Getting Started

This case is designed to be an interactive discussion of a scenario residents may encounter in their practices. Participation and discussion are essential to a complete learning experience. This Facilitator's Guide provides potential prompts, suggestions for directing the discussion, and ideas for incorporating the optional teaching tools. It is not designed as a lecture.

Why is This Case Important?

Autism spectrum disorder (ASD) are characterized by qualitative impairments in social interaction and communication and by repetitive behavior or restricted interests (DSM-IV-TR). Behavioral interventions are often used to address the deficits in these three core domains, but there are no treatments – pharmacological or behavioral – proven to "cure" ASD.

Psychopharmacology has been shown, however, to help with some of the following maladaptive behaviors and psychiatric co-morbidities that are prevalent in children with ASD:

- Harmful/bothersome repetitive behaviors
- Attention problems
- Anxiety
- Aggression/irritability
- Self-injurious behavior
- Sleep difficulties

Many of the medications are used off-label because FDA-approved uses are limited. A primary care physician may encounter a child with an ASD on one or more of these medications in the course of his/her practice. It is important to be aware of side effect profiles, contraindications, and health monitoring in children on these medications. While side effects should be monitored by the prescriber, the primary care provider also needs to make sure these are monitored,
be aware of the possible drug interactions with other medications prescribed, and know the side effects so they can be considered in the differential diagnosis of symptoms brought to the primary care office for treatment.

Cultural Competence

It is important for clinicians to understand how different childrearing practices and cultural norms may influence key decisions that parents make regarding their child, including obtaining evaluations and treatment, future planning, and acceptance of the child's diagnosis. Clinicians can approach parents openly and honestly by asking them about their unique style of parenting and how the information or recommendations provided are received.

See the curriculum introduction for additional information on cultural competence and potential discussion questions.

1.1 What are some strengths of this child and family?

1.2 How would you respond to Kofi's mother?

1.3 What further information would you like following the mother's disclosure?

1.4 How would you prioritize this mother's concern and questions?

Supporting Information for Potential Prompts

1.1 What are some strengths of this child and family?

It is always important to explore the strengths of a child with an autism spectrum disorder or developmental delays. Parents and clinicians may become so focused on the deficits and, in some cases, the behavioral issues that a child is having that they aren't able to notice what the child does well. By asking a family about what a child is good at, and what their positive traits are, one is able to frame recommendations for intervention and treatment in the context of these strengths. In addition, asking about what a child likes can be used when discussing next steps. Finally, in addition to exploring the strengths of the child, it is helpful to think about the strengths of the family and how these can be used when discussing options and next steps for treatment. If parents are unable to offer strengths and positive attributes of the child, it is important to acknowledge how difficult and stressful things seem for them at this time. It is always helpful for clinicians to take the time to note changes and improvements in functioning and positive features of the child and narrate these observations to parents.

- Kofi is independent with basic self-help skills (e.g. toileting).
- Kofi uses language and pointing to communicate wants and needs.

1.2 How would you respond to Kofi's mother?

Very commonly, parents of children with maladaptive behaviors arrive at the office distressed and have many questions and concerns. The first step in such an emotionally charged encounter is to acknowledge the mother's difficulties. It is a moment to empathize. Telling her you are glad she has come to see you **reaffirms her decision to seek help from you** for this type of problem. Explaining that these behaviors are common in children with ASD and can be treated successfully may provide reassurance.

Establishing goals for the visit up front and prioritizing them makes the visit more manageable for both you and the parent. Stating that, together, you will try to unravel the behavioral deterioration, but that it may take several visits and perhaps other consultations, sets realistic expectations. If you feel you must deal with the entire problem at that minute, you'll feel overwhelmed by the time commitment for that first unexpected visit and will be likely to subconsciously give the message that the problem is not solvable.

Knowing what behaviors **are most concerning for Kofi's mother** helps you know where to focus your energies in counseling and treatment. Ask questions about the type of treatments the mother is interested in or has read about. Is the mother looking for a specific behavioral intervention, pharmacologic treatment, or just psychosocial support? **By acknowledging that follow-up visits may be necessary before** successful intervention, you reassure the parent that there is

continuity with the clinician, thereby strengthening the therapeutic alliance.

1.3 What further information would you like following the mother's disclosure?

Any new maladaptive behaviors in a child with a communication disorder, such as an ASD warrant an **inquiry into possible physical causes**. Gather information about the following at the first visit, at another longer scheduled visit, or over multiple visits depending on the practicalities for you and Kofi's other

Dental abscesses• Diarrhea

- Headache
- Bone fracture
- Constipation
- Allergies
- Vision problems
- Dietary history

It is important to remember you may be the only person in the care team who considers medical causes and examines the child thoroughly. Onset, chronicity, potential triggers, and alleviating factors provide important clues. Gather a complete review of systems, including a diet history to determine if there might be an association with the problematic behaviors. Ask detailed questions about appetite, sleep, and energy.

Any variation in history around the time of the onset of these behaviors should be pursued, including a travel history.

- Kofi's history of "loose, foul-smelling stools" suggests the possibility of malabsorption or infection, especially if the timing of the stool and behavioral change coincide. As an aside, there has been controversy surrounding the theory that ASD are caused by malabsorption in the gastrointestinal (GI) tract resulting in excessive levels of opioids in the central nervous system ("leaky gut") and an increased prevalence of GI disorders. There are no rigorously designed studies, however, that support this hypothesis. In a recent long-term, population-based study, the co-occurrence of GI symptoms in children with an ASD was no higher than in normal controls.
- Irritability and insomnia can be symptoms of obstructive sleep apnea or gastroesophageal reflux disease.

All of this information, along with a physical and neurological exam, will guide you in deciding whether to pursue a medical workup and what path to take in that workup.

While pursuing a medical etiology for the behavioral deterioration, gathering information about the child's environment can also give you a context for these behaviors.

Changes around the time the behavior worsened are particularly helpful. Ask the parent to describe the home and school settings:

- Who lives at home?
- Are there siblings?
- How many students are in the classroom?
- How does their functioning compare with Kofi's?
- How experienced are the teachers and aides in working with children with ASD?
- What are the triggers and alleviating factors for the behaviors?
- Do the behaviors occur less in some settings and more in others?
- Do they occur during transitions?
- Was there a recent stressful event in the family?
- What, if anything, has been done about high BMI?

Investigate any interventions Kofi's mother and school have tried to this point. Details about the quality of these interventions are valuable, although sometimes difficult to determine, because often these interventions have not been applied effectively, consistently, or long enough to work. Direct communication from teachers or other professionals involved with the child provides additional insight into behaviors and intervenmtions.

Behavioral rating scales or checklists (e.g., Childhood Behavioral Checklist, Strengths and Difficulties Questionnaire, and Aberrant Behavior Checklist) can be useful for categorizing behaviors and quantifying their intensity. They can also be used to establish a baseline and track treatment.

- Kofi's mother has tried approaches based on applied behavioral analysis. This includes a functional behavioral analysis (FBA). A functional behavioral analysis can be a useful way of analyzing and identifying strategies to cope with problem behaviors and the environment(s) they occur in. It is important to recognize that maladaptive behaviors in children with developmental delays are often a means to communicate.
  - An FBA can be performed at home or by the school psychologist to provide more information about behavior in that setting. It involves using direct observation to look at a behavior in the context of what occurs before and after. This approach can be used to identify triggers and reinforcers of problem behaviors and to evaluate the communicative intent of the behavior.
  - The ABCs of a functional behavior analysis include: Antecedent > Behavior > Consequence

Before treating any child with a behavioral problem, **ask questions that enhance your understanding of the parent's perspective of the problem**.

- What does Kofi's aggression and irritability mean to the mother?
- To whom does she attribute these behaviors?
- Does she blame herself or others?
- Does she think an ASD has anything to do with these behaviors?
- How worried is the mother about her safety or the safety of others?
- Is she concerned that these behaviors are disruptive to the family and class?
- How much do these behaviors impair Kofi's ability to learn or have meaningful relationships?

Information about how a parent sees or feels about the problem allows you to discuss the treatment plan in a sensitive manner.

1.4 How would you prioritize this mother's concerns and questions?

The most pressing behavior is Kofi's aggression and irritability, followed by sleep dysregulation and hyperactivity. Several pharmacologic agents can be used to treat aggression and irritability. Risperidone has the strongest evidence for efficacy. Unfortunately, risperidone has been shown to cause weight gain and somnolence.

Aripiprazole, another atypical antipsychotic approved by the FDA in 2009, is favored by some clinicians because it may be associated with less dystonia, smaller increases in prolactin levels, and less QTc prolongation. Risperidone will be discussed in further detail later on in this case.

Several off-label medications are used to target aggression and irritability:

- **Alpha2-adrenergic agonists (guanfacine and clonidine)**
  - Indications: Aggression, oppositionality, hyperactivity, inattention sleep disturbances
  - Side Effects: Hypotension, sedation, dry mouth, headache, constipation

- **Opioid antagonist (naltrexone)**
  - Indications: Irritability, repetitive/self-stimulatory behaviors, hyperactivity
  - Side Effects: Insomnia, headache, decreased appetite, bitter taste
- **Psychostimulants (e.g., methylphenidate, mixed amphetamine salts)**
  - Indications: Aggression, irritability, inattention, impulsivity, hyperactivity
  - Side Effects: Appetite loss, insomnia, headache, irritability, withdrawn behavior, tachycardia, hypertension (not recommended in children with preexisting heart disease or defects), growth retardation (chronic use)
- **Serotonin reuptake inhibitors (e.g., fluoxetine, sertraline)**
  - Indications: Aggression, impulsivity, mood lability, irritability, sleep disturbances
  - Side Effects: Sedation, dry mouth, constipation, suicidality (black box warning)

Compared with risperidone and aripiprazole, these medications are not as well studied in children with ASD. Some argue these medications are less efficacious and have a higher propensity to cause adverse effects in children with ASD. An extensive review of the evidence behind the use of these medications is beyond the scope of this discussion. However, the following resources provide more information:

Many general pediatricians are inexperienced in prescribing and managing psychotropic medications, especially in children with ASD. Regular monitoring, sometimes as frequently as weekly in the initial stages of starting a medication, is warranted. Weight, height,
blood pressure, and heart rate are important measurements to document at each visit for certain medications; for others (e.g., atypical antipsychotics), laboratory tests, such as fasting lipids, liver function tests, and serum glucose, are recommended. Because these medications are not well studied in this population and carry a high potential for adverse side effects, consultation with, or referral to, a mental health specialist is recommended. Typically, child psychiatrists, developmental-behavioral pediatricians, and pediatric neurologists are formally trained to treat children with ASD with psychotropic medications and can assist with dosing and titration schedule.

Supporting Information for Potential Prompts

2.1 How would you address the issue of CAM in your practice?

The National Center for Complementary and Alternative Medicine (NCCAM), part of the National Institutes of Health, defines CAM as "a group of diverse medical and health care systems, practices, and products that are not presently considered to be part of conventional Western medicine." Complementary therapies are used in addition to conventional, Western medical practices, while alternative therapies replace them. Surveys estimate that among children with chronic diseases and disabilities, an estimated 70% have used CAM, and among these, children with autism spectrum disorder (ASD) are one of eight subgroups reporting the most use of CAM.

Generally, people use CAM for a multitude of reasons, including:

- Eagerness to try anything that might help their child
- Culture/philosophy
- Dissatisfaction with the nature of the conventional medical system
- Concern about adverse effects of "unnatural" medications

ASD present particularly compelling reasons for parents to seek alternate or complementary treatments. Parents often feel a desperate need to take quick action. Conventional medicine has identified relatively few treatments to help with the symptoms of ASD and nothing to cure it. Faced with feelings of lack of control, lack of explanation

for a devastating illness, and media saturation with enticing promises of "miracle cures" from unproven therapies, many parents are willing to try CAM for their children with ASD.

Pediatricians are in a critical position to initiate and maintain dialog with parents about the role of CAM in treatment for children with ASD, as many parents might be hesitant to bring this up. Although most children who use CAM also use the conventional medical system, few parents inform their pediatricians about CAM use. Encourage parents to discuss CAM with you, but also educate parents on how to navigate the vast amounts of information available regarding CAM therapies.

Ask about CAM regularly and in specific terms to prompt parents' memory of things they may not consider "treatments" or may be embarrassed to admit ("Have you used any vitamins or supplements or gone to any other practitioners?"). It is essential to convey objectivity and encourage open communication. Emphasize safety and quality of life for not only the child, but also for the entire family, noting that this includes financial considerations, safety, stress on the child, and stress on siblings and parents.

2.2 How would you respond to the mother's concerns about disclosing that she already started giving Kofi vitamin supplements?

First, provide enthusiastic, positive reinforcement about her disclosure to create an atmosphere in which she will continue to feel like she can be completely open with you about her use of CAM therapies. You must convey that you wish to partner with her to help her navigate through the information to make a well-informed decision about what is best for Kofi and for the family. Emphasize that you wish to help her keep Kofi and the whole family as safe, healthy, and happy as possible, and that **you will not judge her decisions or values.** To do this, it is critical for you to know everything
he takes, including prescription medications, over-the-counter medications, dietary supplements, vitamins, and any other preparations, such as teas, aromatherapy, or hands-on therapies (such as acupuncture, massage, Reiki, music therapy).

any parents may not realize the importance of this disclosure because they do not realize that "natural" substances can be harmful or that teas and supplements can have interactions with each other, with foods, and with medications. Parents also may not realize that **vitamins and foods are regulated by different laws than medications.**
They are not subject to the same stringent regulations about composition, so there can be impurities and inconsistency in dosage. Furthermore, vitamins and dietary supplements do not undergo the same pre-market testing for adverse reactions that prescription medicines must.

2.3 How do you address questions about selecting or recommending CAM?

It is most critical to communicate that some therapies are potentially dangerous.

- **Chelation therapy**, based on the tenet that an ASD mimics symptoms of heavy metal (mercury) poisoning, is a prime example. Chelation is an established treatment for decreasing heavy metal levels in patients with documented toxic exposures to such metals. However, mercury toxicity has not been causally linked to ASD, and chelation as a treatment for ASD is often conducted in the absence of laboratory evidence of mercury toxicity. In other cases, the evidence used is a hair sample, the accuracy of which is unproven. The effects of chelation on children who do not harbor toxic levels of heavy metals are unknown. At least one child has experienced fatal complications related to intravenous chelation therapy for ASD. Furthermore,

safe chelation therapy requires frequent blood testing, which impacts the child's quality of life.

- Many children are prescribed **anti-fungal medication, vancomycin, or antiviral medication**, based on the assumption that they have fungal, viral, or bacterial intestinal overgrowth or occult infection contributing to the development of ASD. These theories have not been adequately substantiated, and parents may not realize that anti-fungals, antibiotics, and antiviral medications all have potentially serious side effects, including liver damage and allergic reaction, and some require frequent blood sampling.

Other therapies show promise, but are expensive and unproven. **Hyperbaric oxygen therapy** is a timely example. Hyperbaric oxygen therapy is an established treatment for forms of disease involving decreased perfusion and/or inflammation, such as burns and carbon monoxide poisoning. The theory behind using it as a treatment for ASD is that ASD are caused by occult inflammation and/or hypoperfusion of the brain. While this treatment has received media attention, there has not been adequate proof of effect to justify its very high cost (ranging from $100 to $850 per session) or substantial time commitment.

Dietary modification is a popular and longstanding CAM therapy for ASD that involves significant lifestyle change and may lead to nutritional deficiencies if not conducted properly. The Feingold Diet, popular in the 1970s, eliminates artificial food additives and naturally occurring salicylates. Also in the 1970s, protein malabsorption theories became the basis for the gluten-free, casein-free diet, suggesting that malabsorption of these proteins led to inflammation and absorption through the "leaky gut," followed by opioid- like neurotransmitter release into the central nervous system that led to behaviors typical of ASD. These theories are based, in part, on the presence of increased peptides in the urine of children with ASD. These laboratory tests have not been shown to be effective biomarkers due to inconsistency and unclear significance. The "leaky gut" theory has never been scientifically proven.

While many parents place their children on such diets and report subsequent improvements in their children's social behaviors, many children have no response, and scientific evidence has not been established. Other popular but unproven dietary modifications include selective elimination diets and ketogenic diets. When talking about dietary intervention, it is important to weigh all the potential risks and benefits,
including expense, effects on the family and child's quality of life, and possible nutritional deficiencies/need to supplement that could arise from a strictly limited diet.

It is important to **teach parents how to distinguish valid scientific evidence** from information presented as evidence, but achieved through less rigorous

methods. In 1999, several double-blinded, placebo-controlled studies failed to show a significant difference between patients with ASD treated with the pig-derived neuropeptide secretin and those given placebo. These studies came after a media frenzy and development of a black market for secretin based on three case reports citing incidental improvement in symptoms of ASD after receiving secretin for a gastrointestinal procedure. In February 2009, Andrew Wakefield's claims regarding a possible link between ASD and MMR vaccination were discredited when Wakefield's original paper, which spawned a large international anti-vaccination movement, was found to contain falsified data. Wakefield's reported results have not been replicated by other investigators, despite several attempts.

Although some CAM treatments are unproven because they do not work, there may be others that work, but are difficult to prove through high-quality (i.e., controlled, blinded, replicable), peer-reviewed research. Several CAM therapies (e.g., probiotics, massage therapy, guided imagery, mindfulness-based meditation, acupuncture) have entered the realm of "conventional" treatments for diseases other than ASD based on convincing, replicable evidence. Thus, it is important to maintain objectivity and create a collaborative relationship with parents interested in CAM, helping them to navigate the evidence and weigh risks and benefits rather than strictly saying "no" to all CAM treatments based on lack of evidence.

A simple rule of thumb is to **strongly discourage therapies that are disproven and possibly harmful, encourage therapies that are proven and safe, and tolerate therapies that are unproven, but safe.** Dietary supplements and modifications are generally thought to be safe in established therapeutic doses, but show varying degrees of validity in research. When treating a child with an ASD for whom CAM therapies make up part of the treatment regimen, it may be helpful to maintain a list of reported treatments, dates or doses/frequency, and either observed or reported effects.

2.4 How would you respond to the mother's interest in melatonin?

A major issue for Kofi's mother is sleep problems. **Many families with children with developmental disabilities and sleep problems give their children synthetic melatonin to help them sleep.** It is considered a relatively safe CAM treatment.

- Melatonin is an endogenous substance produced by the pineal gland that **helps regulate the sleep-wake cycle**. Synthetic melatonin has been shown to be effective in children with neurodevelopmental disabilities in helping with sleep onset and maintenance. It is available as a controlled-release tablet. Although one study cited increased seizure activity in children with severe neurodevelopmental disabilities on melatonin, another similarly-designed study showed the opposite. Other than that, there have been no reports of significant adverse effects of melatonin. In addition to telling Kofi's mother that you would support her decision if she were to try melatonin, you should discuss the importance of **adding one new treatment at a time** to monitor for adverse or positive effects, which should be done in an organized fashion so that ineffective therapies can be stopped.

It is also important to **discuss what parameters you will use to see if this treatment is effective for treating Kofi's sleep disturbance.** In this case, you could decide together that after one week you will follow up with Kofi's mother over the phone and discuss whether Kofi is falling asleep faster or having fewer night awakenings since starting the melatonin.

At this point, treatment of Kofi's behavioral problems is beyond the scope of a primary care physician. Kofi needs an evaluation by a specialist who can provide expertise in the management of maladaptive behaviors in a child with an ASD and recommend treatments. As Kofi's primary care pediatrician, however, you should remain the central figure who coordinates and advocates for Kofi's health. Kofi's mother has clearly identified you as someone she trusts and looks to first for professional advice in her decisions about Kofi's care. This relationship cannot be emphasized enough in its importance for treatment compliance and monitoring

3.1 What would you recommend following the mother's inquiry into risperidone?

To put a child with an ASD on a pharmacologic medication that specifically targets maladaptive behaviors is a big decision for parents. It requires a physician who is familiar with the therapeutic and adverse effects of the medication, committed to monitoring the child regularly, and comfortable counseling the parents while the child is on medication.

Any conversation with parents who are considering medication for a child with an ASD must begin with the following statement: "Medications can alleviate some of the associated symptoms of ASD, but they do not treat the core symptoms (i.e., qualitative impairment of social interaction, qualitative impairment of communication, and restricted and repetitive behaviors)."

- Associated symptoms of ASD include aggression, self-injury, oppositionality, hyperactivity, impulsivity, inattention, irritability, emotional lability, depression, anxiety, unusual responses to sensory stimuli, irregular appetite, sleep problems, and gastrointestinal disturbances.

Emphasize to parents that the most studied and effective of ASD treatments are behavioral management and intensive, sustained education. There are certainly limitations to these treatments: they take time to see incremental benefits, they are labor- intensive and expensive, and they are difficult to take to scale.

Pharmacologic medications are appealing because effects can be seen almost immediately. Kofi demonstrates several associated symptoms that have not improved with behavioral intervention. It appears they are severely interfering in multiple settings and potentially harmful. A serious discussion about medication as an adjunct treatment is appropriate. All involved in the care of the child (parents, teachers, and clinicians) should agree on measurable target behavioral outcomes.

Risperidone is an FDA-approved atypical antipsychotic medication used for the treatment of behavioral problems in children ages 5 to 17 years with ASD (www. fda.gov, 2006). These behaviors include irritability described as tantrums, aggression, and self-injurious behavior.

- **Side effects of risperidone** include weight gain and increased appetite, sedation, constipation, and fatigue. There can also be effects such as prolactinemia, insulin resistance, elevated lipids, movement disorders (e.g., tremors), seizures, and dry mouth.

As a primary care physician, you should know that health monitoring of children on risperidone includes a baseline exam measuring BMI as well as lab testing including lipid profile, liver function tests, and fasting blood sugar or hemoglobin A1C. This testing should be repeated at regular intervals. Clinical trials have confirmed that risperidone is a useful medication for the short-term treatment of irritability associated with an ASD

Handout I: Vitamins/Dietary Supplements and Exercise-Based Therapies

Vitamin Therapies and Dietary Supplements

Carnosine	Thought to have antioxidant activity, as well as a role in production of the inhibitory neurotransmitter GABA.; may lead to hyperactivity.
Dimethyglycine (DMG)	Given on the basis of a theory of decreased inflammation and increased immune function. An earlier study reported improvements in language when children with disabilities were given DMG; more recent studies have been unable to replicate these findings.
Melatonin	Pineal gland hormone given to help with sleep. Synthetic melatonin has been shown to be effective in children with neurodevelopmental disabilities in helping with sleep onset and duration but not necessarily maintenance. Generally thought to be safe.
Omega-3 fatty acids	Thought to have a variety of health and neuroprotective benefits. Pre- liminary studies have shown mixed, but promising results for improving behavior in children with ASD. Generally thought to be safe.
Probiotics	Given to counteract GI bacterial and fungal overgrowth. Beneficial effects of probiotics have been shown in irritable bowel syndrome (IBS), acute gastroenteritis, urinary tract infections, and other conditions, but meaningful research has not been done on the use of probiotics in children with ASD. Generally thought to be safe in the absence of immunodeficiency and assuming intact gut.
Vitamin A (cod liver oil)	Thought to improve immune function and vision (some groups theorize that ASD have to do with immune or auto-immune dysfunction). Can cause hepatoxicity, increased intracranial pressure.
Vitamin B6 (pyridoxine)-magnesium	Given on the basis of B6's role in neurotransmitter production plus magnesium's supportive effect. Research has been suboptimal, but pediatricians should advise parents of the risk of B6 toxicity (periph- eral neuropathy) and magnesium toxicity (changes in mental status, GI upset, muscle weakness, respiratory depression, hypotension, and arrhythmias).
Vitamin B12 (cobalamin)	Given intramuscularly, in conjunction with oral folinic acid, to counteract decreased plasma antioxidant concentrations identified in a study of 20 children with ASD. Initial research showed positive results, but attempts to replicate the findings were unsuccessful. Low risk of B12 toxicity but requires injection.

Vitamin C (ascorbic acid)	Shown to decrease stereotypic behaviors in double blind, placebo-controlled study that was never replicated. Toxicity causes nephrolithiasis and GI upset.

Exercise-Based Therapies

Many activity-based therapies are also believed to help with symptoms of ASD. The following are popular, safe, but unproven and often expensive therapies:

- Sensory integration therapy
- Aromatherapy
- Massage
- Hippotherapy (horseback riding)
- Yoga
- Water therapy (swimming)
- Craniosacral massage
- Music therapy

Handout II: Treatment Tracking Tool

Clinical Approach to Psychopharmacologic Management

Clinical Approach to Psychopharmacologic Management Identify and assess target behaviors Parent/caregiver interview

Intensity Duration

Exacerbating factors/triggers (time, setting/location, demand situations, denials, transitions, etc.) Ameliorating factors and response to behavioral interventions Time trends (increasing, decreasing, stable) Degree of interference with functioning

Consider baseline behavior-rating scales and/or baseline performance measures/direct observational data Include input from school staff and other caregivers

Assess existing and available supports

Behavioral services and supports

Educational program, habilitative therapies Respite care, family psychosocial supports

Search for medical factors that may be causing or exacerbating target behavior(s)

Consider sources of pain or discomfort (infectious, gastrointestinal, dental, allergic, etc.) Consider other medical causes or contributors (sleep disorders, seizures, menstrual cycle, etc.)

Complete any medical tests that may have a bearing on

treatment choice Consider psychotropic medication

Evidence that the target symptoms are interfering substantially with learning or academic progress, socialization, health and safety (of the patient and/or others around him/her), or quality of life

Suboptimal response to available behavioral interventions and environmental modifications

Research evidence that the target behavioral symptoms or coexisting psychiatric diagnoses are amenable to pharmacologic intervention

Choose a medication on the basis of

Likely efficacy for the specific target symptoms Potential adverse effects

Practical considerations such as formulations available, dosing schedule, cost and requirement for laboratory or electrocardiographic monitoring

Informed consent (verbal or written) from parent/guardian and, when possible, assent from the patient Establish plan for monitoring of effects

Identify outcome measures

Discuss time course of expected effects

Arrange follow-up telephone contact, completion of rating scales, reassessment of behavioral data, and visits accordingly

Outline a plan regarding what might be tried next if there is a negative or suboptimal response or to address additional target symptoms

Change to a different medication

Add another medication to augment a partial or suboptimal therapeutic response to the initial medication (same target symptoms)

Add a different medication to address additional target symptoms that remain problematic

Obtain baseline laboratory data if necessary for the drug being prescribed and plan appropriate follow-up monitoring

Explore the reasonable dose range for a single medication for an adequate length of time before changing to or adding a different medication

Monitor for adverse effects systematically

Consider careful withdrawal of the medication after 6-12 months of therapy to determine whether it is still n

Receiving an ASD Diagnosis

Finding out that you or your child is experiencing

ASD can be a very emotional time. All families react in different ways, but many people report struggling on some level.

As a parent, you love your child so much that it can be heartbreaking to think that things will be hard for him or her. Adults receiving a diagnosis for themselves may also have many different emotions. Some may be relieved to finally understand themselves better, while others may feel overwhelmed.

Facing and accepting an ASD diagnosis is not a one-time experience. There may be times when things are going well and parents or individuals feel they have come to accept their diagnoses, and then something will trigger the emotions all over again.

There are emotional stages that many individuals report experiencing, which may include:

Shock or confusion

The day you or your child is diagnosed with ASD can be very overwhelming and confusing. Some people may deal with this by not agreeing with the diagnosis, getting angry or wanting a second opinion. Some people "disconnect" and attempt to ignore the information, while others just feel at a loss for how to communicate about it. It takes time to really process the news you have been given.

Sadness

Some people feel like they are mourning the loss of what they thought they or their child might become. Sometimes the realization of how unfair it will be that they or their child will struggle with some things is hard to accept. It is normal to be sad and upset, and
It is healthy to cry. As a parent, it is important to not let the sadness consume you because the thing you and your child need most is you. Starting to come up with a plan for how you are going to move forward to help yourself and/or your child may help you feel more in control, even if it is just one step at a time.

Guilt

Many individuals feel guilt. They wonder if they may have caused
their child's ASD, or if they could have done something to prevent it.

Even though the causes of ASDs are not completely known, we do know that they are nothing a person could have controlled.
Research suggests that ASD is genetically linked and that changes in brain development happen very early. ASD rates are similar across ethnic and racial groups around the world, so it is widely accepted that it is not caused by specific environmental or medical factors

Anger

It is very hard to watch your child struggle with things that come naturally to other children. Sometimes you might feel angry at others, your spouse, yourself, or anger that is not directed at anyone in particular. This is a natural part of the process. Even years from now, there will be times when things seem so unfair it will make you angry. Many times others do not understand that you are hurting or that you may need support. It can be very helpful to talk to other individuals and parents who have similar experiences.

Loneliness

Acceptance

Periods of acceptance may mean that you can appreciate the reality of living with ASD, and are also ready to advocate for what you or your family needs. Acceptance is an ongoing process, not an end stage.
This can often come and go for individuals and for parents whose child has a disability. It may seem that no one can understand or that others don't have to go through the same struggles. Others who do not experience a disability or have a child with a disability may find it hard to grasp what you are going through. It may be up to you to tell them what it is like so they can support you.

Siblings

Siblings of a child with ASD often have their own set of questions, stressors and challenges. It is important that you

attend to their needs too, and take time alone with them. They can easily be overshadowed by the demands of their sibling with ASD and may benefit from their own therapies or special times with you. It can be helpful to find activities that siblings can enjoy together. Autism Speaks had a booklet that you can download that is specifically for siblings (www.autismspeaks.org).

Family members

Others in your family will respond to a new diagnosis in different ways, just like every individual deals with ASD differently. They may not have received all of the information that you have. Sometimes parents choose to wait until they are more comfortable with ASD before talking about it with friends or family. Other people who love you and your child may also feel overwhelmed, angry or confused. Encourage them to:

- Be respectful and supportive of the decisions you are making for your child.
- Learn more about ASD.
- Follow the routines and systems that your child is used to.

Defining the Spectrum

The term "spectrum" simply means that symptoms

may look very different for each person. Although there are clear patterns that define the diagnosis of ASD, there is a wide range of how different symptoms affect different people.

Rather than thinking of a number line of increasing intensity, you can think of ASD like a "buffet" — everyone at the table gets the same basic courses, but the portioning and condiments will be unique to the individual.

Because of this, ASD can seem very different in each person and can also shift over the course of a lifetime.

For example, one child may have a very hard time with social skills and have very few repetitive behaviors. Another child might be consumed by routines and have an easier time with language. A girl who seems shy in kindergarten may become more verbal in middle school, but also begin to struggle with anxiety or depression.

How is ASD Diagnosed?

There is no medical test that can be done to diagnose ASD, including blood tests or brain imaging. But there are a number of assessments that should be completed as part of an evaluation for an ASD. Most of these tests are known as "standardized" or "validated" tests. They require a well-trained person (a doctor or psychologist) to interact with an individual while looking for
some very specific types of behavior patterns. Other assessments help the clinical team rule out other disorders that may look like ASD or that often go along with ASD (like ADHD). Some tests are used to help the team understand an individual's strengths and weaknesses to ensure the right planning for supports, interventions and goal setting.

There will usually be a combination of tests done directly with the individual being assessed, as well as interviews that rely on parent report or input from teachers/caregivers/ employers. Both types of information (direct and indirect) are important for making a diagnosis. This helps the clinical team to get a good behavioral
"snapshot," as well as a history of any behaviors they may not get to observe during appointments.

Symptoms of ASD:

The following describes the symptoms a child must demonstrate to be diagnosed with ASD:

Difficulties with social interaction and communication (across settings):

- Social-emotional reciprocity (sharing interests or emotions, pointing out objects, initiating social situations, back and forth conversation)

- Using and understanding nonverbal communication (eye contact, facial expressions, gestures, body-language, combining verbal and nonverbal efforts. Making and keeping
age-typical social relationships (showing interest in others, sharing imaginative

play, adjusting behavior to match situations)

Restricted and repetitive patterns of behavior, interests, or activities:

- Repetitive speech, motor movements, or use of objects (hand flapping, echolalia, non- functional use of objects)

- Inflexibility about routines, repetitive patterns of behavior, or strong resistance to change (insistence on same driving route, repetitive questioning or extreme distress at small changes)

- Restricted, fixated interests that are abnormally intense or focused (attachment to objects, excessively narrow or preoccupying interests)

- Over- or under-reactivity to sensory input or unusual interest in sensory aspects of the environment (pain/heat/cold, specific sounds or textures, smelling or touching of objects, fascination with lights or spinning objects)

keeping age-typical social relationships (showing interest in others, sharing imaginative play, adjusting behavior to match situations)

Other Characteristics of ASD

Advanced thinking

Individuals with an ASD can be very bright and highly motivated by their own internal desire to master a subject. They sometimes have intense interests and can become experts in those areas. Even those who are very strong on cognitive testing may still have a hard time in many areas such as:

- Abstract thinking
- Seeing the whole picture
- Filtering out what is not important
- Organization

- Planning
- Problem solving
- Taking something they have learned and applying it to a different setting.

Global Developmental Delay (GDD)

This diagnosis is provided when young children are delayed across different areas of their lives (such as communication, fine motor skills, or age-typical independence skills). Global simply means that the delay can be seen across most areas of the child's abilities. This diagnosis is for children six years old and under.

Intellectual Disability (ID)

If a person has low IQ (a measure of mental ability) and their "life skills" are significantly delayed after age six, it is called Intellectual Disability. ID must be diagnosed before age 18, and includes people with significant limitations in their ability to carry on everyday life activities (such as self-care and communicating), as well as in their general mental abilities to reason, plan, and solve problems.

Anxiety and depression

Some people with an ASD also suffer from anxiety and/or depression. This is more common as children get older and become more socially aware. Social expectations also increase with age so it can become even more difficult to keep up with peers. The stress of this can accumulate over time and make a person vulnerable to feeling constantly worried or hopeless. Mood and problematic behavior changes over time should be discussed with therapists and primary doctors.

Genetic disorders

Some individuals have ASD as a part of a genetic disorder, such as Fragile X syndrome. Others may have a dual diagnosis of ASD with another syndrome like Down Syndrome. Being tested for a genetic disorder is considered best practice for people with an ASD diagnosis. It will not change the ASD diagnosis, but it may help explain why a person has these difficulties or indicate that other medical conditions should be monitored. It can also help in family planning and understanding if others in the family may be at risk for passing on a syndrome to their children.

Gastrointestinal and feeding disorders

Some people with ASD report gastrointestinal (GI) or stomach problems. Children and adults with ASD are sometimes very picky eaters and may have difficulty swallowing or even tolerating certain food in their mouth. Children with an ASD may have problems such as chronic constipation or diarrhea. These difficulties should be discussed with your medical providers so they can be addressed sooner rather than later. This may include a referral to a GI specialist, feeding/ swallowing clinic or supportive therapies like occupational therapy or speech-language therapy.

Sleeping problems

Many people with ASD have trouble falling asleep and/or staying asleep at night. This can be very hard on the whole family. If you or your child is having trouble with sleep, talk to your doctor about things you can do to help, possibly including behavioral interventions, medical treatment, or a sleep study.

What causes ASD?

Scientists do not know what causes ASD. There is a lot of research being done to answer that question. Let your clinical team know if you would like to get involved. It is likely that within the next 20
years there will be much more information available to explain the diversity and presence of ASD around the world. For now, there are some things that are widely accepted.

- ASD is caused by the way the brain develops, likely beginning very early in development.

- There is not one single cause of ASD. There are likely multiple factors that may make a child more likely to experience ASD.

- Genes are one of the risk factors. ASD often runs in families. A child with a sibling or parent who has ASD is more likely to have ASD, too.

What does not cause ASD?

The causes of ASD have not been determined, but some things have been ruled out.

- There have been many large, high-quality studies done, and no link between vaccines and ASD has been found.

- Bad parenting was once thought to be a cause of ASD. This is not true.

- Some people wonder whether diet during pregnancy is a factor, but there is no research to support this. Many ethnic groups around the world have similar ASD rates and their diets are very different.

Public Services given to ASD detected person

BIRTH–21 YEARS

Special education (0–kindergarten)

Once a child has been identified as having a medical diagnosis of ASD he or she will likely be eligible for special education s ervices. In Oregon, school districts have their own eligibility criteria, which sometimes can be different from medical criteria.
This can be confusing so don't be afraid to ask the educational team questions. There are also statewide parent organizations that can help answer questions, such as FACT Oregon. The federal government mandates that all children with a disability receive a "free and appropriate education."

For children birth until kindergarten, most educational services are provided by the child's local Educational Service District (ESD).

- Children under three years old receive Early Intervention (EI) services (often in the home setting).

- Children between the ages of three years and kindergarten receive Early Childhood Special Education (ECSE) services (often in a preschool classroom setting).

For young children who qualify for Early Intervention and/or Early Childhood Special Education (EI/ECSE), a team of professionals and the child's parents work together to come up with an Individual Family Service Plan (IFSP). This is a plan that helps the child learn strategies to be more successful at home and at school. This plan will include how the child is currently performing and the goals they will be working towards. Some of the things that ESDs may provide include:

- Speech therapy (speaking and using language, feeding, etc.)

- Occupational therapy (sensory, self-care, fine motor skills, etc.)

- Physical therapy (mobility or movement, gross motor skills, etc.)

- Behavioral therapy (transitions, play, behavioral regulation, etc.)
- Training for parents and families
- Social play groups

The Early Intervention programs can be very different from region to region. Some of the services will be provided in the home, others may be at a preschool or other location depending on the needs of the child and the resources of the ESD.

Special education services (kindergarten–age 21)

Children between the ages of five and 21 receive special education services through their local public school district. These programs always include an Individualized Education Program (IEP). This is developed by a team of school professionals and the child's parents in order to decide what the child needs to be successful at school. The IEP is a plan that the school is required to have in place, and follow for each child with an eligible disability.

The range of services that may be provided by a school district is very broad, and depends on the needs of the child. Some children may benefit from being in a classroom with children who also have disabilities, while other children may do better if they remain in the regular education classroom (and some may do best with a combination of both).

It is very important that parents are involved in the decisions that affect the education of their child. Parents should be treated as equal partners in the education process. Sometimes parents have to advocate for different placements or interventions for their child that may not be obvious to other educators on the team.

What types of services are available for children under 18?

Supports for families

Every county in Oregon has a program that can help families with respite, training opportunities and other basic assistance not provided by special education. This support is administered by your County

Developmental Disabilities Program. Your child must meet Oregon's definition of "developmentally disabled" to be eligible for help under this program. You'll need school test results and/or doctor's reports that show your child has an ASD. The program is open to families at all income levels.

Case managers can help you think about the type of respite and training you need to care for your child at home. You will play a big part in this — you determine where and when you need help, and what kind. Case managers will coordinate and monitor the assistance you receive. Remember, the program is small and probably can't meet all your needs. But it can get you started.

Intensive in-home services (for children under 18 years old)

If your child needs intense supervision or intervention because of dangerous behavior and/or medical problems, your county may refer you to a state program for intensive in-home services. This program is for children who can't remain at home unless their family receives significant help with personal care, safety modifications, training, behavior consultation and similar child- related needs. A checklist that rates the severity of the child's difficult behaviors and/or medical issues determines eligibility. It's not
easy to get into this program and there is a limit to the number of children who can be served. But if you think you need it, ask your county developmental disabilities case manager to be considered.

Crisis/out-of-home placement (for children under 18 years old)

If your child is in crisis and can't live at home, county and regional/ state placement specialists can work with you to find a temporary foster home or group home for your child. Some children are in a placement setting for a few weeks; others for a longer period of time, depending on the child and the family's situation. There are a limited number of foster and group homes in the state that provides services to children with an ASD and other developmental disabilities. (Oregon has no specific institution or residential public school for children with an ASD). Your county may have some crisis foster homes but probably will refer you to the state program for children's crisis services. Unfortunately, the specialized placements may not be close to the family home.

A legal agreement with the State is required. It is called the Developmental Disabilities Child Placement Agreement. Also, a plan will be written to include ways that families can remain involved with their children during placement. Families are required to authorize the Oregon Program for Seniors and People with Disabilities (SPD) as payee for their children's SSI benefits (see below). If the child does not currently receive SSI, the program will apply for these benefits in the child's name. The cost of the placement is not charged to families; however, this could change in the future. Families are expected to provide clothing and retain health insurance for their child. SPD also will apply for a medical card to supplement the family's health insurance.

Supplemental Security Income (SSI)

SSI is a federal program that provides income and medical insurance through Medicaid to eligible children who are disabled or chronically ill and whose families have little or no income or financial resources. Your child may qualify for SSI payments if your family is eligible for Medicaid. Applying for SSI can be challenging and complex, but it can be done. For more information, contact your county Mental Health and Developmental Disabilities Services Office.

Oregon's Program for Seniors and People with Disabilities offers services ranging from respite care and technical consultation to intensive in-home assistance, crisis intervention and out-of-home placement. There is no separate, specific program for individuals with an ASD. Instead, services are provided through county and state programs that serve people with developmental disabilities.

If your child is under 18, it's important to understand that there is no "entitlement" to services from the Program for Seniors and People with Disabilities. Unlike special education, where children with disabilities have a legal right to public education, there is no law requiring services to children with disabilities — even if eligible.

Services are generally limited to available funds in crisis situations. However, in the past few years, services for children with disabilities who are under 18 years old and their families have been expanded and

improved. Now there is more help available for families caring for children with disabilities at home and more dollars going to prevent crisis and “burnout” in families.

No matter your child’s age, the “doorway” to services is your local county Developmental Disabilities Program. It’s usually located in the county Mental Health Department (see State and Local Developmental Disability Services). Case managers (sometimes called service coordinators) in your county will talk with you to see if your child is eligible for services.

- If your child is younger than 18, the case manager will help decide what help you need and develop service options.

- If your child is 18 or older, the case manager will work with your child and you to identify options and access available services.

Treating ASD: Frequently Recommended Therapies

Communication, speech and language

One of the key components of autism is communication, speech and language development. Some individuals may be preverbal, while others may speak very well but with poor social conversational ability. Regardless of the level at which individuals with autism use language, they all will have some level of social- communication challenge. Speech and language therapy can begin as early as 18 months of age. Some common difficulties in this area are:

- Not speaking at all

- Difficulty answering questions or telling a story

- Lack of reciprocity (“back-and-forth”) in conversation

- Unnatural tone of voice (“prosody”) or use of unusual vocal sounds
- Repeating what another person says (“echolalia”)
- Difficulty understanding abstract meanings or words out of context
- Poor use and understanding of eye contact, body language/ nonverbal cues
- Repeating memorized words or phrases in a rote manner, sometimes in context

A speech language pathologist (SLP) is trained to work on speech, language, and communication, nonverbal communication, and sometimes feeding. They can help with many issues, such as:

- Requesting help and appropriately protesting
- Initiating and maintaining play
- Conversation skills to help build relationships
- Recognizing verbal and nonverbal cues

Occupational therapy

Individuals with ASD can often benefit from occupational therapy (OT). An occupational therapist works with people to increase their skills in the “occupation” of living (i.e., playing and school for children). They help to identify things that are keeping the person
with ASD from fully participating in the typical activities of daily life (eating, grooming, safety, playing, writing, typing, going to school or work, etc.).

Many people with ASD have trouble processing sensory information or being able to take in information around them in an effective way (touch, smell, sight, sound). For example, they may get overwhelmed by loud noises or the way things feel on their skin. This can make it difficult to regulate their behaviors, attention, and emotions. Sensory integration (SI) Therapy addresses these issues, and OT is usually the primary specialty involved in making treatment plans in this area.

- OT is a common therapy that school age children receive at school.

- It can occur at home, in a clinic, or in the community.

- This therapy is very individualized and based on the needs of each person.

Some examples of what an OT might do:

- Plan games that increase hand-eye coordination
- Adjust sensory input to improve ability to process (wearing headphones if it is too loud)

Physical therapy

Motor skills impact the way a person is able to move their body to do a task. Sometimes individuals with autism have less developed motor skills. If this is the case, physical therapy (PT) can help. A physical therapist works on physical limitations to help a person develop the muscles, balance and coordination needed for the day- to-day activities.

Behavioral therapy

Applied Behavior Analysis (ABA)

ABA is the most well supported intervention for ASD and is based on research. ABA is the use of scientifically based behavioral principles in everyday situations ABA Therapy works towards goals that help to increase or decrease different behaviors. For example, a family may want to increase their child's food intake, while also decreasing head banging. Which behaviors are most helpful to target will depend on the specific situation. All ABA programs share similar components, including specialized teaching, parent involvement, and teaching skills that can be used at home, school and other settings. ABA should be playful and motivating for children.

- ABA can help build skills so a person can function at a higher level in everyday life. ABA is often used to increase skills in the area of language, play, behavior, attention and being able to learn.

- People of all ages can benefit from ABA, although some research suggests that the earlier this approach is used, the better.

- ABA is a treatment that is used for all kinds of behavioral needs, not just those experienced by people who have ASD.

The following approaches are also grounded in the science of ABA:

- Early Start Denver Model (ESDM)

- Pivotal Response Treatment (PRT)

- Relationship Development Intervention (RDI)

- Floortime or Developmental Individual Difference Relationship (DIR)

- Treatment and Education of Autistic and Related Communication (TEACCH)

- Discrete Trial Teaching (DTT)

Cognitive Behavioral Therapy (CBT)

CBT refers to a group of well-researched techniques that are effective in treating difficulties experienced by children and adults. CBT works well for treating anxiety and mood disorders, teaching stress and anger management, and improving interpersonal skills. The goal of CBT is to help people learn how emotions, thoughts, and behaviors are related. CBT teaches people how to identify unhelpful beliefs and how to develop more positive patterns of behavior.
Treatment is typically skills-based, and involves active family participation for children.

- CBT is helpful for individuals with ASD who have sufficient verbal skills and the ability to think about their thoughts and behavior.

- The use of visual aids and the incorporation of an individual's special interests into therapy activities is often helpful.

- Licensed mental health professionals may provide CBT, including psychologists, clinical social workers, psychiatrists, and professional counselors.

- CBT may be done individually or in groups. CBT is often a large part of therapeutic Social Skills Groups aimed at improving social communication and social thinking.

The following treatment approaches effectively incorporate aspects of Cognitive-Behavioral Theory:

- Dialectic Behavior Therapy (DBT)
- Parent-Child Interaction Therapy (PCIT)
- Mindfulness-based CBT

Other supportive therapies and interventions

Music, art, adaptive exercise, and animal therapy: There are many therapies that are not yet well researched for the treatment of ASD, but may be helpful. These therapies can support social skills, boost self-esteem and build confidence, help develop motor skills, and improve the overall quality of life for an individual with ASD.

Prescription medications

There is no prescription medication designed to treat ASD, but some medications can effectively treat associated symptoms, such as hyperactivity, inattention, aggression, anxiety, depression, sleep disturbance and mood swings. The goal of including prescription medication as a part of treatment is often to reduce an interfering symptom so a person can respond better to the other types of therapies or educational opportunities. It is important to discuss any behavioral changes with your PCP, and to keep your clinical team informed of all medications (including over-the-counter or vitamin/ herbal supplements) in order to monitor any related interaction or side effects.

Dietary interventions

Some people report improvements in functioning after changing their diet. The two most common dietary interventions utilized by families experiencing ASD are gluten and casein-free and yeast-free diets. There are professionals such as naturopathic specialists who can provide

guidance in this area, while also seeking the advice of your primary doctor. Together, they can help decide if the potential outcome of the dietary restriction outweighs the potential harm. If there are concerns, specific allergy testing may be recommended.

Glossary :

Americans with Disabilities Act (ADA) is the US law that ensures rights for a person with a disability.

Applied Behavior Analysis (ABA) is a type of therapy that helps individuals change behaviors through a step- by-step process.

Audiologist is a professional who diagnoses and treats individuals with hearing loss or balance problems.

Autism Diagnostic Observation Schedule (ADOS) is an interactive test considered the gold standard for
diagnosing ASD. Along with other information (e.g., from interviews and developmental testing), the ADOS is usually incorporated into an autism evaluation.

Chronic constipation is an ongoing condition of having fewer than three bowel movements per week.

Cognitive skills are any mental skills that are used in the process of learning.

Developmental disorder refers to a family of disorders that affect typical development.

Developmental Individual Difference Relationship (DIR)

is therapy, known as Floortime.

Developmental milestones skills or behaviors that most children can do by a certain age. These can be found at www.cdc.gov

Developmental pediatrician is a medical doctor who has specialty training in developmental-behavioral pediatrics.

Diagnostic and Statistical Manual of Mental Disorders (DSM) is the official system for classification of psychological and psychiatric disorders published by the American Psychiatric Association.

Discrete Trial Teaching (DTT) is a type of behavior therapy.

Dyspraxia is the brain's inability to plan muscle movements and carry them out.

Early Intervention (EI) is a state-funded program designed to identify and treat developmental problems or other disabilities as early as possible. Eligibility for EI is from birth to three years of age.

Echolalia is repeating words or phrases.

Expressive language is communication of intentions, desires, or ideas to others. It includes speech, writing, gestures, signing, use of a communication board and other forms of expression.

Free Appropriate Public Education (FAPE) means that education must be provided to all children ages three to twenty-one at public expense.

Floortime is a developmental intervention for children with an ASD.

Fragile X is a genetic disorder that sometimes shares characteristics of ASD. It is generally recommended that individuals receiving a diagnosis of ASD be tested for Fragile X.

Gastroenterologist doctors specialize in disorders of the

Gl tract, including esophagus, stomach, small intestine, large intestine, pancreas, liver, gallbladder and biliary system.

General education is a series of "regular education" courses in multiple subjects taught to the same grade level.

Geneticist refers to a medical doctor who specializes in genetic problems.

Gestures are hand and head movements, used to signal communication non-verbally to someone else (such as a give, reach, wave, point, or head shake).

Global Developmental Delay (GDD) is diagnosis in children younger than 6. It means the development is delayed in several areas.

Hyperlexia is the ability to read at an early age. To be hyperlexic, a child does not need to understand what he or she is reading.

Hypotonia is a term that means low muscle tone.

Incidental teaching teaches a child new skills while in their home or community "in the moment," to help make sense of what they learn during formal teaching.

Individual Family Service Plan (IFSP) is developed by a team including family as primary participant. It is a plan that helps identify goals and a process to meet those goals.

Individualized Education Program (IEP) identifies student's specific learning needs, how school will meet them, and methods to review progress. For students 14 & older, the IEP must contain a plan to transition to postsecondary education or the workplace, or to help the student live as independently as possible in the community.

Individuals with Disabilities Education Act (IDEA) is the US law mandating the "Free and Public Education" of all persons with disabilities between ages 3 and 21.

Inclusion involves educating all children in regular classrooms with typically developing peers, regardless of disability.

Intellectual Disability describes limitations in mental functioning that cause an individual to develop more slowly. They may take longer to learn to speak, walk, and take care of personal needs such as dressing or eating, and are likely to have trouble learning in school. May be mild to severe and was previously referred to as mental retardation.

Joint attention is the process of sharing an experience with another person, often observable by following gaze or pointing gestures. Impairment in joint attention is a core deficit of ASD.

Least Restrictive Environment (LRE) a setting that least restricts opportunities for child with disabilities to be with peers without disabilities. The law mandates that every child with a disability be educated in a Least Restrictive Environment.

Mainstreaming means students are expected to participate in existing regular education classess. It may be a gradual, partial, or part-time process (e.g., student may attend separate classes within regular school, or participate in regular gym and lunch only).

Modified Checklist of Autism in Toddlers (MCHAT) is a screening tool for identifying toddlers who may be referred to specialist for further testing.

Motor deficits are physical skills that a person cannot perform or has difficulty performing.

Neurologist refers to a doctor specializing in medical problems associated with the nervous system, specifically the brain and spinal cord.

Nonverbal behaviors convey information or express emotions without words, including eye gaze, facial expressions, body postures, and gestures.

Occupational therapy (OT) assists development of motor skills that aid in daily living. OT may focus

on sensory issues, coordination of movement, balance, and self-help skills such as dressing, eating with a fork, grooming, etc. May address visual perception and hand-eye coordination.

Pervasive Developmental Disorder (PDD) used to be considered a subtype of autism, but is no longer used in the medical setting.

Physical therapy helps patients regain or improve their physical abilities.

Pica is persistent eating or mouthing of non-food substances for at least 1 month (older than 18–24 months). Substances may include items such as clay, dirt, pebbles, hair, plastic, etc.

Picture Exchange Communication System (PECS) is a communication system using picture symbols. Individuals learn to use picture symbols to construct complete sentences, initiate communication, and answer questions.

Pivotal Response Treatment (PRT) is a therapy that helps change unwanted behaviors.

Receptive language is the ability to comprehend words and sentences.

Reinforcement or reinforcer is a reward given after a desired behavior.

Relationship Development Intervention (RDI) is a therapy based on building positive behaviors through social connection that normally develop in infancy and early childhood.

Respite care is temporary, short-term care provided to individuals with disabilities. Respite care allows caregivers to take a break in order to relieve stress and fatigue.

Self-regulation refers to self-control. Self-regulation helps individuals manage their emotions and behaviors, and to allow us to participate successfully in society, work, and family life.

Sensory defensiveness is a tendency to over-react negatively to sensory input. Also called hypersensitivity.

Sensory integration is the way the brain processes sensory stimulation or sensation from the body and then translates that information into specific, planned, coordinated motor activity.

Sensory integration dysfunction is a neurological difference causing difficulties processing information rom the senses and positional sense (proprioception). Sensory information may be sensed normally, but perceived abnormally.

Sensory integration therapy is used to improve ability to use incoming sensory information.

Sleep hygiene refers to habits and environmental

factors important for sound sleep, such as adjusting noise, light and temperature, avoiding naps and caffeine.

Social reciprocity is the back-and-forth flow of social interaction between people.

Social stories are simple stories that describe situations that may be difficult for a person with ASD to understand. For example, a social story might be written about

birthday parties if a child appears to have a difficult time understanding what is expected of him or how he is supposed to behave there.

Social worker is a trained specialist in the social, emotional and socioeconomic needs of families. Social workers often help families find the services they need.

Special education is a public school program at no cost to families, to meet unique needs of a child with a disability.

Speech and language therapy is provided with the goal of improving an individual's ability to communicate. This includes verbal and nonverbal communication.

Spoken language (also referred to as expressive) use of verbal behavior, or speech, to communicate thoughts, ideas, and feelings with others.

Stereotyped behaviors are repeated behaviors or actions. They may include repetitive movements like rocking, spinning, hand flapping or posturing of the body or fingers.

Stereotyped patterns of interest or restricted patterns of interest refer to a pattern of intense preoccupation with a narrow range of interests and activities.

Stim or "self-stimulation" behaviors help stimulate one's senses. Some "stims" may be helpful (calming, increasing concentration, or shutting out an overwhelming sound).

Symbolic play describes play in which children pretend to do things or to be something or someone else. It typically develops between the ages of two and three years. Also called make believe, or pretend play.

Tactile defensiveness is a strong negative response to a sensation that would not be upsetting to most people, such as touching something sticky or the feeling of soft foods in the mouth. The term is specific to touch.

Training and Education of Autistic and Related Communication Handicapped Children (TEACCH) is a therapy based on the idea that individuals with ASD more effectively use and understand visual cues to increase functional behaviors.

Change the environment with technology or different equipment (can be as simple as using a pencil grip for writing, or wearing soft clothes)

- Often OT includes swings, trampolines, and other ways to incorporate physical movement for children.

Understanding Your Child's Condition

What is autism spectrum disorder (ASD)? ASD includes a range of behavioral symptoms. T he two core features of ASD are: Difficulty with social interactions and communication. Repetitive behaviors, interests, and activities. How

common is ASD? About one in every 68 children in the United States has ASD. It is about four times more common in boys than girls. It can affect children of all races and social classes wherever they live. Researchers are not sure what causes ASD. No two children with ASD are alike ASD is called a “wide spectrum disorder” because the symptoms are different for each child. Symptoms can range from mild to severe, and can change as the child grows. No two children with ASD are alike. T his makes understanding ASD and finding the best therapies difficultUnderstanding Your Options How do I make sense of all the different treatments? Treatments for ASD can be grouped into different categories (see f igure below). Each category focuses on a type of treatment. Behavior Programs Medications Education and Learning Programs Other Treatments and Therapies Because children with ASD may show different symptoms, a family will need to choose from the available treatments, therapies, and programs based on their child’s needs. The treatment plan for your child may have some treatments from each of these categories. What can the research tell me? T here is a lot of research being done on how to treat the symptoms of ASD in children or to help children overcome the challenges of ASD. But to decide whether something helps or not (or works better than something else), researchers need to look at the results from many studies rather than just one. One study may find that something helped, while another study may find that it did not. T he information in this section will tell you about each type of treatment and what researchers found when they looked at all the studies at once. 2 .

Behavior programs

T hese programs address social skills, attention, sleep, play, anxiety, parent interaction, and challenging behaviors. Some programs also help with children’s overall development. Many of these programs use specially trained providers who work with parents and children for up to 25 hours every week. The programs can last as long as 12 weeks to 3 years. T hey are held in homes, schools, and clinics. Early intensive behavioral intervention, cognitive behavioral therapy, and social skills training are types of behavior programs. Early intensive behavioral interventions target children’s overall development. Programs such as the Lovaas Model and Early Start Denver Model mostly focus on working with children. Other programs, such as Pivotal Response Training and Hanen More T han Words, focus on teaching parents how to help their children. Programs that use cognitive behavioral therapy help children manage anxiety. Coping Cat and Facing Your Fears are examples of this type of program. Social skills programs address social skills, attention, and play. Programs such as Skillstreaming help older children with their social skills. Programs such as Joint Attention Symbolic Play Engagement and Regulation (JASPER) aim to help younger children with issues such as trouble with cooperative play. T he behavior programs in your area may be based on these or other models. However, they might be called by different names. 4 Do they help? Early intensive behavioral interventions that focus on helping children with their overall development may improve a young child’s reasoning and communication skills. Research is not clear about whether they improve social skills, daily living skills, or the severity of ASD symptoms. Programs that focus on teaching parents how to help their children show promise, but researchers do not yet know if they work. Cognitive behavioral therapy reduces anxiety in some older children with ASD who do not have other developmental delays and have
average reasoning and language skills. Social skills programs may help school-age children without other developmental or language delays for short periods of time. More research is needed to know whether children remember and use these skills after the programs end. Programs that address how children play may improve children’s social interactions, but more research is needed to know for sure. What are the costs? T he costs of behavior programs vary by State. Providers have different fees. Insurance may not cover some costs. You should check with your insurance plan to find out about coverage. Other assistance may be available. Ask your doctor. What else should I think about? Because of the amount of time involved, you may need to change your family’s schedule or routine to participate in some programs

Education and learning programs

T hese programs are offered in schools or other learning centers. They focus on learning and reasoning skills and "whole life" approaches. Schools may have different names for their programs, but many of these programs are based on the Treatment and Education of Autistic and Communication related handicapped CHildren (TEACCH) approach. Programs like TEACCH use visual tools and arrange the classroom in ways that are easier to manage for a child with ASD. Other programs are classroom- or center-based and use "applied behavior analysis" (commonly known as ABA) strategies like positive reinforcement

Do they help?

Some children in the TEACCH program showed improvement in motor skills (the ability to walk, run, hold items, or sit up straight), eye-hand coordination, and thinking and reasoning. T here were not enough studies for researchers to say for sure, however, whether TEACCH was effective. Other education programs have not been studied enough to know if they work. What are the costs? Usually, these services are included in the cost of the school or learning center, so there may not be any other costs to you if you are a resident of the school district or community. What else should I think about? Your school district or learning center may have other names for these educational approaches, so you may want to ask about the exact types of strategies they use. Schools or other public agencies may be able to help pay for these programs if there are costs

Medications What medicines are used to treat ASD symptoms?

Antipsychotics: Risperidone (brand name: Risperdal®). Aripiprazole (brand name: Abilify®). Serotonin-reuptake inhibitors or "SRIs" (antidepressants). Examples include Prozac,® Sarafem,® Celexa,® and Cipramil.® Stimulants and other hyperactivity medicines. Examples include Ritalin,® Adderall,® and Tenex.® Secretin. This medicine is used for digestion problems but some researchers thought it might help children with ASD symptoms as well. Chelation. This therapy uses substances to remove heavy metals from the body, which some people think causes autism. Do they help? Research found that two antipsychotic drugs – risperidone (Risperdal®) and aripiprazole (Abilify®) – can help reduce emotional distress, aggression, hyperactivity, and self-injury. Many people who take risperidone and aripiprazole report side effects such as weight gain, sleepiness, tremors, and abnormal movements. Because of these side effects, these medicines may be best only for children who have more severe symptoms or have symptoms that might increase their risk of hurting themselves. SRIs and a hyperactivity medicine called methylphenidate (Ritalin®) have

not been studied enough to know if they help treat ASD symptoms. Research showed that secretin is not effective in improving autistic symptoms. 8 According to the U. S. Food and Drug Administration, there are serious safety issues associated with chelation products. Even when used under the care of a doctor, these products can cause serious harm, including dehydration, kidney failure, and death. Research does not support the use of chelation for ASD. What are the costs? T he cost to you for each type of medicine will depend on your health insurance, the amount (dose) your child needs to take, and whether a generic form of the medicine is available

Other treatments and therapies

You may have heard or read of other types of treatments or therapies that have been used for children with ASD, such as: Speech and language therapy. Music therapy. Occupational therapy. Acupuncture. Vitamins and mineral supplements. Massage therapy. The Picture Exchange Communication System. Responsive Prelinguistic Milieu Teaching. Neurofeedback. Sleep education and training

Do they help? These other therapies have not been studied enough to know if they help or have any side effects. This does not mean that they do not work or are not safe. It just means that researchers do not have enough information to know for sure. What else should I think about? Because little is known about how well these treatments or therapies work, talking about them with your doctor, other health care or education professionals, your family, and other people that you trust may help you decide whether to try them.

Why is there so little known about ASD and these treatments?

The research reviewed for this guide showed that some treatments can make specific improvements in the way a child thinks or acts. But researchers do not have enough information to know whether one type of treatment works better than any other. For most treatments, researchers also do not know which treatments will work best for specific children. For example, research does not show whether a program usually works best for older or younger children, or for children with severe or less severe ASD. T his does not mean that a treatment, therapy, or program will not be helpful for your child. It only means that researchers do not have enough information to say so with strong confidence. Researchers are still studying these treatments and therapies. Check with your doctor or a support group to find out about new research on the programs and treatments in this guide and about new options.

Making a Decision

There are many things for you to consider when choosing therapies or programs for your child. There are many people you should talk to, including your doctor, social worker, school administrator, and health insurance representative. Here are some questions to ask: What plan is best for my child? Do you think an early intensive intervention would help my child? What other types of programs might be helpful? Do you think my child would benefit from taking medicine? What is available in my community? Are there any early intensive intervention programs in this community? Do the schools in this district have programs for children with ASD? What support groups are available? What are the costs? How much will it cost for us to participate in these programs? Is help available from the schools or other public agencies? Does my health insurance plan cover any costs? What changes to our work schedules and life will we need to make? How much time does each option take? What are ways that other families have fit these programs into their lives? What else can we do to help our child

Which medicine, if any, is best for my child? What symptoms will the medicines help? How soon should I see changes in my child's symptoms? What are the warning signs that my child may be having a harmful side effect? What else is available if my child needs different medicine

Source T he information in this guide comes from the reports, Comparative Effectiveness of Therapies for Children With Autism Spectrum Disorders and Therapies for Children With Autism Spectrum Disorder: Behavioral Interventions Update. The reports were produced by the Vanderbilt Evidence-based Practice Center with funds from the Agency for Healthcare Research and Quality (AHRQ). For a copy of the reports, or for more information about AHRQ and the Effective Health Care Program, go to www.effectivehealthcare.ahrq.gov/autism1.cfm. This summary guide was prepared by the John M. Eisenberg Center for Clinical Decisions and Communications Science at Baylor College of Medicine, Houston, TX. It was reviewed by parents and caregivers of children with ASD. It was updated in 2014 by researchers at AHRQ

Diagnosis

Your child's healthcare professional looks for signs of developmental delays at regular well-child checkups. If your child shows any symptoms of autism, you'll likely be referred to a specialist who treats children with autism spectrum disorder for an evaluation. This specialist could be a child psychiatrist or psychologist, a pediatric neurologist, or a developmental pediatrician.

Because autism spectrum disorder symptoms and how severe they are can vary widely, it may be hard to make a diagnosis. There is no specific medical test to diagnose autism spectrum disorder. Instead, a specialist may:

- Observe your child and ask how your child has developed or changed over time in terms of interacting socially, communicating and behaving.
- Give your child tests covering hearing, speech, language, level of development, and social and behavioral issues.
- Present structured social and communication interactions to your child and score the performance.
- Include other specialists in coming up with a diagnosis.
- Recommend genetic testing to figure out whether your child has a genetic condition such as Rett syndrome or fragile X syndrome.

Care at Mayo Clinic

Our caring team of Mayo Clinic experts can help you with your autism spectrum disorder-related health concerns.Start Here

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Treatment

There is no cure for autism spectrum disorder, and there is no one-size-fits-all treatment. Treatment seeks to support your child's learning, development and behavior. Getting treated early, during the preschool years, can help your child learn critical social, communication, functional and behavioral skills.

The range of home-based and school-based treatments for autism spectrum disorder can be overwhelming, and your child's needs may change over time. Your healthcare professional can recommend options and help find resources in your area.

If your child is diagnosed with autism spectrum disorder, talk with experts about creating a treatment strategy and build a team of health professionals to meet your child's needs.

Treatment options may include:

- **Behavior and communication therapies.** Many programs address the range of social, language and behavioral difficulties linked with autism spectrum disorder. Some programs focus on reducing challenging behaviors and teaching new skills. Other programs focus on teaching children how to act in social situations or communicate better with others. Applied behavior analysis can help children learn new

skills and adapt these skills to many situations by motivating them with rewards.

- **Educational therapies.** Children with autism spectrum disorder often respond well to highly structured educational programs. Successful programs usually include a team of specialists and various activities to improve social skills, communication and behavior. Preschool children who get intensive, individualized behavioral treatments often show good progress.
- **Family therapies.** Parents and other family members can learn how to play and interact with children who have autism in ways that support social interaction skills, manage challenging behaviors, and teach daily living skills and communication.
- **Other therapies.** Depending on your child's needs, speech therapy to make communication skills better, occupational therapy to teach activities of daily living, and physical therapy to make movement and balance better may help. A psychologist can recommend ways to manage problem behavior.
- **Medicines.** Medicine can't make the core signs of autism spectrum disorder better, but specific medicines can help control symptoms. For example, certain medicines may be prescribed if your child is hyperactive. Sometimes healthcare professionals prescribe antipsychotic medicines to treat severe behavioral symptoms. Or they may prescribe antidepressants for anxiety. Keep all healthcare professionals updated on any medicines or supplements your child takes. Some medicines and supplements can affect how one medicine acts with another, causing dangerous side effects.

Managing other medical and mental health conditions

In addition to autism spectrum disorder, children, teenagers and adults also can have:

- **Medical health issues.** Children with autism spectrum disorder also may have medical issues such as epilepsy, sleep disorders, limited food preferences or stomach problems. Ask your child's healthcare professional how to best manage these conditions together.
- **Problems with transition to adulthood.** Teens and young adults with autism spectrum disorder may have a hard time understanding body changes. Also, social situations become more complex during the teen years, and there may be less tolerance for individual differences. Behavior also may be challenging at this time.
- **Other mental health conditions.** Teens and adults with autism spectrum disorder often have other mental health conditions, such as anxiety disorders; depression; attention-deficit-hyperactivity disorder, also known as ADHD; and substance misuse. Your healthcare professional, mental health professional, and community advocacy and service organizations can help.
- **Behavioral health concerns.** In addition to autism spectrum disorder, your child could be irritable or aggressive and may not pay attention. Your child also could be hyperactive, have sudden outbursts or try self-harm. Work with your healthcare professional, mental health professional and other team members to look for a cause, such as pain, distress or frustration, and to manage these challenges if they occur.

Planning for the future

Children with autism spectrum disorder usually continue to learn and come up with ways to handle challenges throughout life. But many continue to need some level of support. Planning for your child's future opportunities can make this process smoother. This includes where to work, go to school and live, and the services required for support, as well as how to be independent and social.

Request an appointment

Alternative medicine

Because autism spectrum disorder can't be cured, many parents seek alternative or complementary therapies. But there's little or no research on these therapies to show whether they're helpful. And some alternative treatments could be dangerous.

Talk with your child's healthcare professional about whether research supports any therapy that you're thinking about for your child.

Examples of complementary and alternative therapies that may offer some benefit when used along with proven treatments include:

- **Creative therapies.** Some parents choose to include art or music therapy along with educational and medical therapies. Doing so can make a child less sensitive to touch or sound.
- **Sensory-based therapies.** Therapists may use brushes, squeeze toys, trampolines and other materials to stir the senses, such as touch, balance and hearing. But research has not proved that these therapies work. It's possible that they may help when used with other treatments.
- **Melatonin.** Research shows that melatonin could help with sleep issues related to autism spectrum disorder when taken as directed. But it's important to work on developing healthy sleep habits first.
- **Massage.** While massage may be relaxing, there isn't enough evidence to show that it improves symptoms of autism spectrum disorder.
- **Pet or horse therapy.** Pets can give your child a companion and a fun time. But more research is needed to determine whether being with animals improves symptoms of autism spectrum disorder.

Some complementary and alternative therapies may not be harmful, but there's no evidence that they help. Some also may be costly and hard to carry out. Examples of these therapies include:

- **Vitamin supplements and probiotics.** Although not harmful when used in the usual amounts, there is no evidence they help autism spectrum disorder symptoms. Also, supplements can be costly. Talk with your healthcare professional about vitamins and other supplements and the right dose for your child.
- **Acupuncture.** This therapy has been used to improve autism spectrum disorder symptoms, but research doesn't show that it works.

Some complementary and alternative treatments aren't proved to help, and they could be dangerous. Examples of complementary and alternative treatments that aren't recommended for autism spectrum disorder include:

- **Special diets that limit nutrients.** There's no evidence that special diets effectively treat autism spectrum disorder. And for growing children, restrictive diets can mean that children won't get enough nutrients. If you decide to pursue a restrictive diet, work with a registered dietitian to create a proper meal plan for your child that has all the needed nutrients.
- **Chelation therapy.** This treatment is said to remove mercury and other heavy metals from the body, but there's no known link between these metals and autism spectrum disorder. Research doesn't support that chelation therapy works, and it can be very dangerous. In some cases, children treated with chelation therapy have died.
- **Hyperbaric oxygen treatments.** Hyperbaric oxygen involves breathing oxygen inside a pressurized chamber. This treatment has not been shown to be effective in treating autism spectrum disorder

symptoms, and the U.S. Food and Drug Administration (FDA) has not approved it for this use.

- **Intravenous immunoglobulin (IVIg) infusions.** There is no evidence that using IVIg infusions improves autism spectrum disorder symptoms. The FDA has not approved immunoglobulin products for this use.
- **Other treatment claims.** Treatments that may not be safe or are not proved to help include CBD oil, secretin, antifungal therapy, and clay baths that supposedly remove toxins.

Coping and support

Raising a child with autism spectrum disorder can tire you physically and drain you emotionally. These suggestions may help:

- **Find a team of trusted health professionals and others.** A team, coordinated by your healthcare professional, may include social workers, teachers, therapists, and a case manager or service coordinator. Team members can help find and assess the resources in your area. They also can explain financial services and state and federal programs for children and adults with disabilities.
- **Keep records of visits with healthcare professionals.** Your child may have visits, evaluations and meetings with many people on the care team. Keep an organized file of these meetings and reports to help you decide about treatment options and watch progress.
- **Learn about the disorder.** There are many stories and beliefs that are not true about autism spectrum disorder. Learning the truth can help you better understand your child and attempts to communicate.
- **Take time for yourself and other family members.** Caring for a child with autism spectrum disorder can put stress on your personal relationships and your family. To avoid burnout, take time out to relax, exercise or enjoy your favorite activities. Try to schedule one-on-one time with your other children and plan date nights with your spouse or partner — even if it's just watching a movie together after the children go to bed.
- **Seek out other families of children with autism spectrum disorder.** Other families managing the challenges of autism spectrum disorder may have useful advice. Some communities have support groups for parents and siblings of children with the disorder.
- **Ask your healthcare professional about new technologies and therapies.** Researchers continue to explore new ways to help children with autism spectrum disorder. See the Centers for Disease Control and Prevention website on autism spectrum disorder for helpful materials and links to resources.

Treatment and Intervention for Autism Spectrum Disorder

Key points

- Current treatments for autism spectrum disorder (ASD) seek to reduce symptoms that interfere with daily functioning and quality of life.
- Treatments can be given in education, health, community, or home settings, or a combination of settings.
- As individuals with ASD leave high school and grow into adulthood, additional services can help improve health and daily functioning, and facilitate social and community engagement.

Types of Treatments

There are many types of treatments available. These treatments generally can be broken down into the following categories, although some treatments involve more than one approach:

- Behavioral
- Developmental
- Educational
- Social-relational
- Pharmacological
- Psychological
- Complementary and alternative

Behavioral approaches

Behavioral approaches focus on changing behaviors by understanding what happens before and after the behavior. Behavioral approaches have the most evidence for treating symptoms of ASD. They have become widely accepted among educators and healthcare professionals and are used in many schools and treatment clinics. A notable behavioral treatment for people with ASD is called **applied behavior analysis (ABA)**. ABA encourages desired behaviors and discourages undesired behaviors to improve a variety of skills. Progress is tracked and measured.

Two ABA teaching styles are **discrete trial training (DTT)** and **pivotal response training (PRT)**.

- DTT uses step-by-step instructions to teach a desired behavior or response. Lessons are broken down into their simplest parts, and desired answers and behaviors are rewarded. Undesired answers and behaviors are ignored.
- PRT takes place in a natural setting rather than clinic setting. The goal of PRT is to improve a few "pivotal skills" that will help the person learn many other skills. One example of a pivotal skill is being able to initiate communication with others.

Developmental approaches

Developmental approaches focus on improving specific developmental skills, such as language skills or physical skills, or a broader range of interconnected developmental abilities. Developmental approaches are often combined with behavioral approaches.

The most common developmental therapy for people with ASD is **speech and language therapy**. Speech and language therapy helps to improve the person's understanding and use of speech and language. Some people with ASD communicate verbally. Others may communicate through the use of signs, gestures, pictures, or an electronic communication device.

Occupational therapy teaches skills that help the person live as independently as possible. Skills may include dressing, eating, bathing, and relating to people. Occupational therapy can also include

- **Sensory integration therapy** to help improve responses to sensory input that may be restrictive or overwhelming.
- **Physical therapy** can help improve physical skills, such as fine movements of the fingers or larger movements of the trunk and body.

The Early Start Denver Model (ESDM) is a broad developmental approach based on the principles of ABA. It is used with children 12–48 months of age. Parents and therapists use play, social exchanges, and shared attention in natural settings to improve language, social, and learning skills.

Educational approaches

Educational treatments are given in a classroom setting. One type of educational approach is the Treatment and Education of Autistic and Related Communication-Handicapped Children (TEACCH) approach.

Educational treatments are given in a classroom setting. One type of educational approach is the **Treatment and Education of Autistic and Related Communication-Handicapped Children (TEACCH)** approach. TEACCH is based on the idea that people with autism thrive on consistency and visual learning. It provides teachers with ways to adjust the classroom structure and improve academic and other outcomes. For example, daily routines can be written or drawn and placed in clear sight. Boundaries can be set around learning stations. Verbal instructions can be complemented with visual instructions or physical demonstrations.

Social-relational approaches

Social-relational treatments focus on improving social skills and building emotional bonds. Some social-relational approaches involve parents or peer mentors.

- The **Developmental, Individual Differences, Relationship-Based** model **(also called DIR or "Floor Time")** encourages parents and therapists to follow the interests of the individual to expand opportunities for communication.
- The **Relationship Development Intervention** (RDI) model involves activities that increase motivation, interest, and abilities to participate in shared social interactions.
- **Social Stories** provide simple descriptions of what to expect in a social situation.
- **Social skills groups** provide opportunities for people with ASD to practice social skills in a structured environment.

Pharmacological approaches

Important to know

There are no medications that treat the core symptoms of ASD.

Some medications treat co-occurring symptoms (those that happen along with ASD) and can help people with ASD

function better. For example, medication might help manage high energy levels, inability to focus, or self-harming behavior, such as head banging or hand biting. Medication can also help manage co-occurring psychological conditions, such as anxiety or depression, in addition to medical conditions such as seizures, sleep problems, or stomach or other gastrointestinal problems.

It is important to work with a doctor who has experience in treating people with ASD when considering the use of medication. This applies to both prescription medication and over-the-counter medication. Individuals, families, and doctors must work together to monitor progress and reactions to be sure any negative side effects of the medication do not outweigh the benefits.

Psychological approaches

Psychological approaches can help people with ASD cope with anxiety, depression, and other mental health issues. **Cognitive-behavior therapy** (CBT) is one psychological approach that focuses on learning the connections between thoughts, feelings, and behaviors. During CBT, a therapist and the individual work together to identify goals and then change how the person thinks about a situation to change how they react to the situation.

Complementary and alternative treatments

Some people with ASD and their families use treatments that do not fit into any of the other categories. These treatments are known as **complementary and alternative** treatments. Complementary and alternative treatments are often used to supplement more traditional approaches. They might include special diets, herbal supplements, chiropractic care, animal therapy, arts therapy, mindfulness, or relaxation therapies. Individuals and families should always talk to their doctor before starting a complementary and alternative treatment.

Autism

Autism is a difference in how your child's brain works that causes them to socialize and behave in unique ways. Early signs of autism include limited eye contact and body language and repetitive motions or speech. Behavioral therapies and other support can help autistic kids (and adults) make the most of their strengths and manage any challenges.

What is autism?

Autism is a difference in how your child's brain works that shapes how they interact with the world around them. We don't know exactly why some people are autistic and others aren't. But we do know:

- Autism isn't a disease. This is important because healthcare providers try to "cure" diseases. With autism, the goal isn't a cure. Instead, providers find ways to help your child make the most of their strengths while managing any challenges they face.
- Autistic people are neurodivergent. This word describes people whose brains are different from what's expected. If your child is neurodivergent, they may excel more in certain areas and need more support in others compared to their neurotypical peers.
- Autism is a spectrum. Autistic kids and adults have a wide range of personality traits, strengths and challenges. This means there's no one-size-fits-all approach to support. Providers tailor support to your child's unique needs and preferences.
- Autism is often misunderstood. Myths about autism go back decades. These have harmed autistic people. We can't erase this history, but we've learned from it. Today's therapies help autistic kids gain skills without forcing them to fit into a certain mold.

When discussing autism, it's important to acknowledge that words aren't perfect. And sometimes, "medspeak" that healthcare providers use — like "disorder," "symptoms" or "diagnosis" — doesn't quite match the lived experience of autistic people or their families.

Throughout this article, we'll use such medical terms as needed to describe how healthcare providers can support your family. But we recognize that autism is an identity, not just a diagnosis.

We use the term "autistic" to reflect the preferences of the autistic community, which largely prefers identity-first language.

What is autism spectrum disorder?

Autism spectrum disorder (ASD) is the full medical name for autism. The *DSM-5-TR* defines ASD as a difference in brain functioning that affects how you communicate and interact with others. For example, you may use eye contact or body language differently than someone who's neurotypical.

This brain difference also affects various aspects of your behavior, interests or activities. For example, you may repeat movements or sounds (a behavior known as "stimming") to regulate your emotions. You may prefer a fixed routine over change.

About 1 in every 31 kids in the U.S. has ASD.

What are the signs and symptoms of autism?

Autism characteristics fall into two main groups:

- Difficulties with social communication and interaction that affect how your child socializes
- Restricted and repetitive behaviors, interests or activities that affect how your child acts

Below are some examples of autism characteristics you might recognize in your child at different ages.

Signs of autism fall into two groups: difficulties with socializing and restrictive and repetitive behaviors, interests or activities.

How your child socializes

You may notice your toddler:

- Doesn't follow your gaze or look at things you're pointing to
- Doesn't respond to their name
- Seems uninterested in taking-turn games like peek-a-boo
- Doesn't seek you out to share something they've discovered
- Looks away rather than looking you in the eye
- Uses your hand as a tool to pick up things they want
- Prefers to play by themselves (continuing beyond age 2)

You may notice your older child:

- Talks about a narrow range of topics
- Has one-sided conversations without back-and-forth talk
- Seems uninterested in starting a conversation
- Has difficulty expressing their feelings or understanding how others feel
- Has difficulty using and understanding body language — for example, they might face away from someone when speaking to them
- Speaks in a monotone or sing-song voice
- Has difficulty noticing social cues

You may notice your adolescent:

- Has trouble understanding what others mean — for example, they might not recognize sarcasm
- Doesn't initiate social interactions
- Makes little or no eye contact
- Has difficulty mixing spoken words and body language
- Has a hard time building relationships with peers
- Gets along more easily with younger kids or grown-ups
- Has difficulty seeing something from someone else's point of view
- Doesn't understand certain social rules like greetings or personal space

- Appears standoffish when around others

How your child acts

You may notice your toddler:

- Repeats words or phrases (echolalia)
- Repeats motions — like flapping their hands, rocking their body or spinning in circles
- Does the same thing over and over with a toy or part of a toy — like spinning the wheels of a toy car
- Gets very upset by changes to their routine
- Lines toys or objects up in a particular order and resists anyone changing it
- Won't eat foods of certain textures
- Reacts strongly to certain fabrics or other things on their skin
- Shows strong interest in a specific object you wouldn't expect, like a wooden spoon or fan

You may notice your older child or adolescent:

- Repeats certain words or phrases from books, movies or TV shows
- Has difficulty switching between tasks
- Strongly prefers familiar routines or patterns of behavior
- Has intense or highly focused interests — like certain topics or collections

There's not always a clear line between what's a feature of autism and what's a kid simply being a kid. Lots of the things above are true for all children at one point or another. But with autism, these behaviors are more than a phase. And they may pose challenges for your child in certain settings, like school or socializing with peers.

What strengths do autistic people have?

Researchers have found a wide range of strengths among autistic people. Your child may have:

- The strength to speak out or "go against the crowd," even if it's not the popular thing to do
- A strong sense of right vs. wrong, leading them to follow their moral compass even when no one's watching
- The ability to express their thoughts directly and honestly
- A knack for connecting with people of all ages
- The ability to focus for long periods of time and gain expertise on a topic
- Strong nonverbal reasoning skills

What causes autism?

Experts haven't found a single cause of autism. It's likely a combination of genetics and certain things related to pregnancy, labor and delivery. You might see these things described as "environmental factors" or "prenatal events." These factors all interact to lead to the brain differences we see in autism.

Specific things that may make autism more likely in your child include:

- Becoming pregnant over age 35
- Becoming pregnant within 12 months of having another baby
- Having gestational diabetes
- Having bleeding during pregnancy
- Using certain medications, like valproate, while pregnant
- Smaller-than-expected fetal size (intrauterine growth restriction)
- Reduced oxygen to the fetus during pregnancy or delivery
- Giving birth early

These factors may directly change how your baby's brain develops. Or they may affect how certain genes work, leading to brain differences, in turn.

Is autism genetic?

Yes — but the genetic causes of autism are complicated. There's not a single, specific gene variation that's unique to autism. This makes autism different from some other genetic conditions, like cystic fibrosis, where providers can pinpoint a specific gene variation and say, "Ah! There it is."

Instead, *many* gene variations are linked to autism. This means autistic people might have one or more gene variations that play a role in their brain differences.

But there's not always a clear genetic cause. For example, genetic testing for your child may reveal no gene variations associated with autism. This finding doesn't change their diagnosis. And it doesn't rule out a genetic cause. It's possible that other gene variations contribute to autism, and researchers simply haven't identified them yet.

Is autism inherited?

It can be. It's easy to confuse genetics with inheritance. When we say autism is genetic, we mean variations in certain genes affect how your baby's brain works. Those gene variations might pop up for the first time in your baby — in this case, they're not inherited.

But it's also possible for biological parents to pass down gene variations to their children. Experts think autism can be inherited because they see patterns among siblings.

How do healthcare providers diagnose autism?

Diagnosing autism involves several steps. Often, the process begins at a routine well-check (annual physical). The American Academy of Pediatrics recommends autism screenings at the 18-month and 24-month visits. A screening means your pediatrician will ask some questions about your child, including how they act, communicate and express emotions.

If your pediatrician notices possible signs of autism, they'll refer you to a provider who specializes in diagnosing autism. This specialist will talk with you and spend some time observing and interacting with your child. They'll look for specific symptoms (characteristics) typical of autism.

Providers use the criteria listed in the *DSM-5-TR*. This diagnostic manual breaks down symptoms into the two main groups discussed earlier: how your child socializes and how they act.

Criteria for an autism diagnosis

Your child must have difficulties in *all three* of the following social areas:

- Social-emotional reciprocity: This is the back-and-forth nature of socializing. A common example is holding a conversation.
- Nonverbal communication: These are the movements and subtle gestures that add meaning to the words we say. Eye contact and body language are examples.
- Developing and maintaining relationships: This involves seeking people to spend time with. It also involves judging which behaviors are appropriate in different situations.

AND your child must do *at least two* of the following:

- Engage in repetitive movements, use of objects or speech: This means doing or saying the same thing over and over, more than you might expect.
- Insist on the same routine or ways of doing things: This means relying heavily on sameness and resisting change.
- Have very intense or unusual interests: This is an interest in a certain object or topic that's stronger or more consuming than you'd expect.
- React more than expected to sights, sounds and textures and/or seek out sensory experiences: This is when your child's environment overwhelms or underwhelms them. If they need more sensory input, they might sniff or touch objects more than expected.

Is there an autism test?

No, not in the way you might think of a medical test. There aren't any lab tests or specific markers in blood or pee for autism. Providers may do genetic testing to check for gene variations associated with autism. But genetic testing doesn't diagnose autism. Instead, it may help narrow down the cause of your child's brain differences.

When seeking a diagnosis, it helps to see a developmental pediatrician, who's trained to recognize autism. They can administer a standardized assessment, like the Autism Diagnostic Observation Schedule (ADOS). The ADOS is a set of questions that help providers identify autism characteristics when observing or interacting with your child. The ADOS and similar tools are designed for providers to use in a clinical setting.

What should I know about autism treatment?

There are many different therapies available to support children with autism. These therapies help your child manage any challenges they face and build on their strengths. Some therapies teach you and other family members ways to support your child.

The earlier such support begins — ideally, before age 3 — the more it can benefit your child in the long run.

Treatment for co-occurring conditions

Some autistic kids have other conditions that need support or treatment. Conditions that may co-occur with autism include:

- Attention-deficit/hyperactivity disorder (ADHD)
- Anxiety disorders
- Avoidant/restrictive food intake disorder (ARFID)
- Conduct disorder or oppositional defiant disorder
- Bipolar disorders
- Depressive disorders
- Digestive issues, like constipation
- Epilepsy
- Intellectual disabilities
- Obsessive-compulsive disorder (OCD)
- Schizophrenia spectrum disorder
- Sensory processing disorder
- Sleep disorders

Providers manage or treat these conditions with things like:

- Cognitive behavioral therapy (CBT)
- Medications
- Referrals for educational support — for example, to create an Individualized Education Plan (IEP) to meet your child's learning needs

Additional Common Questions

Is ASD a neurodevelopmental disorder?

Yes. ASD falls within the umbrella category of neurodevelopmental disorders. These are conditions affecting a child's brain function that become noticeable early in life — often before or soon after starting school.

In the past, providers used several different names to describe neurodevelopmental disorders with features of autism:

- Autistic disorder
- Asperger's disorder
- Pervasive developmental disorder not otherwise specified (PDD-NOS)
- Childhood disintegrative disorder

Providers now recognize that autism is a spectrum with a wide range of features, and autistic kids need varying levels of support. So, instead of using these other names, providers use ASD as the official diagnosis. They also describe specific features and needs unique to each child.

Abstract

Autism spectrum disorder is a diagnosis that includes significant social communication deficits/delays along with restricted patterns of interests and behaviors. The prevalence of this diagnosis has increased over the past few decades, and it is unclear whether this is solely attributable to the increased awareness of milder forms of the disorder among medical providers. The current treatment options for the core symptoms of autism are limited to psychosocial therapies, such as applied behavior analysis. Medications have been most effective in treating the associated behavioral symptoms of autism, though studies have examined potential benefits in some of the core symptoms of autism with certain medications, especially the repetitive behaviors often seen with this diagnosis. Risperidone and aripiprazole are currently the only medications FDA approved for symptoms associated with autism spectrum disorders, targeting the irritability often seen with this diagnosis. Children and adolescents with autism spectrum disorder appear to be more susceptible to adverse effects with medications; therefore, initiation with low doses and titrating very slowly is recommended. Some complementary alternative treatments have been researched as possible treatments in autism, though evidence supporting many of these is very limited.

Keywords: autism spectrum disorder, treatment, psychotherapy, psychopharmacology

Diagnosis and Prevalence

Changes to diagnostic criteria in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition included eliminating several sub-diagnostic categories (i.e. Asperger syndrome, pervasive developmental disorder not otherwise specified, disintegrative disorder) and using one term to describe both the lower and higher functioning forms of autism: autism spectrum disorder (ASD). The requirements for this diagnosis also decreased from 3 criteria (social reciprocity, communicative intent, and restricted and repetitive behaviors in DSM IV-TR) to 2 criteria (social communication/interaction and restricted and repetitive behaviors in DSM 5).[1,2] Individuals must meet all the social communication/interaction criteria, which include: problems reciprocating social or emotional interaction; severe problems maintaining relationships; and nonverbal communication problems. They must also meet 2 of the 4 restricted and repetitive behaviors criteria, which include: stereotyped or repetitive speech, motor movements or use of objects; excessive adherence to routines, ritualized behavior, or excessive resistance to change; highly restricted interests, abnormal in intensity or focus; and hyper or hypo reactivity to sensory input or unusual interest in sensory aspects of environment. These symptoms must cause functional impairment for a diagnosis to be made. Associated symptoms may be seen with autism spectrum disorder, including, but not limited to, irritability, hyperactivity, aggressive behaviors, anxiety, mood symptoms, and insomnia.[3]

Current recommendations by both the American Academy of Child and Adolescent Psychiatry and the American Academy of Pediatrics include routine developmental screening for symptoms of ASD in young children.[4,5] The US Preventative Services Task Force recently reported there is insufficient evidence to assess the balance of benefits and harms of screening for ASD in young children for whom no concerns of ASD have been raised either by their parents or their clinicians.[6] Their recommendation is for clinicians to use clinical judgment to decide if screening for ASD in these children is appropriate.

The Center for Disease Control's Autism and Developmental Disabilities Monitoring Network estimated prevalence of ASD to be 1 in 68 individuals in their latest survey.[7] The prevalence of ASD has continuously increased in past decades, with a nearly fourfold increase in diagnosis (parent-reported) from 1997 to 2008. This is thought to be, at least partially, due to increased awareness of milder forms of the diagnosis among clinicians, meaning many cases are being identified which would have previously gone undiagnosed. The latest National Health Statistics Report by the US Department of Health and Human Services and the CDC showed school-aged children newly diagnosed with ASD in or after 2008 were more likely to have milder ASD and less likely to have severe ASD than those diagnosed in or before 2007.[8]

A recent systematic review of prognosis/outcome studies showed that intelligence quotient (IQ) and early language ability are the strongest predictors for a favorable prognosis in ASD. Studies also show with age (in general) the diagnosis of ASD remains stable, but adaptive functioning improves and co-morbid behavioral symptoms become less severe, whereas social functioning, cognitive ability and language skills have more variable outcomes.[9]

Treatment

Psychosocial Therapies

Many different psychosocial interventions have been developed targeting both the core symptoms and associated symptoms of ASD. Applied behavior analysis (ABA) is a treatment based on theories of learning and operant conditioning. It includes specific intervention targets, coupled with positive reinforcement (verbal praise, tokens, or edible rewards), with repetition of learning-trials a key component.[10] It was postulated that early, intensive ABA intervention might lead to remarkable outcomes, including almost half of the children receiving this treatment gaining significant IQ points and being mainstreamed into regular classes.[11] Many of the earlier studies lacked methodological rigor, and replication with randomized controlled trials was needed to support such claims. One proposed early intensive ABA therapy model, the Early Start Denver Model, showed significant cognitive and adaptive behavior gains over the course of 2 years in a randomized, controlled trial of 48 preschool-aged children.[12] A meta-analysis examining the efficacy of ABA interventions for young children with autism showed medium to large positive effects on intellectual functioning, language development, daily living skills acquisition, and social functioning, with the larger effect sizes observed on language-related outcomes.[13]

Limitations to this form of intervention include the length of time required to see improvements, questionable generalizability of learned skills, and lack of motivation at times from the patient to work on these skills.[14] Additional limitations to ABA interventions include the cost of these intensive therapies, which can be substantial, given the intensive nature of treatment (usually 20+ hours a week).

Another intervention that shows some promise in treating core symptoms of ASD is Pivotal Response Treatment (PRT) and includes a more naturalistic behavioral method that targets specific skills as well as motivations (i.e. pivotal areas).[15,16] The theory is that PRT leads to more widespread/generalizable gains in areas not specifically targeted by the therapy, such as joint attention. It is also less time-intensive than ABA therapies. A randomized, controlled trial found

PRT to be helpful for functional and adaptive communication skills in 53 children (aged 2 to 6 years) with autism and significant language delay.[17] A randomized clinical trial comparing PRT and ABA interventions found PRT to be superior to ABA in improving verbal expressive communication with three months of treatment.[18] Children also were found to exhibit less disruptive behaviors during PRT when compared to ABA.[19]

One randomized controlled trial examined the addition of a supplemental social curriculum to treatment, which included aspects of ABA and PRT to assess whether the supplemental curriculum resulted in improved joint attention, shared positive affect and socially engaged imitation as compared to those without the supplemental curriculum.[20] The group with the supplemental curriculum showed a twofold increase in socially engaged imitation, though the other two outcome variables showed similar gains in both treatment groups. Other psychosocial interventions include parent-mediated early interventions (teaching parents interventions that they can then apply in the home) and social skills interventions. Studies examining parent-mediated interventions have shown mixed results and most include small sample sizes, though one large randomized controlled trial showed parent training to be superior to parent education alone.[21-25] Other randomized controlled trials have found parent-training to be effective in improving social communication and adaptive behavior.[26,27]

Social skills interventions have also been studied, though usually as components of other types of therapies. They have been studied more extensively in individuals with medium to higher cognitive functioning levels and are often provided in a group format. Social skills interventions include peer-related mediation, social narratives, and video modeling. Goals of social skills training may include emotional regulation, basic conversation skills, nonverbal communication skills, perspective taking, initiating, responding, and maintaining social interactions.[28] Reviews of social skills interventions show them to be promising treatments, especially with targeted skills; however, the generalizability of

skills is still unclear and more rigorous, high quality intervention studies are needed.[29,30] Cognitive behavior therapy (CBT) has been studied as a treatment for co-morbid anxiety disorders in children and adolescents with autism spectrum disorder. Randomized controlled trials have shown CBT to be an effective treatment for anxiety, but it may be more effective for higher functioning individuals.[31-34]

Pharmacology

Medications are primarily used for treating associated symptoms of autism spectrum disorder, as efficacy for use in treating the core symptoms of autism has not been established. Targeted associated symptoms may include, but are not limited to, irritability, aggression, self-injurious behaviors, anxiety, hyperactivity, impulsivity, inattention, and insomnia.

Atypical Antipsychotics

Risperidone and aripiprazole are approved by the Food and Drug Administration (FDA) for the treatment of irritability associated with the diagnosis of autism spectrum disorder. Risperidone is approved in children at least 5 years of age

and aripiprazole is approved for children at least 6 years of age.

Risperidon

A double blind, placebo-controlled study by the Research Units on Pediatric Psychopharmacology (RUPP) Autism Network examined the efficacy of risperidone in treating irritability associated with autism in 101 individuals, aged 5–17 years.[35] This 8 week study compared risperidone (mean dose 1.8 mg/d) to placebo on measures of irritability (Abberant Behavior Checklist Irritability subscale) and global improvement (Clinical Global Impressions – Improvement scale).[36-37] Response was defined as ≥ 25% decrease in the irritability score and a rating of much improved or very much improved on the CGI-I scale. Response rates were 69% in the risperidone treatment group and 12% in the placebo group, which was a significant difference. Significant side effects in the risperidone group were weight gain (2.7 kg versus 0.8 kg in the risperidone and placebo groups, respectively), increased appetite, fatigue, drowsiness, dizziness, and drooling. Of the responders in the risperidone group, 68% maintained this response at a 6 month follow up. An 8-week, double-blind, placebo-controlled study examined the efficacy of risperidone on irritability in children with autism and other pervasive developmental disorders. The risperidone group (mean dose 1.17 mg/d) was superior to placebo in decreasing scores on the irritability subscale of the ABC.[38] Weight gain was significant in the risperidone group, with a mean increase of 2.7 kg versus 1 kg in the placebo group. A six month randomized controlled trial examined the efficacy of risperidone in children with autism spectrum disorder.[39] Targets included some core autism symptoms (social and emotional responsiveness and communication) and associated symptoms (aggressiveness, hyperactivity, and irritability). The primary outcome measures were the changes in the median Childhood Autism Rating Scale rating from baseline and the mean Children's Global Assessment Scale score from baseline.[40-41] The risperidone group was superior to the placebo group on both outcome measures. Risperidone also lessened hyperactivity and aggression and improved social responsiveness and nonverbal communication. Side effects in the risperidone group included mild sedation, increased appetite, weight gain (mean 2.8 kg), and mild, transient dyskinesias.

Several studies have examined the long-term benefits of risperidone in autism spectrum disorder. A blinded discontinuation study examined the long-term efficacy of risperidone in children, aged 5 to 17 years.[42] The 8 week, randomized, double-blinded discontinuation phase of this study included 32 individuals.[35] After 6 months of risperidone treatment, 62.5% of youth randomized to placebo relapsed compared to 12.5% of youth randomized to continue risperidone treatment, which was a significant finding. Relapse was defined as a 25% increase in the ABC irritability subscale score and a CGI-I score of much worse or very much worse compared to the prediscontinuation baseline. A study examining the long term efficacy of risperidone in autism spectrum disorder in 36 youths (aged 5 to 17 years) included 6 months of risperidone treatment followed by an 8 week, randomized, double-blinded, placebo-controlled discontinuation phase.[43] Signifcantly more youth in the placebo group relapsed (67%) when compared to youth who continued risperidone treatment (25%) during the discontinuation phase of the study. Side effects in the risperidone group included increased weight and appetite, anxiety, and fatigue. A 21-month naturalistic study followed 84 children and adolescents over an average of 21 months and showed 2/3 of the participants remained on risperidone throughout the follow up period.[44] Though risperidone was associated with more adverse effects (weight gain, enuresis, increased appetite), the study concluded that these were balanced by the positive effects seen in those who continued treatment. These included improved social skills/socialization and decreased irritability, compared to baseline and compared to the group who discontinued treatment during the follow up phase.

The efficacy of risperidone and haloperidol was compared in 30 children and adolescents, aged 8 to 18 years in a 12-week randomized controlled trial.[45] The mean dose was 2.6 mg/d in both the risperidone and haloperidol groups. Risperidone was shown to be more effective in reducing behavioral symptoms and impulsivity than haloperidol. It was also more effective in improving language skills and social relations. When comparing adverse effects, the risperidone group had greater increases in prolactin and the haloperidol group had greater increases in alanine amino transferase (ALT). There was no significant difference between the two groups in weight gain.

Though no medication is approved for use in treating the core symptoms of autism, there is some evidence that risperidone may be effective in treating the repetitive and restricted patterns of behaviors in children with autism. An open-label continuation study of 63 children and adolescents (aged 5–17 years) examined the efficacy of risperidone in treating the core symptoms of autism spectrum disorder.[46] Measurements included the Ritvo-Freeman Real Life Rating Scale, the Children's Yale Brown Obsessive Compulsive Scale, and the maladaptive behavior domain of the Vineland Adaptive Behavior Scales.[47-49] Statistically significant improvements in restricted, repetitive, and sterotyped patterns of behavior, interest, or activities was observed over the 16 week continuation phase. No significant improvement was observed in the area of social interaction and communication.

The benefits of risperidone for adaptive behaviors in autism spectrum disorder was examined in 48 children and adolescents, aged 5 to 16 years.[50] Adaptive behaviors were assessed using the Vineland Adaptive Behavior Rating Scales over a 6 month period. Significant improvement was seen in adaptive behavior in the areas of communication, daily living skills, and socialization. This suggests possible direct positive effects on adaptive behavior with risperidone treatment, but more rigorous study is needed in this area.

Aripiprazole: The efficacy of aripiprazole in the acute treatment of irritability associated with autism spectrum disorder was examined in an 8 week, double-blind, randomized controlled trial in 218 children and adolescents, aged 6 to 17 years.[51] Subjects were randomized into four fixed dosing groups, 5 mg, 10 mg, 15 mg, or placebo. All doses of aripiprazole were superior to placebo on the primary outcome measure, the mean change on ABC irritability subscale score from baseline to endpoint. Weight gain was significantly higher in each aripiprazole dose group when compared to placebo, and sedation was the most common adverse effect reported. An 8 week trial examined the efficacy of aripiprazole in the treatment of irritability associated with autism spectrum disorder in 98 children and adolescents, aged 6–17 years, using a flexible dosing schedule.[52] Doses at 8 weeks were either 5 mg, 10 mg, 15 mg, or placebo. Aripiprazole was found to be superior to placebo

on the primary outcome measure of mean change of the ABC irritability subscale score from baseline to endpoint. The most common side effects in the aripiprazole group were somnolence and fatigue. The rate of extrapyramidal symptoms was 14.9% in the aripiprazole group, versus 8% in the placebo group.A double-blind, randomized, placebo-controlled trial examined the efficacy of aripiprazole in preventing relapse in long-term maintenance treatment.[53] The study included 85 youths, aged 6 to 17 years with autism, who were responders to acute treatment with aripiprazole for 12 weeks. They were randomized to receive either continued aripiprazole treatment or placebo and followed to relapse or 16 weeks. Time from randomization to relapse was the primary outcome measure, and there was no difference between the two groups on this measure. The hazard ratio (HR = 0.57) and number needed to treat (NNT = 6) suggested that some patients may benefit from maintenance treatment.

The long-term efficacy of aripiprazole for irritability in patients with autism spectrum was examined in a 52 week open-label study of 199 children and adolescents, aged 6–17 years.[54] The study included responders to acute treatment with aripiprazole (who continued treatment for the 52 weeks of this study) as well as individuals with no prior treatment with aripiprazole (who began open-label treatment with this study, continuing for 52 weeks). Flexible dosing was used, with a mean daily dose of 10.6 mg by week 52. The group that continued treatment with aripiprazole maintained response, as measured by the ABC irritability subscale and the CGI improvement scores. The group of patients with no prior aripiprazole treatment showed significant improvement in both scores compared to baseline. The most common side effects included weight gain, vomiting, nasopharyngitis, appetite increase, pyrexia, upper respiratory tract infection, and insomnia.

A 2-month randomized, double-blind, placebo-controlled comparison trial examined the efficacy of aripiprazole versus risperidone in 59 children and adolescents with autism spectrum disorder and associated behavioral symptoms.[55] There

was no difference between the groups on primary outcome measures (ABC scores) or on safety measures (including appetite increase and weight gain).

Olanzapine: The efficacy of olanzapine on global improvement was examined in an 8-week double-blind, randomized, placebo-controlled study of 11 children and adolescents (aged 6 to 14 years) with pervasive developmental disorders.[56] Response rates (CGI-I $\leq$ 2) were significantly higher in the olanzapine group compared to the placebo group (50% versus 20%, respectively). Weight gain was significant in the olanzapine treatment group (mean 7.5 pounds) compared to the placebo group (mean 1.5 lbs).

In a 3 month open-label study, the efficacy of olanzapine was examined in 25 children and adolescents (aged 6 to 16 years) with autistic disorder or pervasive developmental disorder not otherwise specified.[57] The mean daily dose of olanzapine in the study was 10.7 mg. The 23 who completed the study showed significant improvements on the ABC subscales of irritability, hyperactivity, and excessive speech; however, only 3 youth were deemed "responders" based on CGI Severity/Improvement scores. Significant weight gain was observed (mean 4.7 kg), along with appetite increase and loss of strength.

An open label study examining the efficacy of olanzapine in 40 male youth, aged 7 to 17 years, with autism showed significant decreases in the ABC subscales of irritability, stereotyped behaviors, hyperactivity, and inappropriate speech.[58] Only 30% of the study participants were considered much improved based on CGI severity scores when

compared to baseline. Mean daily dose was 7.5 mg and no significant weight gain was observed in this study.

Lurasidone: A 6-week, double-blind, randomized, placebo-controlled study examined the efficacy of lurasidone for irritability associated with autism spectrum disorder in 150 children and adolescents, aged 6 to 17 years.[59] Study participants were randomized into three different fixed dosing groups: lurasidone 20 mg/day, lurasidone 60 mg/day, and placebo. Lurasidone was not found to be superior to placebo at either dose as measured by the change in ABC-I scores from baseline. Lurasidone was superior to placebo, as measured by change in the CGI-I scores from baseline to endpoint, in the 20 mg/day treatment group but not in the 60 mg/day treatment group. The most commonly observed side effects included vomiting and somnolence.

Quetiapine: Several small, open-label studies have examined the efficacy of quetiapine in children and adolescents with autism spectrum disorder. One 16-week trial included 6 male children with autism who also had intellectual disability.[60] No statistically significant improvement in symptoms were demonstrated. Side effects with quetiapine were sedation, a possible seizure, behavioral activation, increased appetite and weight gain. A 12-week trial with 9 adolescents with autism showed overall low response; only 2 study participants met criteria for response (CGI $\leq$ 2).[61] A study examined the efficacy of low dose quetiapine in 11 adolescents with autism spectrum disorder over the course of 8 weeks.[62] Mean dose of quetiapine was 122.7 mg/day at the end of the study. The study showed significant improvements in aggression and sleep, and quetiapine was generally well-tolerated at these lower doses.

Ziprasidone: A 6-week, open-label pilot study of ziprasidone examined the efficacy and safety of this medication in 12 adolescents with autism.[63] Seventy-five percent of participants were deemed responders (CGI-I $\leq$ 2), and ziprasidone was well-tolerated, with no weight gain and mean QTc increase of 14.7 msec. Two

study participants experienced acute dystonic reactions. An open-label trial examined the efficacy of ziprasidone in 12 patients, aged 8–20 years with autism or pervasive developmental disorder not otherwise specified for at least 6 weeks.[64] Fifty percent of study participants were considered responders (CGI-I ≤ 2), with transient sedation as the most commonly observed side effect. There was no observed weight gain and no observed cardiovascular side effects.

PaliperidoneAn 8-week, open-label trial examined the efficacy of paliperidone in the treatment of irritability in 25 adolescents and young adults (aged 12–21 years) with autism.[65] The mean daily dose of paliperidone was 7.1 mg. Eighty-four percent of study participants were considered "responders" (CGI-I ≤ 2 and ≥ 25% improvement in ABC-I score). Mild to moderate extrapyramidal symptoms were reported in 4 study participants and mean weight gain was 2.2 kg over the course of the study.

Typical Antipsychotics

Haloperidol

Haloperidol was one of the first medications studied for use in autism spectrum disorder. Studies of acute treatment with haloperidol have shown benefits in the areas of hyperactivity, temper tantrums, withdrawal, stereotypical behaviors, and facilitating learning on discrimination tasks.[66-68] Doses used in these studies ranged from 0.25 mg to 4 mg per day. The most commonly observed side effects included sedation, irritability, and acute dystonic reactions. A 6-month study examining the long-term efficacy of haloperidol in 60 children (aged

2–8 years) with autism showed maintenance of efficacy over the course of the study.[69] It was most helpful for children with irritability, angry/labile affect, and uncooperative behaviors. Side effects included haloperidol-related dyskinesias, including withdrawal dyskinesias.

The risk of extrapyramidal symptoms with haloperidol is a concern. A prospective, longitudinal study followed 118 children, aged 2 to 8 years, with autism treated with haloperidol for associated behavioral symptoms for a mean length of 708 days.[70] Thirty-four percent of children developed either withdrawal or tardive dyskinesia during the course of the study. The risk of dyskinesia increased with length of treatment, making long-term use of this medication especially concerning. For this reason, haloperidol should be considered after the atypical antipsychotics in children and adolescents with autism spectrum disorder.

Antidepressants

Antidepressants have been considered for use in autism spectrum disorder due to the observed symptoms of repetitive, ritualistic behaviors and insistence on restricted patterns of routines. Selective serotonin reuptake inhibitors (SSRIs), tricyclic antidepressants, and other antidepressants have been studied in patients with autism spectrum disorders.

Selective Serotonin Reuptake Inhibitors (SSRIs)

Studies examining the efficacy of SSRIs in autism spectrum disorder have had mixed results. Some studies show potential benefits in the treatment of repetitive movements and irritability, while others show no improvement and significant adverse effects when these medications are used in this patient population.

Two double blind, placebo-controlled studies examining the efficacy of fluoxetine showed conflicting results. In one study of 45 children and adolescents (aged 5 to 17 years), the efficacy of liquid fluoxetine was compared to placebo for repetitive behaviors associated with autism spectrum disorder.[71] This cross-over study included 8 weeks of treatment with fluoxetine and 8 weeks of treatment with placebo, separated by a 4-week washout phase. Fluoxetine (mean dose 10 mg/day) was found to be superior to placebo in the treatment of repetitive behaviors, as measured by the Children's Yale-Brown Obsessive-Compulsion Scale, compulsions subscale (CY-BOCS).[72] Fluoxetine appeared to be well-tolerated. A 14-week double-blind, placebo-controlled trial examined the efficacy of low dose fluoxetine for repetitive behaviors associated with a diagnosis of autistic disorder in 158 children and adolescents (aged 5 to 17 years).[73] Fluoxetine was not found to be superior to placebo in this study. An open trial examined the efficacy of fluoxetine in 23 children and adults with autistic disorder and found significant improvement in CGI ratings of clinical severity in 15 of 23 subjects.[74] Observed side effects were restlessness, hyperactivity, agitation, decreased appetite or insomnia.

Citalopram was not superior to placebo in a randomized, placebo-controlled trial of 149 children and adolescents (aged 5 to 17 years) with autism spectrum disorder.[75] The primary outcome measures were the CGI, Improvement subscale and CY-BOCS (repetitive movements), and the mean daily dose of citalopram was 16.5 mg. 97% of those in the citalopram group experienced adverse effects, including increased energy, impulsivity, decreased concentration, hyperactivity, stereotypy, diarrhea, insomnia, and dry skin or pruritus.

Fluvoxamine was studied in a double-blind, placebo-controlled study in 34 children with autistic disorder.[76] No significant clinical improvement was seen with the medication when compared to placebo. The efficacy of low dose fluvoxamine (mean 67 mg/day) was examined in an open study of 18 children and adolescents with pervasive developmental disorders.[77] No statistically significant improvement was seen during the 10-week study. Adverse effects were experienced in 72% of the participants, with agitation/behavioral activation and insomnia the most commonly reported symptoms.

The efficacy of escitalopram was examined in a 10-week open-label trial of 28 children and adolescents (aged 6 to 17 years) with pervasive developmental disorders.[78] Significant improvement was seen on irritability and global improvement measures, and the study highlighted the need to start with very low doses and titrate slowly. Twenty-five percent of the participants responded at doses < 10 mg and did not tolerate doses at or above 10 mg. The most commonly reported adverse effects were irritability and hyperactivity, which appeared dose-related.

Other Antidepressants

Low dose venlafaxine was found to be effective for repetitive behaviors and restricted interests, social deficits, communication and language function, inattention, and hyperactivity in an open, retrospective clinical report of 10 individuals (aged 3 to 21 years) with autism spectrum disorder.[79] Over an average length of 5 months, 60% of participants responded to venlafaxine (mean dose 24.4 mg/day). Response was based on CGI, improvement scores, and adverse effects included behavioral activation, nausea, inattention and polyuria.

Mirtazepine was studied in a naturalistic open-label study of 26 children and adults (aged 3 to 23 years) with pervasive developmental disorders.[80] The mean daily dose was 30 mg/day, and 34.6% of participants were deemed responders (much improved or very much improved on CGI scale). The medication was not effective for the core symptoms of social or communication impairment. Adverse effects included increased appetite, irritability, and sedation.

A 6-week, open-label, pilot study of 8 children with autistic disorder showed clomipramine was not effective for symptoms, with 7 of the 8 children showing worsening symptoms.[81] Side effects were also concerning, including one incidence of acute urinary retention, requiring catheterization. Five children with autistic disorder and severe intellectual disability showed improvement in adventitious movements and compulsions in a small, open-label study of clomipramine.[82]

A double-blind, placebo-controlled trial examined the efficacy of clomipramine and desipramine in the treatment of autistic disorder.[83] This 12 week study included 24 participants, aged 6 to 23 years, with autistic disorder and included a clomipramine versus placebo group (n = 12) and a clomipramine and desipramine crossover comparison group (n = 12). Clomipramine was superior to both placebo and desipramine on measures of stereotypical behaviors, anger, and compulsive, ritualized behaviors. Both clomipramine and desipramine were helpful for reducing hyperactive behaviors. Adverse effects were high in the desipramine group, with 8 of the 12 subjects experiencing increased irritability, temper outbursts, and uncharacteristic aggression while receiving desipramine. Clomipramine was relatively well-tolerated, with no significant adverse effects when compared to placebo.

Mood Stabilizers

There have been two small double-blind, placebo-controlled studies of divalproex sodium for the treatment of autism spectrum disorder in children and adolescents, aged 5 to 17 years. A 12-week study examined the efficacy of this drug in treating irritability in 27 children and adolescents with autism spectrum disorder.[84] Response was defined using scores from the ABC, irritability subscale and the CGI-I scale, with 62.5% in the divalproex sodium treatment group responders versus 9% in the placebo group, which was statistically significant. The trend was for responders to have higher valproate blood levels than the non-responders. Divalproex sodium was generally well-tolerated, with one case of extreme agitation in the treatment group. An 8-week study examined the efficacy of divalproex sodium in improving repetitive behaviors associated with autism spectrum disorder in 13 children and adolescents.[85] There was significant improvement in repetitive behaviors among the group treated with divalproex sodium when compared to placebo, as measured by the CY-BOCS. The most common adverse effect in the divalproex sodium group was irritability.

A randomized, double-blind, placebo-controlled trial examined the efficacy of lamotrigine in 28 children (aged 3–11 years) with autistic disorder.[86] This 18 week study showed no significant difference between lamotrigine and placebo on any of the outcome measures. Reported adverse effects also did not differ significantly between the groups.

Stimulants/Atomoxetine/Alpha-2 Agonists

Symptoms of attention-deficit/hyperactivity disorder (ADHD) are commonly observed with a diagnosis of autism spectrum disorder, which has led to research examining the efficacy and tolerability of ADHD treatments in this patient population. Several studies have examined the efficacy of methylphenidate for symptoms of inattention, hyperactivity, and impulsivity among patients with a diagnosis of autism spectrum disorder. The largest of these, a double-blind, placebo-controlled, crossover study,[87] included 72 children and adolescents, aged 5–14 years, with pervasive developmental disorders and hyperactivity. Methylphenidate was found to be superior to placebo in treating hyperactive symptoms using the ABC, hyperactivity subscale. Effect sizes ranged from 0.20 to 0.54, lower than what is seen in typically developing children and adolescents with ADHD treated with methylphenidate. Adverse effects were also observed more frequently than are seen in typically developing patients with ADHD, and included appetite decrease, insomnia, irritability and emotional outbursts. A placebo-controlled study examining the use of extended-release preparations of methylphenidate in 24 elementary school-aged children with autism spectrum disorder showed it was beneficial for hyperactivity, impulsivity and inattention with no evidence of an increased risk of adverse effects in this patient population.[88] This study included children who were relatively high functioning, and the investigators point this out as a potential limitation of the study.

Smaller placebo-controlled studies have shown benefits of methylphenidate for hyperactivity in children with autism

spectrum disorder, but effects have been modest and side effects are concerning, especially at higher doses.[89-91] More studies examining the effects of this medication on core symptoms of autism are needed. The findings from the existing studies suggests a need to start these medications at low doses and increase slowly.

Atomoxetine has been studied in several double-blind, placebo-controlled trials in children and adolescents with autism spectrum disorder and ADHD symptoms.[92-94] Modest improvements in hyperactive and impulsive symptoms were seen in these studies, and atomoxetine was generally well-tolerated, with no indication of increased adverse effects in this population versus that of typically developing children and adolescents with ADHD. One study found atomoxetine to be effective in some core autism symptoms (decreasing restricted and stereotyped behaviors and communication) but showed no effect on social functioning.[94]

Due to concerns about a possible increased risk of side effects when using stimulants in children with autism spectrum disorder, alpha-2 agonists have been studied as possible alternatives to stimulants for managing hyperactivity and impulsivity in this patient population. A recent randomized, double-blind, placebo-controlled trial examined the efficacy of extended-release guanfacine in children and adolescents (aged 5 to 14 years) with autistic disorder, asperger's disorder, or pervasive developmental disorder, not otherwise specified.[95] This 8 week trial showed extended-release guanfacine to be superior to placebo in lowering scores on the ABC-hyperactivity subscale as well as on global improvement measures (CGI-I scores). Adverse effects included drowsiness, fatigue and decreased appetite. Blood pressure decreased slightly early in the study, but returned to baseline by study endpoint. These findings were similar to another trial in which guanfacine was compared to placebo in children (aged 5 to 9 years) with autism, intellectual disability, and comorbid ADHD.[96] Guanfacine was superior to placebo on measures of hyperactivity and global improvement. Adverse effects included drowsiness and irritability, with no significant difference in blood pressure or pulse in the guanfacine group.

Two small double-blind, placebo-controlled studies and one retrospective open-label study have examined clonidine for the treatment of hyperactivity and impulsivity in children and adolescents with autism spectrum disorders.[97-99] All three studies found clonidine to be at least modestly effective for symptoms of hyperactivity. Some of the studies found it to be helpful for other symptoms, such as social relationships, sensory responses, irritability, sleep and aggression. Adverse effects common to all three studies were sedation or drowsiness, but the medication was otherwise well-tolerated.

Other Medications

Several randomized, placebo-controlled trials have examined the efficacy of naltrexone for core symptoms of autism, associated symptoms of hyperactivity and irritability, and for discrimination learning. Overall, it appears naltrexone may have some benefits in reducing hyperactivity and impulsivity in children and adolescents with autism spectrum disorder, but core symptoms did not appear to improve with this medication.[100-103] Naltrexone also had no effect on discrimination learning.[104-105] The efficacy of oxytocin has been examined in several randomized, placebo-controlled trials in children and adolescents with autism spectrum disorder and results have been mixed. One small study showed oxytocin to improve emotion recognition significantly when compared to placebo.[106] Two other studies showed no separation from placebo on social behaviors, emotion recognition, or general behavioral symptoms.[107,108]

Medications that have shown some promise in improving the core symptoms of autism in children and adolescents in randomized, placebo-controlled trials include donepezil hydrochloride, levocarnitine (l-carnitine), and the GABA-ergic drug, bumetanide.[109-111] Galantamine may be beneficial for irritability, hyperactivity and social withdrawal associated with autism spectrum.[112] More studies replicating these findings are needed to support the use of these medications in

the management of autism spectrum disorders.

Medications that have shown mixed results in randomized, placebo-controlled trials of children and adolescents with autism spectrum disorders include amantadine and arbaclofen. Amantadine showed no improvement on parent-ratings of hyperactivity and irritability, but clinicians reported significant improvements in behavioral ratings.[113] Arbacolfen showed no significant improvement on social withdrawal compared to placebo, but it did separate from placebo on improved global functioning scales.[114] Medications that have shown no benefits in treating symptoms of autism in children and adolescents in randomized, placebo-controlled studies include mecamylamine, memantine, and levetiracetam.[115-117]

Several medications have been studied as potential augmenting agents in combination studies with risperidone or haloperidol. Agents studied as augmenting agents to risperidone include pentoxifylline, N-acetylcysteine, riluzole, memantine, amantadine, celecoxib, pioglitazone, and buspirone.[118-126] All medications except buspirone were superior to risperidone plus placebo on various measures, including irritability, hyperactivity, social withdrawal, or inappropriate speech. Cyproheptadine was studied in combination with haloperidol and was found to be superior to haloperidol plus placebo on the primary outcome measure, change in scores on the Aberrant Behavior Checklist from baseline to endpoint.[127] More studies are needed examining medication augmentation strategies in children and adolescents with autism spectrum disorder.

Complementary Alternative Medicine

The efficacy of melatonin for sleep disturbances in children and adolescents with autism spectrum disorder has been examined in multiple double-blind, placebo-controlled studies, making it one of the best-studied complementary alternative treatments used in autism spectrum disorder. The largest of these examined controlled-release melatonin alone and in combination with cognitive-behavioral therapy (CBT) versus CBT alone and placebo in 160 children (aged 4 to 10 years) with autistic disorder.[128] This 12-week study showed combination treatment (melatonin plus CBT) to be the most effective intervention for sleep-related difficulties, but all active treatment groups outperformed placebo. No difference was observed between the groups in reported adverse effects. Other randomized, placebo-controlled trials and one open trial have shown similar improvements in sleep with melatonin, and none showed treatment-emergent adverse effects with this medication.[129-133] Melatonin was well-tolerated in all the above studies and appears to be a safe treatment option for sleep in children with autism spectrum disorder.

Omega-3 fatty acids have been examined as potential treatments for autism spectrum disorder, specifically for the associated symptom of hyperactivity. Randomized, placebo-controlled trials have shown possible improvements in hyperactivity in children and adolescents with autism spectrum disorder, but the findings have failed to achieve statistical significance in this population.[134-136] Omega-3 supplementation has been relatively well-tolerated, and seems to be a safe intervention to consider in children with ASD.

Methyl B12 has been studied in two randomized, placebo-controlled trials as a treatment for both behavioral symptoms and core symptoms of autism spectrum disorder in children. One study found no significant difference between the placebo group and the active treatment group,[137] and the other study found significant improvement in clinician-ratings of global improvement but no difference in parent-ratings of behavioral or core symptoms when compared to placebo.[138] Though it was considered to be safe and was well-tolerated in these studies, the need for frequent injections make this treatment less desirable for many patients and their families. N-acetylcysteine may improve irritability in children with autism and appears to be well tolerated, but more studies are needed examining its efficacy in this patient

population before this treatment can be recommended.[139] Vitamin supplementation has been studied as a possible treatment for autism spectrum disorder, and results from two randomized controlled trials have been mixed. One study found significant improvements only in gastrointestinal symptoms and sleep compared to placebo, but no significant improvements in core symptoms or associated behavioral symptoms of ASD.[140] The other study found significant global improvement on parent rating scales, along with improved receptive language and decreased hyperactivity and tantrums.[141]

Digestive enzymes and special diets have been examined as potential treatments in autism spectrum disorder, due to the increased rate of gastrointestinal symptoms found in these patients. The evidence does not support any improvement in core symptoms or associated behavioral symptoms of autism with digestive enzyme supplementation, though it may improve food variety scores in these patients.[142] A small randomized, placebo-controlled study examining the possible effects of a gluten-free/casein-free diet suggested no change in core symptoms or associated behavioral symptoms in children with autism in a double-blind challenge trial.[143]

Intravenous immunoglobulin therapy has been suggested as a potential treatment for autism spectrum disorder, however there are no randomized-controlled trials examining this treatment in children and adolescents with autism. The several open-label trials have been mixed, and there is significant risk associated with this treatment, therefore, available evidence does not support this treatment for ASD.[144-147]

Chelation is another suggested treatment for symptoms of autism spectrum disorder which is associated with significant risks and has limited evidence supporting its use in this patient population. Two studies conducted by the same group

reported possible benefits from chelation therapy for symptoms of autism spectrum disorder; however, the studies were not randomized controlled trials, and only served to compare one round versus multiple rounds of chelation therapy for autism symptoms. A small group of study participants showed worsening of symptoms, which is concerning. No difference was found between the two groups on any of the measures of core symptoms or associated behavioral symptoms.[148-149] Post-chelation urine metal reference ranges have not been validated, and comparing them with validated non-chelated urine specimens may be misleading.[150] There are risks associated with unnecessary chelation, some of which are severe (hypocalcemia, renal impairment, and reported death), and there is evidence that some patients may experience worsening symptoms after treatment, therefore, this treatment is not currently recommended for children and adolescents with autism spectrum disorder.[147] The FDA released a warning for parents regarding several possibly harmful treatments for autism spectrum disorder that do not have evidence supporting their use, including chelation therapies, hyperbaric oxygen therapy, miracle mineral solution, detoxifying clay baths, and coconut kefir and other probiotic products.[151] It is important for clinicians to be aware of the various proposed complementary and alternative treatments so they can answer questions parents and families may have and provide evidence-based treatment recommendations.