-term benefit, and even long-term benefit when prescribed the appropriate medicine and dosage. However, for a growing number of individuals taking these medications, the short-term benefits quickly wane and the unfortunate side effects begin to outweigh the benefits of taking them (Whitaker, 2010).

Whitaker states:

> *A few years ago, while writing an article about the merits of psychiatric medications, I looked at whether the number of adults receiving a federal disability payment due to mental illness had significantly changed since 1987, which was the year that Prozac was introduced. Our society's use of psychiatric medications, of course, has soared since that time, and here's what I discovered: The number of adults, ages 18 to 65, on the federal disability rolls due to mental illness jumped from 1.25 million in 1987 to four million in 2007. Roughly one in every 45 working-age adults is now on government disability due to mental illness.*
>
> *This epidemic has now struck our nation's children, too. The number of children who receive a federal payment because of a severe mental illness rose from 16,200 in 1987 to 561,569 in 2007, a 35-fold increase.*
>
> *I wrote Anatomy of an Epidemic to investigate this epidemic, and this pursuit necessarily raises a very uncomfortable question. Although we, as a society, believe that psychiatric medications have "revolutionized" the treatment of mental illness, the disability numbers suggest a very different possibility. Could our drug-based paradigm of care, for some unforeseen reason, be fueling this epidemic?*

Many of the medications for ADD/ADHD, anxiety, depression, insomnia, and other mental health and behavioral health problems, do not have supportive outcome data for long-term use and in some cases, as is the instance with certain pharmaceuticals for depression, the benefits are no better than placebo (Weil, 2012). "The difference between the effect of a placebo and the effect of an antidepressant is minimal for most people," says Harvard scientist Irving Kirsch (CBS News – 60 Minutes, 2012). In addition, many of these medications are being prescribed for off-label use [off-label use is the practice of prescribing pharmaceuticals for an unapproved indication or in an unapproved age group, unapproved dose, or unapproved form of

administration[1]](Jaslow, 2012), and as the New York Times reported, physicians decisions to prescribe specific drugs may be linked to financial gains:

> *Many researchers have found evidence that such payments can influence doctors' treatment decisions and contribute to higher costs by encouraging the use of more expensive drugs and medical devices.*
>
> *Consumer advocates and members of Congress say patients may benefit from the new standards, being issued by the government under the new health care law. Officials said the disclosures increased the likelihood that doctors would make decisions in the best interests of patients, without regard to the doctors' financial interests.*
>
> *Large numbers of doctors receive payments from drug and device companies every year — sometimes into the hundreds of thousands or millions of dollars — in exchange for providing advice and giving lectures …The [New York] Times has found that doctors who take money from drug makers often practice medicine differently from those who do not and that they are more willing to prescribe drugs in risky and unapproved ways, such as prescribing powerful antipsychotic medicines for children (Pear, 2012).*

Alan Sroufe (2012), Professor Emeritus, whose research involves the complementary study of normal and abnormal development, reports that the efficacy of medications for ADD/ADHD becomes questionable with long-term use. In summarizing a 2009 study, he notes,

> *Findings were published from a well-controlled study that had been going on for more than a decade, and the results were very clear. The study randomly assigned almost 600 children with attention problems to four treatment conditions. Some received medication alone, some cognitive-behavior therapy alone, some medication plus therapy, and some were in a community-care control group that received no systematic treatment. At first this study suggested that medication, or medication plus therapy, produced the best results. However, after three years, these effects had faded, and by eight years there was no evidence that medication produced any academic or behavioral benefits.*

Sroufe (2012), goes on to say:

> *Indeed, all of the treatment successes faded over time, although the study is continuing. Clearly, these children need a broader base of support than was offered in this medication study, support that begins earlier and lasts longer.*

[1] http://en.wikipedia.org/wiki/Off-label Retrieved July 23, 2012.

Mosholder, Gelperin, Hammad, Phelan, & Johann-Liang (2009) reported that patients and physicians should be aware that psychosis or mania arising during drug treatment of attention-deficit/hyperactivity disorder may represent adverse drug reactions.

Alan Sroufe (2012), reports:

> *To date, no study has found any long-term benefit of attention-deficit medication on academic performance, peer relationships or behavior problems, the very things we would most want to improve. Until recently, most studies of these drugs had not been properly randomized, and some of them had other methodological flaws.*

Sroufe (2012), continues,

> *Nevertheless, findings in neuroscience are being used to prop up the argument for drugs to treat the hypothesized 'inborn defect.' These studies show that children who receive an ADD diagnosis have different patterns of neurotransmitters in their brains and other anomalies. While the technological sophistication of these studies may impress parents and nonprofessionals, they can be misleading. Of course the brains of children with behavior problems will show anomalies on brain scans. It could not be otherwise. Behavior and the brain are intertwined. Depression also waxes and wanes in many people, and as it does so, parallel changes in brain functioning occur, regardless of medication.*
>
> *Many of the brain studies of children with ADD involve examining participants while they are engaged in an attention task. If these children are not paying attention because of lack of motivation or an underdeveloped capacity to regulate their behavior, their brain scans are certain to be anomalous.*

Approximately one-in-ten Americans over the age of 11, takes an antidepressant drug, and since 1988 the rate of anti-depressant use nationwide among all age groups has increased almost 400 percent (Shallcross, 2012). Commonly prescribed anti-depressants appear to be doing patients more harm than good, say researchers who have published a paper examining the impact of the medications on the entire body (Science Daily, 2012).

Andrew Weil, MD states:

> *Epidemic depression is occurring at a time when the field of mental health appears very robust. There are more mental health professionals treating more people than ever before*

in history: psychiatrists, clinical psychologists, licensed social workers, counselors, and therapists of all kinds. We have a powerful 'therapeutic arsenal' of drugs to make us happier, calmer and saner. When I leaf through the pharmaceutical ads that take up so much space in psychiatric journals, I get the feeling that we should all be in great emotional health, Depression and anxiety should be as fully conquered as smallpox and polio. But more of us than ever are discontented and not experiencing optimum emotional well-being. What is wrong with this picture? Why is the vast enterprise of professional mental health unable to help us feel better?

I want you to consider the possibility that the basic assumption of mainstream psychiatric medicines are obsolete and no longer serve us well. Those assumptions constitute the biomedical model of mental health and dominate the whole field (Weil, 2012, p. 45).

Weil also notes that 75% of the Benefits of SSRIs antidepressants appear to be placebo effect and this has been confirmed with research (Weil, 2012).

In my clinical practice, I have experienced a slow but continuous flow of patients who have sought treatment to assist them in their desire to wean themselves off the medications they have been taking for anxiety, depression, insomnia and other disorders including migraine headaches, with dwindling benefit. Many are tired of the side effects that in some cases are the very problem for which they have been taking the medication (i.e., some patients report antidepressants made them feel more depressed or suicidal). Some often describe the side effects as intolerable.

Finally, it is not uncommon for many young people to progress through a series of diagnoses, and as they grow older, it seems that each subsequent diagnosis is worse than the previous. With each new diagnosis, a new medication is prescribed and ultimately the medication does not work and, in some cases, exacerbates the problem. Frequently, medications and dosages are changed without effectiveness; and often this is due to misdiagnosis (Swatzyna, 2009).

Psychotropic Pharmaceutical Classes

ADD/ADHD Medications: (used to treat attentional and hyperactivity problems).

Examples: Adderall, Concerta, Focalin, Focalin XR , Intuniv (guanfacine ER), Metadate CD, Ritalin, Vyvanse and related amphetamines.

Medications prescribed for patients with ADD/ADHD can often help reduce symptoms of hyperactivity, inattentiveness, and impulsivity in children and adults.

As, with any medication, these medications come with side effects and risks. Medication for ADD/ADHD is not the only treatment option. It is important for patients (and parents) to understand what these medications can and can't do. In general, these medications may help improve the ability to concentrate, control impulses, plan ahead, and follow through with tasks. Unfortunately, no medication is perfect and persons taking these medications may continue to experience emotional problems, social difficulties, and forgetfulness. Medication doesn't cure ADD/ADHD and medications work better for some patients more than others; however, medications can help to relieve symptoms. Some people experience significant improvement while others experience minimal gains. Generally, once medication stops, those symptoms come back.

Anti-Anxiety Medications (Benzodiazopines)
Benzodiazopines are among the most commonly used psychotropic medications in psychiatry, and they are used to treat anxiety, insomnia, panic attacks and are also prescribed for OCD, PTSD, as sedatives, as anticonvulsants, and as muscle relaxants.

Benzodiazopines are typically used on an as needed basis or on a daily basis for the treatment of anxiety and anxiety related disorders. These medications can be highly addictive and it is easy to form a dependence on them. Withdrawal symptoms can be severe and, if a person withdraws rapidly or incorrectly, they can experience long-term symptoms.

Examples: Short-acting benzodiazepines are generally used for patients with sleep-onset insomnia (difficulty falling asleep) without daytime anxiety. Shorter-acting benzodiazepines used to manage insomnia include estazolam (ProSom®), flurazepam (Dalmane®), temazepam (Restoril®), and triazolam (Halcion®).

Benzodiazepines with a longer duration of action are utilized to treat insomnia in patients with daytime anxiety. These benzodiazepines include alprazolam (Xanax®), chlordiazepoxide (librium®), clorazepate (Tranxene®), diazepam (Valium®, halazepam (Paxipam®), lorazepam (Ativan®), oxazepam (Serax®), prazepam (Centrax®), and quazepam (Doral®). Clonazepam (Klonopin®), diazepam, and clorazepate are also used as anticonvulsants.

Zolpidem (Ambien®) and zaleplon (Sonata®) are two relatively new, benzodiazepine-like CNS depressants that have been approved for the short-term treatment of

insomnia. Both of these drugs share many of the same properties as the benzodiazepines and are in Schedule IV of the CSA. They are often marketed in such a way that many people do *not* recognize their dangers.

Antidepressants
Antidepressants are a class of drugs that reduce symptoms of depression and depressive disorders. The premise behind antidepressants is that they help to correct imbalances of neurotransmitters.

SSRIs (antidepressants and sometimes used for anxiety).

Examples: Citalopram (Celexa), Escitalopram (Lexapro), Fluoxetine (Prozac, Prozac Weekly, Sarafem), Paroxetine (Paxil, Paxil CR, Pexeva), Sertraline (Zoloft), Luvox, Venlafaxine. Atypical antipsychotic olanzapine (Symbyax), Fluoxetine, Paroxetine.

SNRIs (antidepressant SNRIs help relieve depression symptoms, such as irritability and sadness).

Examples: duloxetine (Cymbalta), venlafaxine (Effexor and Effexor XR), desvenlafaxine (Pristique).

Dopamine Reuptake Inhibitors DRIs are frequently used in the treatment of conditions like ADHD and narcolepsy on account of their psycho-stimulant effects and in the treatment of obesity due to their appetite suppressant properties. They have also been used as antidepressants in the treatment of mood disorders, but their use for this indication has been limited on account of their abuse potential and restricted nature.[2]

Examples: (Bupropion, Wellbutrin, Wellbutrin SR and Wellbutrin XL).

Medications for Insomnia
According to the New York Times[3], "About 20% or more of older American adults use some form of sleep aid, including prescription or over-the-counter drugs or alcohol. Many use such aids every night. Over-the-counter or nonprescription medications make use of the drowsiness caused by some common medications. Prescription drugs used specifically for improving sleeping are called sedative hypnotics. These drugs include benzodiazepines and non-benzodiazepines. Sedative hypnotics carry risks for

[2] http://en.wikipedia.org/wiki/Dopamine_reuptake_inhibitor Retrieved July 15, 2012.
[3] http://health.nytimes.com/health/guides/disease/primary-insomnia/medications.html Retrieved July 15, 2012.

withdrawal, dependency, and rebound insomnia. The chance of risk for these problems varies among different drugs."

Examples:

Brands with Antihistamines
Many over-the-counter sleeping medications use antihistamines, which cause drowsiness. Diphenhydramine is the most common antihistamine used in non-prescription sleep aids. Some drugs contain diphenhydramine alone (such as Nytol, Sleep-Eez, and Sominex).

Some over the counter medications contain diphenhydramine with a pain medication (such as Anacin P.M., Excedrin P.M., and Tylenol P.M.).

Non-benzodiazepine Hypnotics for Sleep-Related Disorders
Newer short-acting non-benzodiazepines can induce sleep with fewer side effects than benzodiazepines.

Brands*:* Non-benzodiazepine hypnotics currently approved in the United States are: Zolpidem (Ambien, Ambien CR, Zaleplon (Sonata), Eszopiclone (Lunesta).

Benzodiazepine Hypnotics for Sleep-Related Disorders, Insomnia
Historically, Benzodiazepines were the most commonly prescribed sedative hypnotics. The risk of tolerance and dependence is higher with this group of drugs than with non-benzodiazepine hypnotics.

Brands: Commonly prescribed benzodiazepines: Long-acting benzodiazepines include flurazepam (Dalmane), clonazepam (Klonopin), and quazepam (Doral).

Medium- to short-acting benzodiazepines include triazolam (Halcion), lorazepam (Ativan), alprazolam (Xanax), temazepam (Restoril), oxazepam (Serax), prazepam (Centrax), estazolam (ProSom), and flunitrazepam (Rohypnol).

Antidepressants for Sleep-Related Disorders
Antidepressants are sometimes used to treat insomnia that may be caused by depression (secondary insomnia). In addition, some antidepressants with sedating properties are prescribed for the treatment of primary insomnia.

Side Effects of Psychotropic Medications

The following information was pulled from manufacturer's websites and the Food and Drug Administration (FDA) website.[4]

Side Effects	Medication Class: ADD/ADHD Medications
Physical	abdominal pain, appetite loss, constipation, dizziness, drowsiness, dry mouth, facial and vocal tics, fatigue, growth suppression, headaches, hypertension, insomnia, jaw clenching, lethargy, low blood pressure, liver disorders, motor abnormalities, nausea, skin problems, vomiting, weight loss, (in some cases weight gain) and (in rare cases) sudden cardiac death.
Psychiatric problems	hallucinations (both visual and tactile), mania, paranoia, psychotic episodes, and obsessive compulsive symptoms.
Cognitive	
Emotional	anxiety, apathy, crying jags, depression, general dullness, irritability, mood swings, and a sense of hostility toward the world.
Behavioral	aggressiveness, hostility, social withdrawal, and as some parents describe it, a daily "crash."

Side Effects	Medication Class: Benzodiazopines (Antianxiety Medications)
Physical	dizziness, drowsiness, fatigue, lightheadedness, loss of coordination, sedation, , blurred vision, change in heart rate, dizziness, hangover effect (grogginess), headache, muscle weakness, poor coordination, stomach upset, trembling, and weakness. Symptoms of an allergic reaction include: rash, itching, swelling, dizziness, trouble breathing.
Cognitive	amnesia, dreaming or nightmares, memory loss, mental confusion and poor concentration.
Emotional	depression.
Behavioral	slurred speech and unsteady gate, poor coordination, poor coping skills.

Side Effects	Medication Class: Anti-Depressant Medications

[4] http://www.fda.gov/Drugs/ResourcesForYou/Consumers/ucm196029.htm

Physical	agitation or restlessness, appetite loss, cardiovascular problems, diabetes, diarrhea, dizziness, dry mouth, drowsiness, gastrointestinal problems, headache, inability to maintain an erection (erectile dysfunction), increased urination, insomnia, increased sweating, increased heart rate, lethargy, nausea, nervousness, muscle cramps, muscle weakness, obesity, skin rash, reduced sexual desire or difficulty reaching orgasm (sexual dysfunction), ringing in the ears, seizures, sore throat, thyroid dysfunction, tremors, weight gain, (and in some cases weight loss), and akathisia (inner agitation).
Cognitive	cognitive decline, hallucinations, loss of motivation, passivity, memory loss.
Emotional	anxiety, chronic depression, "flatness", mania, panic attacks.
Behavioral	hostility, suicidal risk.

Side effects	**Medication Class: Medications for Insomnia**
Physical	daytime sleepiness, dizziness, drowsiness, blurred vision, dry mouth and throat, unpleasant taste, fatigue, headache, diarrhea.
Cognitive	cognitive impairment.
Emotional	
Behavioral	drunken movements.

Withdrawal Symptoms of Medications

The majority of psychotropic medications have withdrawal symptoms. It is always advisable to discuss discontinuing any of the medications in this category with a physician before discontinuing a psychotropic medication.

Medication Class	**Withdrawal Symptoms**
ADD/ADHD Medications	Stimulants are associated with withdrawal symptoms that are different from other classes of drugs and medications (i.e., opioids, sedatives, alcohol). Common symptoms associated with stimulant withdrawal include, anxiety, changes in heart rhythm, depression, drug craving, fatigue, insomnia, irritability, increased appetite, lack of focus and concentration, paranoia, and poor reflexes.
Benzodiazopines (Anti-anxiety Medications)	blurred vision, extreme depression, extreme sensitivity to noise, feeling like insects are crawling all over the body, hallucinations, insomnia, nightmares, rebound /

	severe anxiety, ringing in ears, and seizures. Physical withdrawal symptoms that may include agitation, headaches, loss of appetite, nervousness, muscle aches, and tremors.
Anti-Depressant Medications	**Abrupt Discontinuation Symptoms** (see discontinuation syndrome below) usually begin within 1 to 3 days after abrupt cessation of SSRI use and can be relieved within 24 hours by restarting anti-depressant therapy. Untreated, however, these symptoms can last from 1 to 3 weeks. Although most discontinuation reactions are mild and short-lived, the symptoms can be mistaken for physical illness or relapse into the treated illness, thereby promoting unnecessary long-term treatment. Symptoms caused by an abrupt discontinuation of SSRI therapy during hospitalization may confound the ongoing assessment of mental status changes or physical findings of a comorbid acute illness (e.g., meningitis, stroke, myocardial infarction) and may result in unneeded and costly diagnostic evaluations.[5] **Psychiatric: a**nxiety, crying spells, insomnia, irritability, mood lability, vivid dreams. **Gastrointestinal: n**ausea and vomiting. **Neurologic: d**izziness, headache, paresthesia. **Motor: d**ystonia, tremor. **Somatic: c**hills, fatigue, lethargy, myalgias, and rhinorrhea. Other possible withdrawal symptoms can include, but are not limited to: irritability, agitation, burning or tingling sensation, confusion and tiredness.

[5] http://psychrights.org/articles/SSRIDiscontinuationSyndrome.htm - Retrieved 12/14/2011.

Insomnia Medications	**Withdrawal Symptoms**. Withdrawal symptoms usually occur after prolonged use and indicate dependence. They can last 1 - 3 weeks after stopping the drug and may include: disturbed heart rhythm, gastrointestinal distress, and sweating. In severe cases, patients might hallucinate or experience seizures, even a week or more after the drug has been stopped. **Rebound Insomnia.** Rebound insomnia, which often occurs after withdrawal, typically includes 1 - 2 nights of sleep disturbance, daytime sleepiness, and anxiety. In some cases, patients may experience the return of the original severe insomnia. The chances for rebound are higher with the short-acting benzodiazepines than with the longer-acting ones.

Discontinuation Syndrome

Discontinuation Syndrome is a medication withdrawal syndrome specific to withdrawing from antidepressants. There are ways that the patient can prevent or reduce Discontinuation Syndrome that include the following:[6]

Don't Stop a Psychotropic Medicine Abruptly

People will abruptly stop their medications for various reasons that may include not being able to afford the medication, forgetting to refill their prescription, experiencing unpleasant side effects, or simply wanting to feel better (relief from the side effects). Stopping some medicines abruptly (often referred to as going cold turkey), can result in specific and unpleasant withdrawal symptoms (Discontinuation Syndrome).

Talk to Your Doctor

People should not be afraid to ask their doctor about stopping medications. People who desire to stop taking their antidepressant, should first consult with their prescribing physician. The person should talk about any concerns he or she has and it is strongly encouraged that individuals do NOT attempt to stop on their own. Withdrawal from psychotropic medications should always be a process that involves both the patient and her/his doctor.

[6] http://psychcentral.com/lib/2011/ssri-discontinuation-or-withdrawal-syndrome/ - Retrieved 12/14/2011.

Consider if You've Received a Thorough Clinical Assessment
Before stopping an antidepressant — or any medicine — your doctor should assess whether this is an appropriate time to do so. He or she should consider various factors, including your past clinical history and current stress level, and supportive treatment(s) to assist with discontinuing a medication.

Discontinue Slowly
One of the best ways to minimize discontinuation syndrome is by reducing doses of medicines, including SSRIs, slowly. Based on clinical research; reducing the dose of an SSRI to zero gradually over two weeks or longer is best. *Even slower discontinuation may be required if you've taken high doses for a long time*.

Practice Healthy Habits
If you're under a lot of stress, not sleeping well, not eating nourishing foods, or not sticking to a consistent schedule, stopping medicine successfully may be unrealistic. It can increase anxiety and depression, which can make stopping harder.

Medications and Brainwaves/Electroencephalography (EEG)
Most psychotropic medications and many recreational drugs have impact on the brain. Table 1 below describes the effects of the basic psychotropic medication drug classes and other commonly used drugs on the brain's EEG.

While this chapter cannot go into the details of how medications affect brain waves, it is important to understand that they do. Most psychotropic medications alter brain waves in one fashion or another. In some cases, the medications alter brain waves in a direction that counters healthy brain functions and exacerbates the very condition for which the medication is being taken. When this occurs, the problem may get worse. When a medication is prescribed, but in fact the patient does not actually have the diagnosed disorder, then the side effects of the medication will often be exaggerated.

Medical errors, including misdiagnosis, kill more than a quarter million people every year in the United States and injure millions. Some estimate that medical errors are probably the third leading cause of death in the USA.[7] ADHD is the most commonly diagnosed behavioral disorder for kids in the United States, with at least 4.5 million diagnoses among children under age 18, according to the Centers for Disease Control and Prevention.[8] Nearly 1 million children in the United States are potentially

[7] http://www.cnn.com/2012/06/09/health/medical-mistakes/index.html Retrieved July 23, 2012.
[8] http://www.sciencedaily.com/releases/2010/08/100817103342.htm Retrieved July 23, 2012.

misdiagnosed with attention deficit hyperactivity disorder simply because they are the youngest -- and most immature -- in their kindergarten class, according to new research.[9]

[9] Ibid.

TABLE 1 ~ Drug Effects on EEG[10]

Family	Drugs	Purpose	EEG Impact
Neuroleptics	Haldol, Prolixin, Thorazine, Mellaril	sedative	increase delta, theta and beta above 20 Hz and decrease alpha and beta below 20 Hz
Neuroleptics	Seroquel, Risperdal, Geodone	non-sedative and antipsychotic medications	decrease alpha and increase beta in general
Anxiolytics	Valium, Halcion, Librium, Dalmane	anxiety relief	decrease alpha and increase beta, especially 13-20 Hz beta
Benzodiazepines	Valium, Xanax, and Ativan	anxiety, panic relief	decrease alpha and increase 20-30 Hz beta
SSRIs	Prozac, Paxil, and Zoloft	a class of antidepressants used in the treatment of depression, anxiety disorders, and some personality disorders.	decrease in frontal alpha and a mild increase in 18-25 Hz beta
MAO Inhibitors	Marplan, Parnate, Eldepryl	antidepressant	tendency to increase 20-30 Hz beta while decreasing all other frequencies
Tricyclic antidepressants	Imipramine and Amitriptyline	useful in depressed patients with insomnia, restlessness, and nervousness	increase delta and theta while decreasing alpha; increase beta 25 Hz and up band
Antipsychotics	Lithium	used for the treatment of manic/depressive (bipolar) and depressive disorders	increases theta, mildly decreases alpha and increases beta
Amphetamines	Ritalin, Adderall, Vyvanse, and Dexedrine.	a group of drugs that act by increasing levels of norepinephrine, serotonin, and dopamine in the brain	decrease slow-wave activity and increase beta in the 12-26 Hz range
Marijuana		recreational	increases frontal low frequency alpha; affects EEG for three days
Opiates	opium, hydromorphone, oxymorphone, heroin, morphine, oxycodone, Talwin, codeine, methadone, meperdine, hydrocodone, Vicodin	pain relief	generate high amplitude slow alpha in the 8 Hz range
Barbiturates	Brevital, thiamylal (Surital), thiopental (Pentothal), amobarbital, Amytal, pentobarbital, Nembutal, secobarbital, Seconal, Tuinal, Phenobarbital, Luminal, mephobarbital, Mebaral	produce a wide spectrum of central nervous system depression, from mild sedation to coma, and have been used as sedatives, hypnotics, anesthetics, and anticonvulsants	increase beta at 25-35 Hz amplitude
Caffeine		increases alertness	increases beta and decreases slower waves
Alcohol	All alcoholic beverages	pleasure, entertainment	increased alpha, then theta increases
Nicotine		pleasure	increases beta

[10] Copyright© (2011). Soutar, R., & Longo, R. (2011). *Doing Neurofeedback: An Introduction*. ISNR Research Foundation: San Rafael, CA.

Summary & Recommendations

A single chapter on this topic cannot begin to give the reader the detailed information that is important to understand regarding psychotropic medications and their effect on the body, the brain, and brain waves. Clinicians, and administrators alike should become familiar with some of the commons side effects and withdrawal symptoms of the psychotropic medication classes if they will be working with patients and clients who are being prescribed psychotropic medications.

Children and adolescents are often prescribed medications that the pharmaceutical manufacturer recommends against use with persons under the age of 18. Some of these psychotropic medications, such as Vyvance®[11, 12] have been put on the market with clinical trials that were only 3-4 weeks long and with small sample sizes; thus the long-term benefits or consequences of that particular medication may not be known. It is wise for patients, clients, their families, clinicians, and administrators to be wise consumers.

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