



PWSA | USA 2023
NATIONAL CONVENTION

June 21 – 24, 2023 • Orlando, FL

Genetics of Prader Willi Syndrome 101/Standards of Care

Birth to Adulthood

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Objectives

- Discuss evidence-based care recommendations for individuals with Prader-Willi syndrome.
- Provide the information on treatments with experiential data without clear evidence for use.
- Provide resources and tools to empower you to educate your child's providers.

Clinical criteria for PWS

Age at Assessment	Add lack of interest in feeding	Features Sufficient to Prompt DNA Testing
Birth to 2 y		Significant hypotonia with poor suck and difficulty with weight gain
2–6 y		Congenital hypotonia with history of poor suck; global developmental delay
6–12 y		History of congenital hypotonia with global developmental delay (often persists), hyperphagia; obsession with food); rapid escalation of mood from A to Z in seconds
13 y through adulthood		Cognitive impairment, uncontrolled, and hypothalamic hypogonadism and/or typical behavior problems (including temper tantrums and obsessive-compulsive features); compulsive eating

Adapted from Gunay-Aygun M, Schwartz S, Heeger S, O’Riordan MA, Cassidy SB.

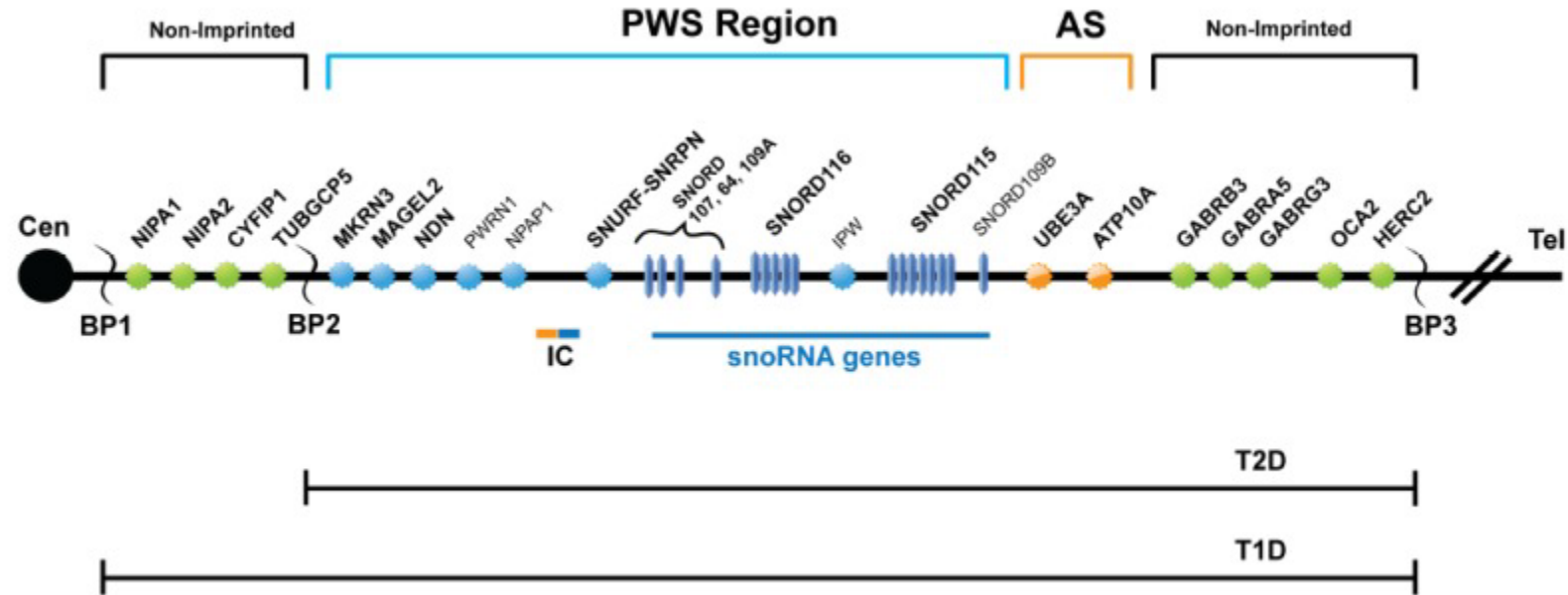
Daytime sleepiness 50%
Cataplexy 15%

Seizures ~10-15%

Add skin picking, perseveration on topics (asking questions over and over), focus on mealtime

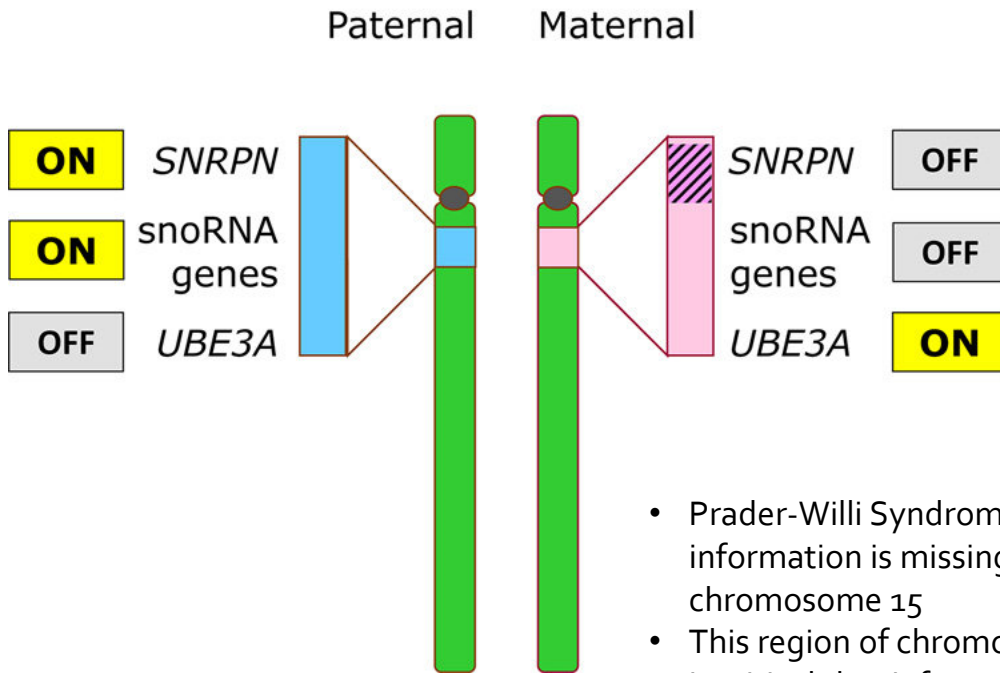
Step I: Establish the Diagnosis

Molecular basis of PWS



Chromosome 15

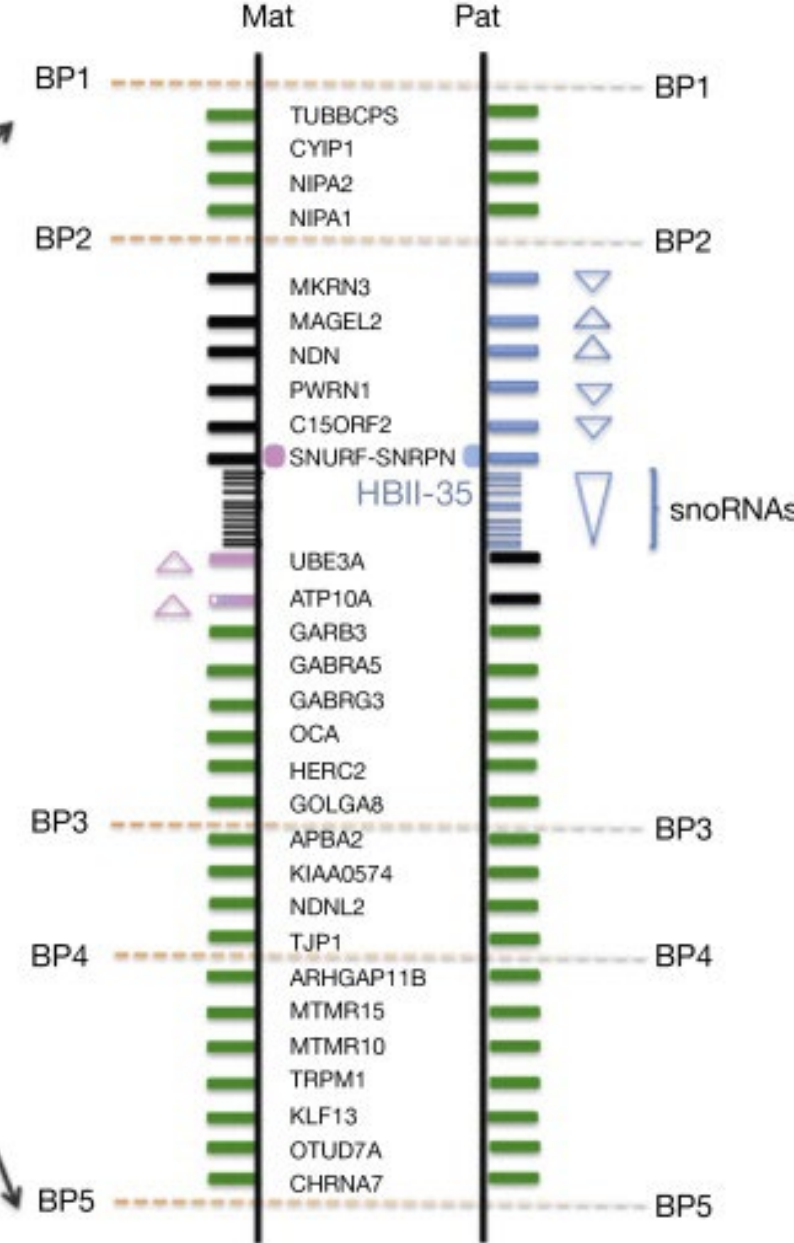
Chromosome 15



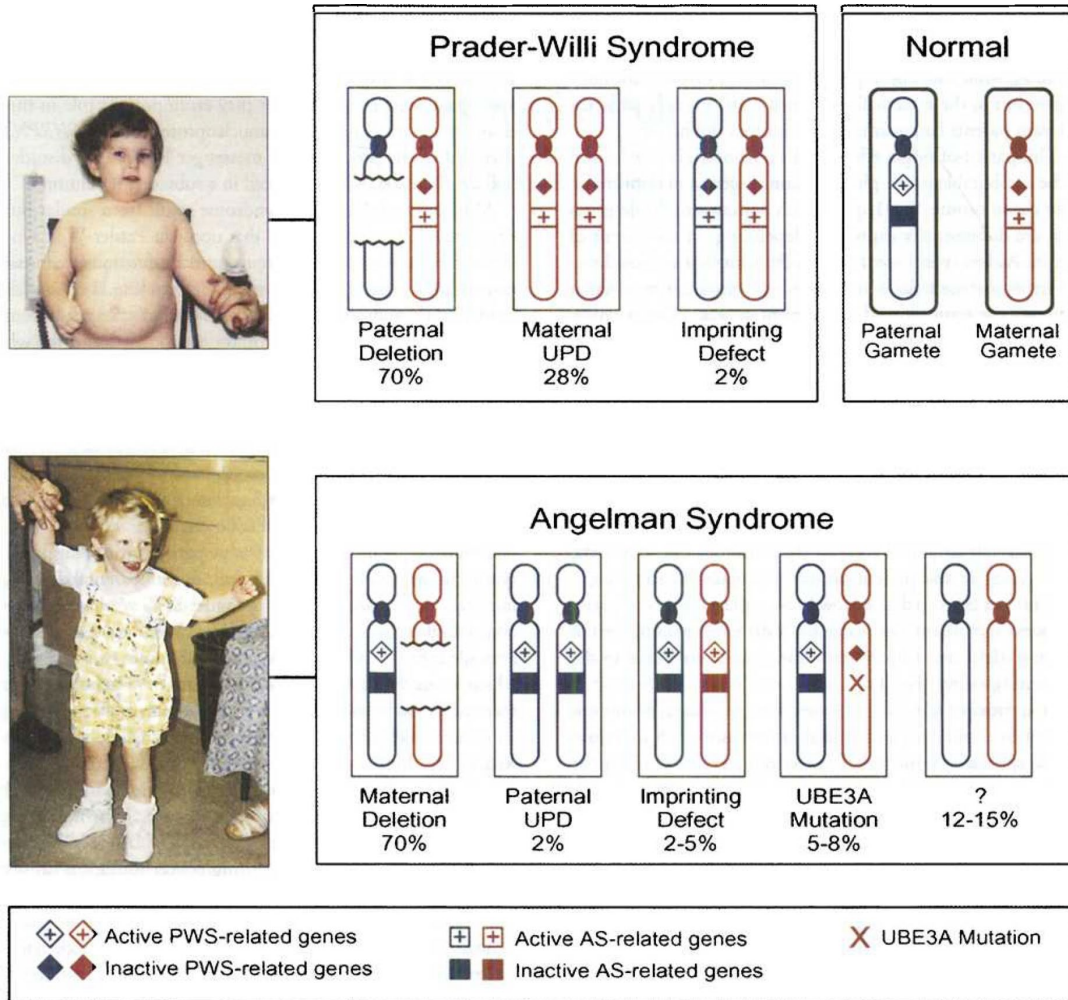
- Prader-Willi Syndrome results when genetic information is missing from the father's copy of chromosome 15
- This region of chromosome 15 is *imprinted*, so that it is critical that information from both the maternal and paternal alleles are present for a person to be normal.



15q11.1-q13.3

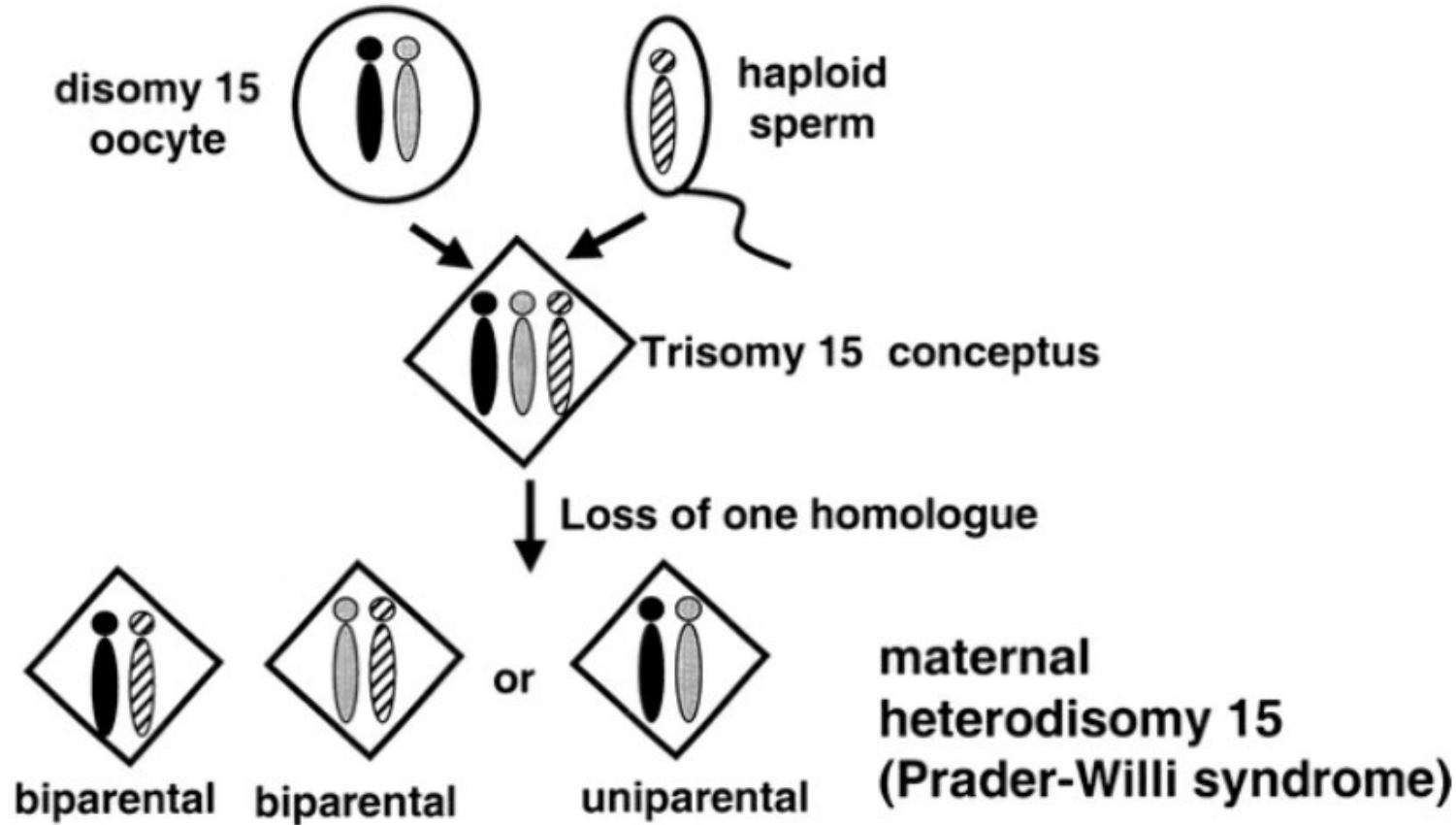


What causes Prader Willi syndrome?



- PWS may result because of:
 - **A deletion of a part of the paternal copy of chromosome 15 (most common)**
 - Inheritance of 2 copies of mother's chromosome 15 called uniparental disomy
 - An imprinting error in how the alleles are marked, causing the body to recognize both chromosome 15s as coming from the mother
- A deletion of the maternal allele causes a completely different disorder known as Angelman syndrome.

(a) Trisomy Rescue



Mechanism
of UPD

Genotype-phenotype correlation

Why is it important to know the specific genetic cause of PWS?

- *Psychosis and autism spectrum disorders may be more common in UPD*
- *Recurrence risk*



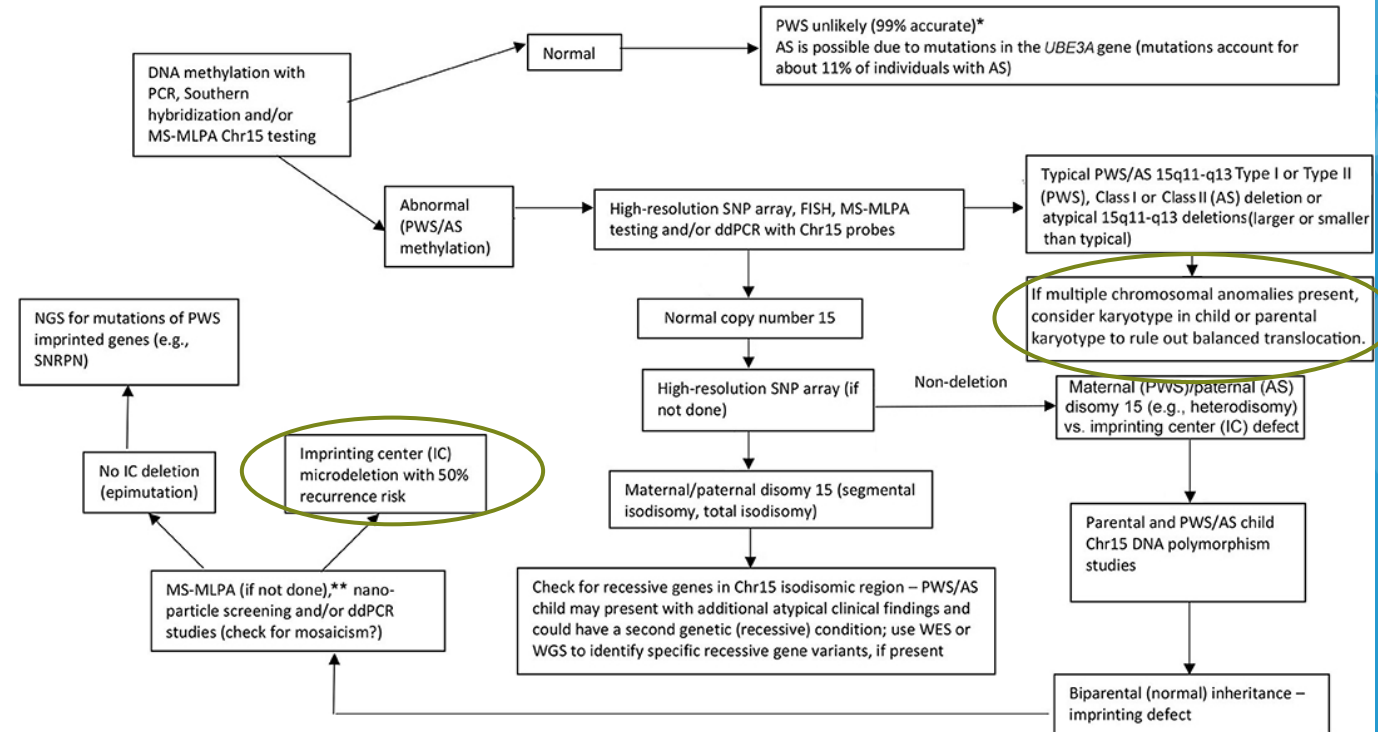
Risk of recurrence

Most of the time PWS is not inherited.

Consider inheritance:

- Imprinting center defect caused by small deletion in the control center for imprinting
- Paternal translocation

Genetic Testing Flowchart for Patients Referred for Prader-Willi Syndrome (PWS)/Angelman Syndrome (AS)



Key points



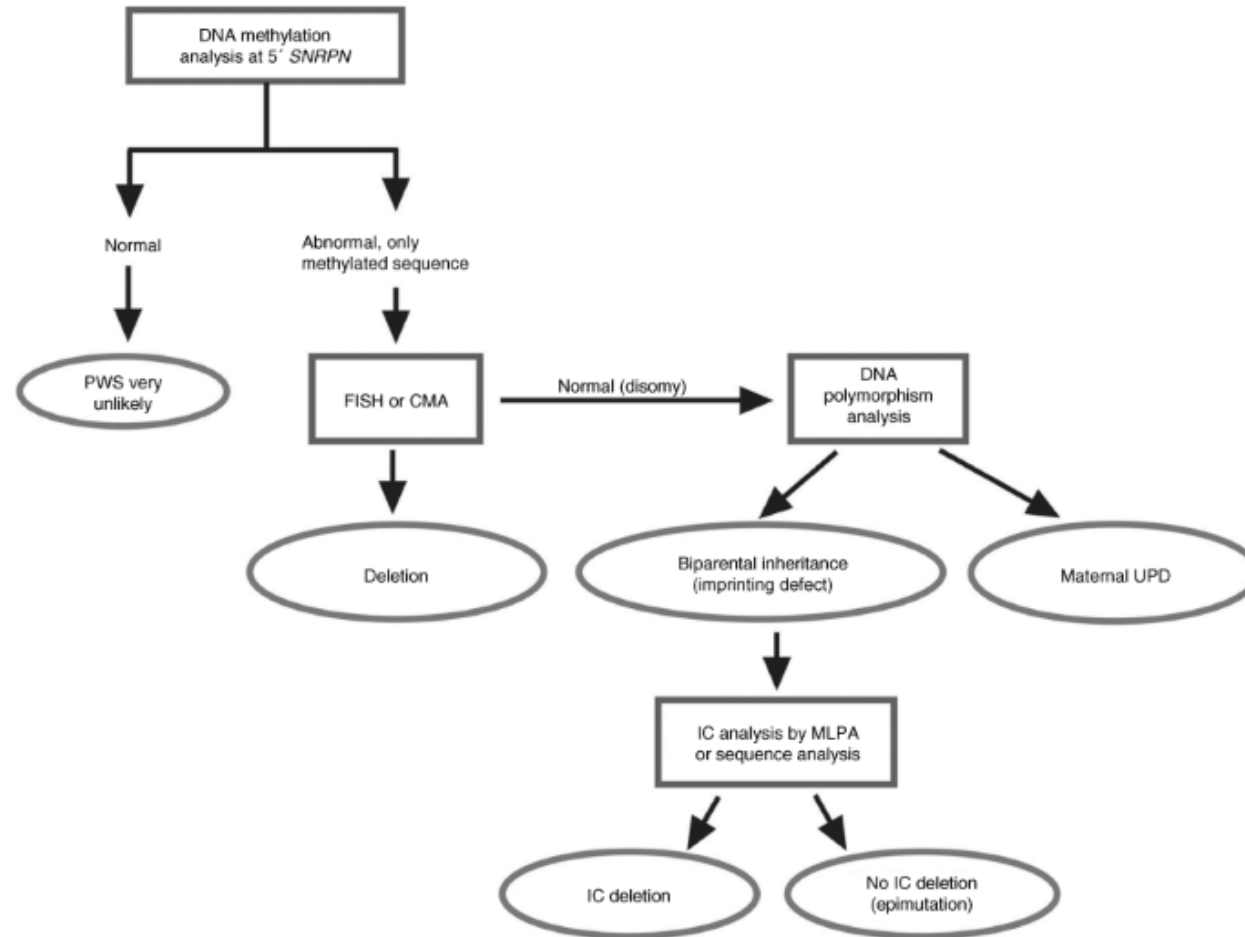
1. Methylation testing is the first line recommended test for PWS



2. Chromosomal testing can tell you most subtypes of PWS



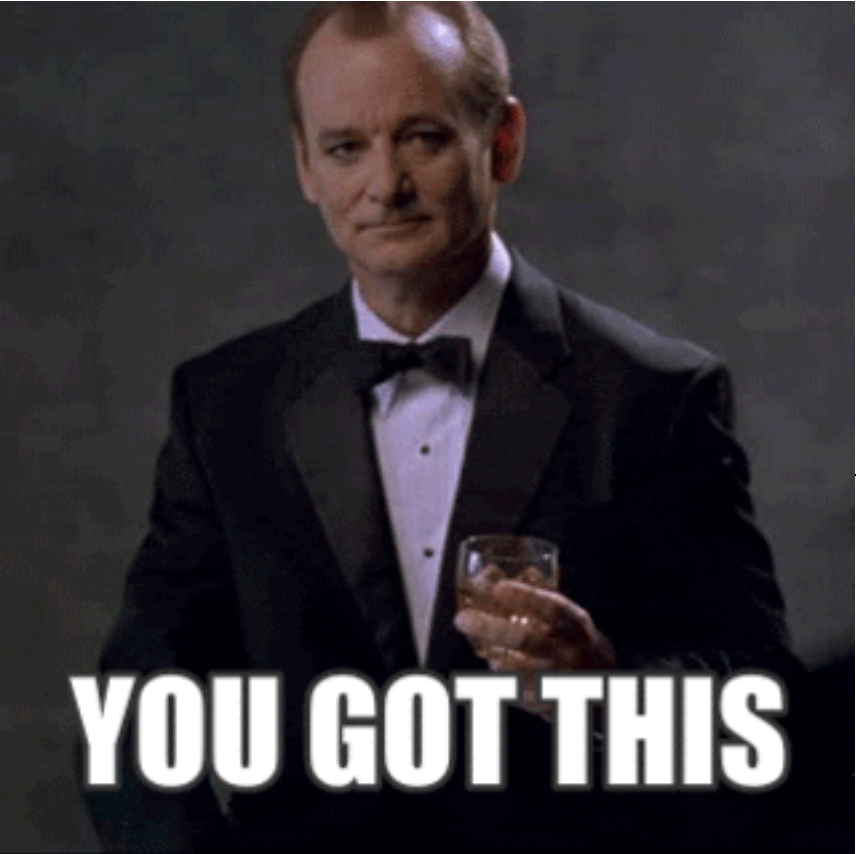
3. Rarely additional testing is needed to determine recurrence risk



STEP 2: find your team



- Give yourself some TIME.
- Find the support team for YOU!
- Avoid your own reading on google.
- Wait till you are ready!
- Be careful on Facebook.
- There is no single right answer...
- Remember: Your child is a warrior and a fighter. She/he is determined to succeed and push herself/himself to the limit. They will teach you to find your strength.
- Your child will do what other kids do – love them, teach them, push them, put them in organized activities...
- Never lose hope! There will be good days and bad days.



Let's get started

- Skin to skin: enjoy the snuggles
 - Bond with your baby!
- Physical exam
 - Developmental dysplasia of the hip
 - Undescended testes
- Feeding & Nutrition – a fed baby is best
 - Supplements
- Therapies
- Growth hormone
- Guide to self-care

Your baby knows you're there

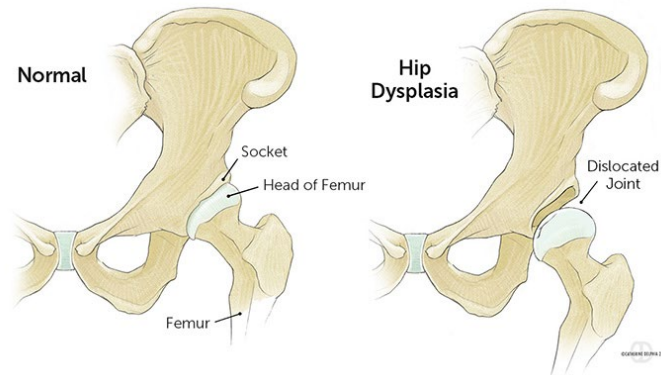


- Skin to skin care has lots of benefits
 - Breast milk production
 - Attachment and bonding
 - Promotes the participation of the mother and father in the infant's care
 - Strengthens the family role in the care
 - Decreases feelings of helplessness.

Undescended testes

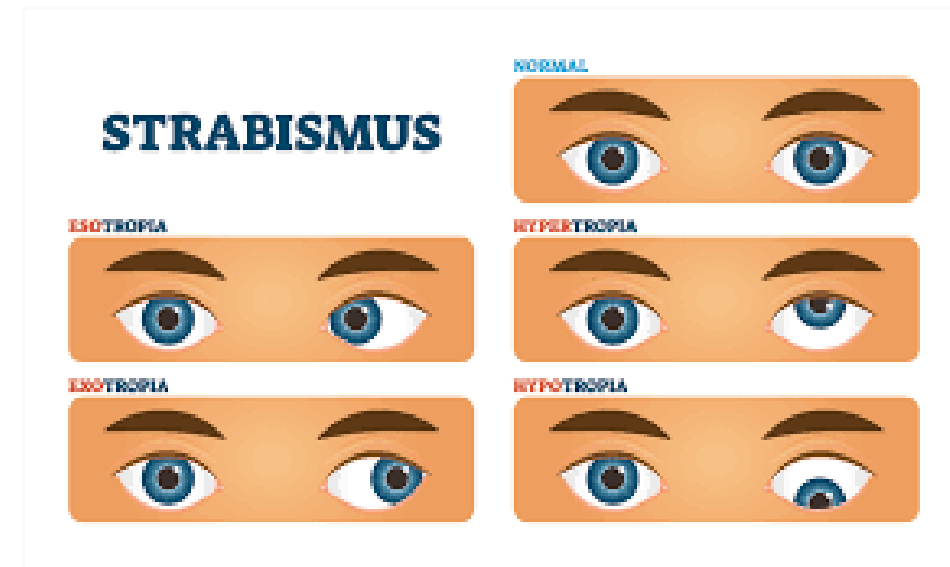
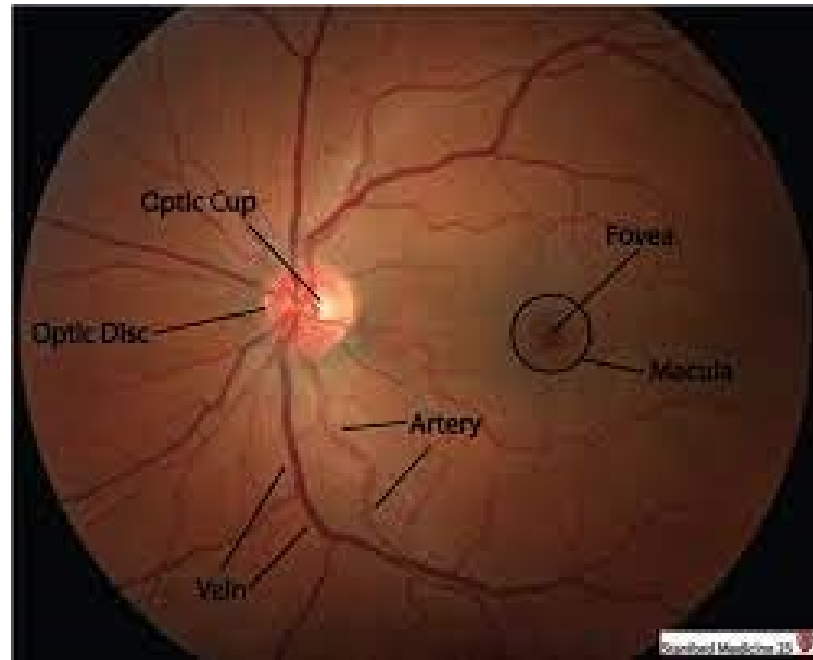
- 70% of males have at least one undescended testicle (Uehling, 1980).
- Human chorionic gonadotropin administration resulted in an anatomically lower testis position in most of our patients with Prader-Willi syndrome, and 23% of testes reached a stable scrotal position. Of the cases 76% required orchiopexy to ensure a stable position in the scrotum (Bakker, 2015).
 - Patients received 250 to 500 IU (depending on age) intramuscularly twice weekly for 6 weeks

Developmental dysplasia of the hip

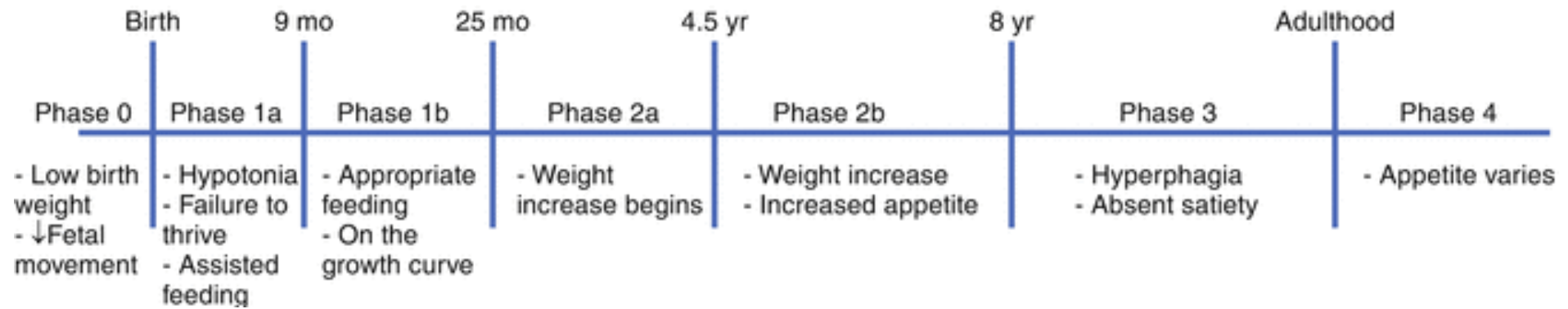


- Present in 30% of individuals with PWS (Trizno, 2018).
- Recommend an ultrasound screening for all infants with PWS at 6 weeks of age and subsequent radiographic studies at 1, 2, 5, 10, and 15 years of age to allow for early diagnosis and intervention
- Treatment with bracing +/- surgery
- Shallow acetabula common – monitoring may be appropriate in consultation with a pediatric orthopedic surgeon

Vision exam



Nutritional phases of PWS



Poll question

What are some ways to facilitate healthy feeding of an infant with PWS?

A. Repositioning

B. Offer different bottles

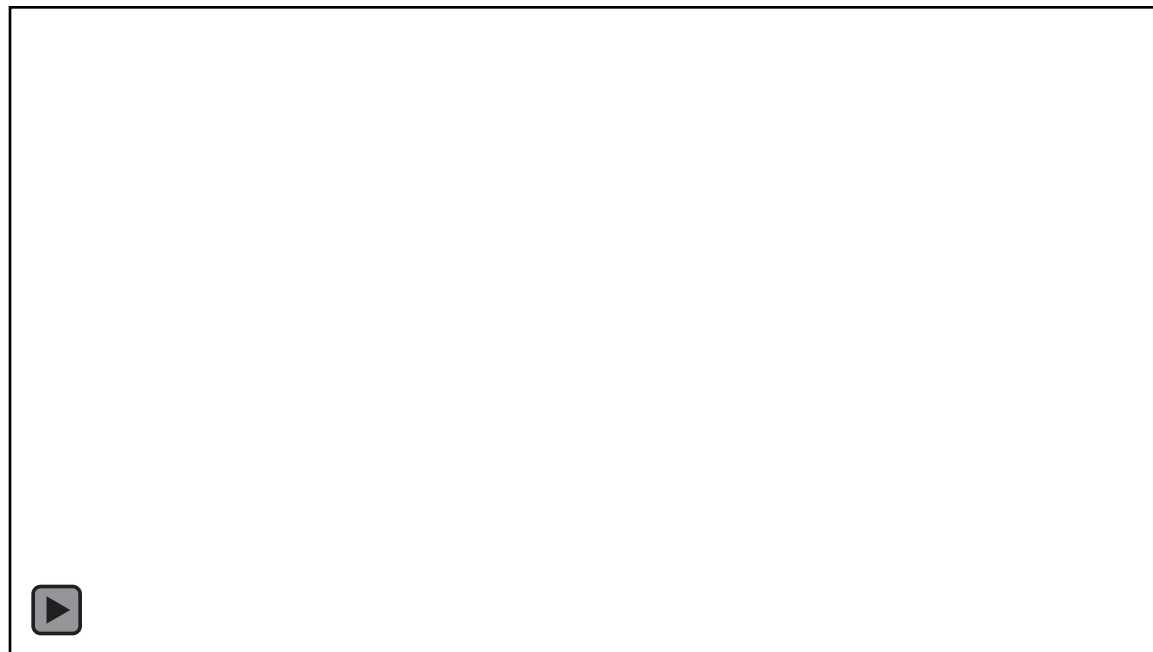
C. Feeding tube place

D. All of the above

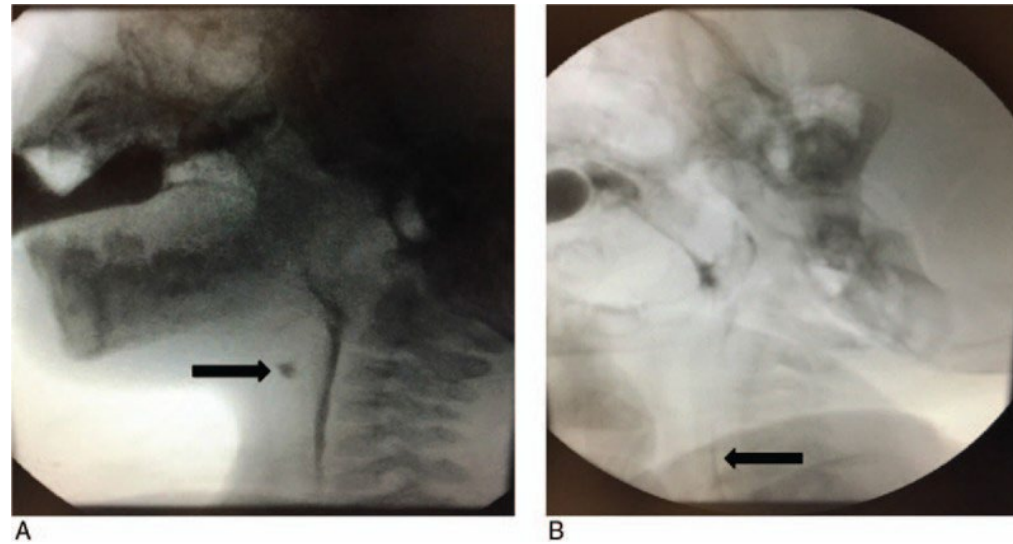
A Fed baby is a healthy baby

- 99% of infants had feeding difficulties (Singh et al., 2018)
- Feed unclothed
- Provide stimuli to keep your child awake
- Try different positions
- Try different bottles
- Support your child as they need to be supported
 - NG tube is preferred
 - 25% need gastrostomy-tubes (Singh et al. 2018)

Positioning can be key

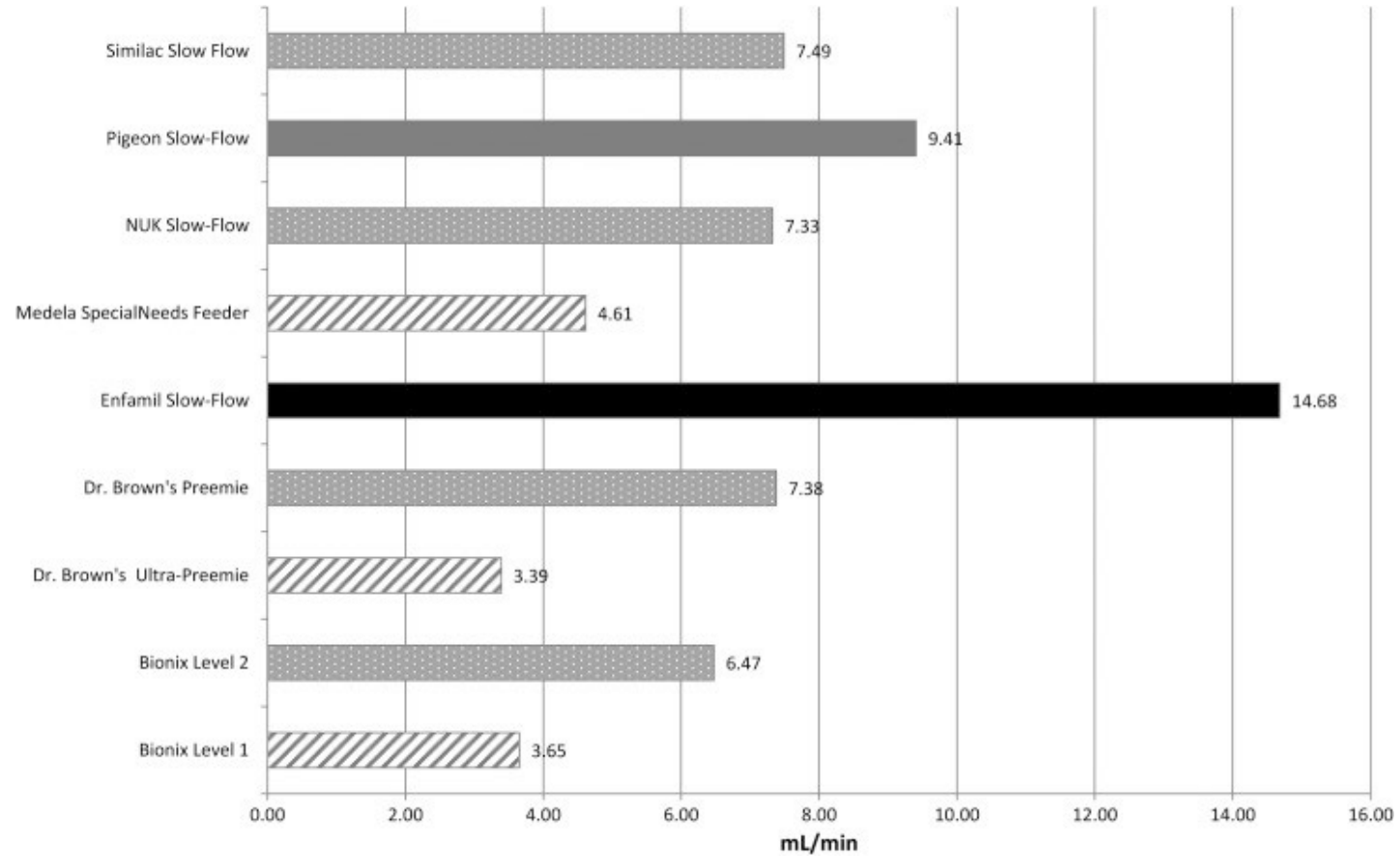


Aspiration is common, but is it clinically significant?



There was a high rate of swallowing dysfunction (pharyngeal residue 71%, aspiration events 87%) in a study of individuals ages 3 weeks to 29 months. All episodes were silent (Salehi, 2017).

Nipple flow rate is important



Bottles



Dr. Brown's level 1
feeding system



Pigeon slow flow



Bionix level 1

NG tube feeding

- Parents should be trained on the use of NG tube.
- There is relatively little data on outcomes of NG fed infants versus placement of a g-tube
 - Theoretical risk of possible stomach rupture at the site of the scar for individuals with a g-tube in place
 - Upcoming study through the Global Registry, so stay tuned!

Poll

- When monitoring your infant's weight gain what is the most important factor?
- A. Your child remains at the 20th percentile for weight for length
- B. Your child is gaining appropriate weight for age.
- C. Your child remains below the curve for weight
- D. Your child follows the same growth pattern expected for age

Formula/Breastmilk

- The growth curve should be followed closely, but there is no specific guideline on where the infant should be
- Increasing the calories may be important
- A dietician should follow the growth curve closely and modify calories
 - It is never appropriate to decrease calories to less than 20 kcal/ounce
- Weights should be followed by the pediatrician

Introduction of solids

- It is ok to introduce solids when your child had achieved good head control
- Feed your child in a supportive chair
- Wait 3 days to a week between introducing new foods (allergies are common)
- AVOID added sugars and juice
- Make your own



Nutrition Facts	
8 servings per container	
Serving size	2/3 cup (55g)
Amount per serving	
Calories	230
% Daily Value*	
Total Fat 8g	10%
Saturated Fat 1g	5%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 160mg	7%
Total Carbohydrate 37g	13%
Dietary Fiber 4g	14%
Total Sugars 12g	
Includes 10g Added Sugars	20%
Protein 3g	

Liquids and Cups

- Liquids
 - Introduce 2 cups of water to your child when you start solids
 - Put in an age appropriate cup
 - NO JUICE.



Solids

- Once your child had mastered purees, start solids
- Start non-starchy vegetables
 - Avoid potatoes, peas and corn
- Vegetables: broccoli, celery, cucumber, summer squash, spinach, kale, tomatoes, zucchini, carrots, asparagus
- Fruits: strawberries, blueberries, raspberries, blackberries, cherries, avocado
- Grains: focus on those with high fiber content
- Proteins: lean meats
- Fats: Avocado, oils, nut butters, cheese
- Pay attention to serving sizes

Early intervention

- Start with early interventional services through your state
- Feeding therapy consultation from day 1
 - May be through OT or speech
- States usually start with developmental therapy
- Add PT early (around 3 months)
 - Meet child where they are
 - Use balance ball and other strategies for core strength
 - No evidence to suggest scoliosis is more associated with sitting kids up, but it is important to always provide support (avoid slouching)
 - A supportive chair can help!
- OT for fine motor skills, sensory processing concerns (start 4-6 months)
- Speech by about 6-9 months
 - Apraxia: problem with motor planning
 - Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT): shown to be beneficial for apraxia (Dale, 2013)
 - Neuromuscular electrical stimulation

Behavior and childcare (infants and toddlers)

- Behavior at this age is usually typical of the age.
- Teach your child the same values and lessons you envisioned for all your children.
- Have the same expectations you would for any other child.
- Some increased stubbornness can emerge.
- Rigidity in interests, appropriate play with toys, repetitive behaviors, and social-communication (such as eye contact) should be monitored especially approaching age 2.
- Implementation of praise, positive-nonfood rewards
- Activities for toddlers are a good thing – gymboree, mother's day out
- Don't feel bad for putting your child in daycare!

Autism and PWS

- PWS participants were more likely to engage in sensory-seeking
 - feeling textural elements of objects
 - smelling items
 - visual inspection
- Repetitive behaviors
 - Perseverating
 - Focus on specific topics of interest
- Poorer verbal skills were associated with higher ADOS scores
- Applied behavioral analysis may be helpful, and we often give the diagnosis of autism!
 - Outside-the-box thinking required

Therapies are key

- Early intervention services
 - OT, PT, ST
- Special therapies
 - Feeding
 - Interactive metronome “evidence-based assessment and training tool that measures & improves neurotiming, or the synchronization of neural impulses within key brain networks for cognitive, communicative, sensory & motor performance. ”
 - Prompts for Restructuring Oral and Muscular Phonetic Targets (PROMPT)
 - Hippotherapy
 - Applied behavioral analysis
 - Sensory integration therapy
 - Spider therapy
 - Cognitive behavioral therapy
 - Trauma-based therapy
 - Mindfulness

Adaptive sports/Exercise

- Provides a social group
- Does not have to be competitive
- Makes your child feel more independent
- Keeps your child/adult active
- Make it competitive with a nonfood reward
- Set expectations
 - 5-6 times per week they can earn a star with reward at the end of the week



PWS Personality



- People pleasers
- They want to have a job/help
- They want to have a social outlet
- They love infants
- They love animals
 - It can be great to appeal to these features
 - Chores that they can earn screen time (or something nonfood related) for completing
 - Volunteering in a newborn nursery or at a pet shelter
- They love competition (especially if they can win)
 - Fitbits work well
- Sometimes they do things they cannot control and you have to let it go

Behavioral Outbursts

- Defined as “becoming very angry or upset in a way that seemed excessive for the situation and beyond the person’s control.”
- Triggers:
 - Being prevented from accessing something the person wanted
 - Social injustice (e.g. feeling accused of something they don’t think is fair)
 - Difficulty dealing with changes and transitions
- Treatment strategies
 - Give them space
 - Distract, distract, distract
- New onset outbursts should encourage one to consider
 - Triggers such as changes in routine
 - Environmental changes
 - Stressors (siblings gaining independence)
 - Anxiety
 - Treatment can help
 - Need to be careful with medications that can be “activating”
 - Sleep apnea
 - Irritability and being on a shorter fuse can be caused by poor sleep or excessive daytime sleepiness

Poll

- Have you tried a medication for mental health concerns in your child/adult with PWS?
- A. Yes
- B. No

Poll

What component has to be controlled for medications to be successful in PWS?

A. Behavioral triggers

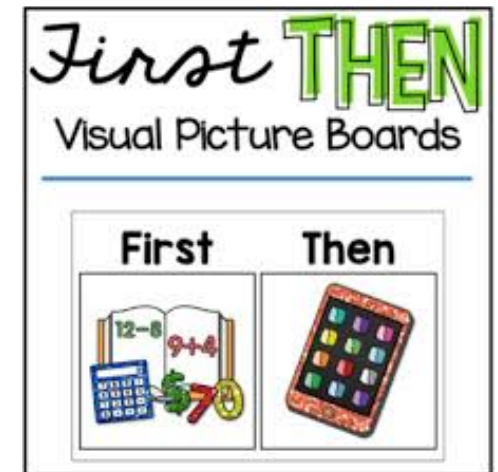
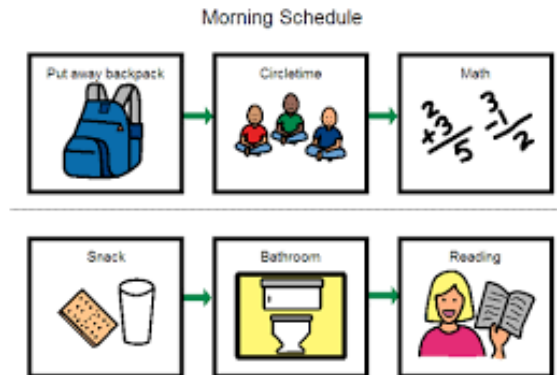
B. Structure

C. Access to food

D. All of the above

Management

- Functional behavioral assessment in the setting where outbursts are occurring
- Referral for applied behavioral analysis
- Helping with routine and transitions
 - First Then
 - Picture schedule
- Guanfacine may help with aggression and self injury (Singh, 2018).
- Treating anxiety
 - Careful with some medications that can be “activating”



Magical thinking & Psychosis

- Difficulty distinguishing fiction from reality
- Sensationalizing
- Less often responding to external stimuli, but rooted somewhere in reality (such as wanting a friend)
- Abnormal, obtrusive and obsessive thoughts
- Management is with medications
 - Case by case basis
 - Ensure safety
 - Some medications with publications
 - Risperdal (Durst, 2000)
 - Topiramate (Bonnot, 2016)

Skin picking



DIARY OF WHEN THIS IS
OCCURRING



IF AT SCHOOL, ASK FOR A
FUNCTIONAL BEHAVIORAL
ASSESSMENT



OFTEN RELATED TO
ENVIRONMENTAL TRIGGERS,
ANXIETY, BOREDOM

Treatment of skin picking

- Eliminate the trigger
- Distract
- Balms or oils may help
- Band-aids will make it worse
- Supplements (N-acetylcysteine)/Medications (guanfacine, naltrexone)

Poll

What is a trigger for food seeking in PWS?

A. There are no triggers

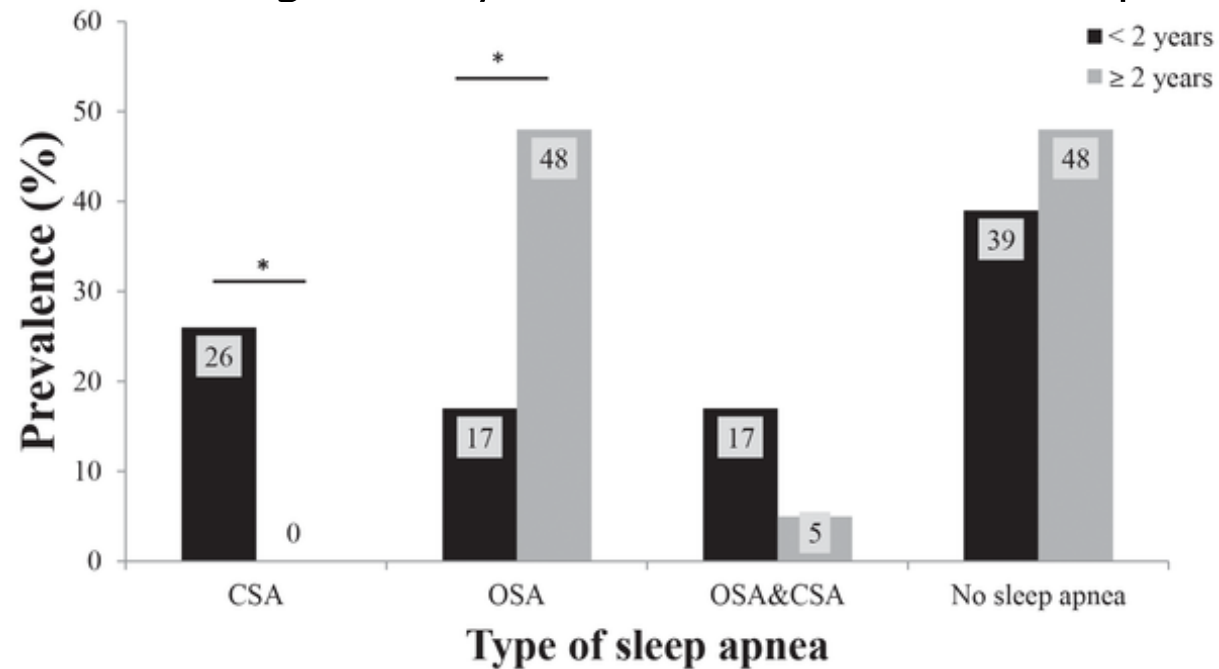
B. Change in schedule

C. Opportunity

D. obsessive and compulsive behavior

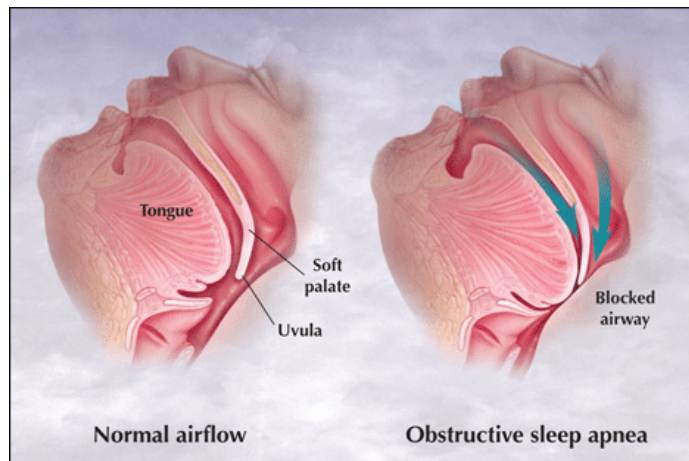
Sleep

- Sleep disturbances are common
- Must get a sleep study or have data from NICU before starting GH, then another overnight study is needed at 8-10 weeks (per FDA)



Prevalence of sleep apnea stratified by age group.

Obstructive sleep apnea



Obstructive sleep apnea occurs when muscles at the back of the throat relax and obstruct airflow. These muscles normally support your tonsils and tongue, the soft palate on the roof of your mouth, and the uvula, which hangs from the soft palate at the back of your mouth.

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- Refer to ENT:
 - Drug induced sleep endoscopy is the first step
- Requires discussion of risk versus benefit of GH because GH helps muscle tone and often makes sleep apnea better at this age

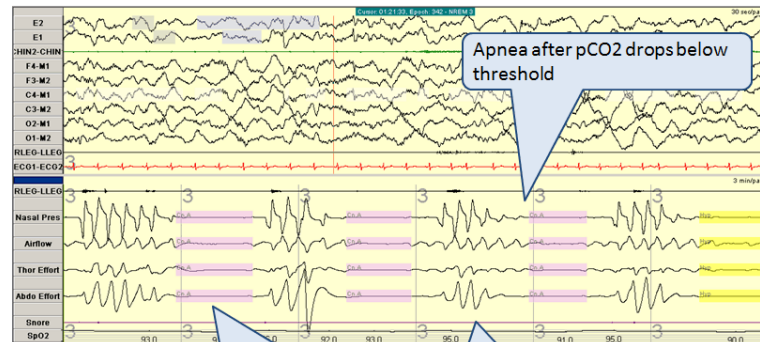
Complications of sleep apnea

- Irritability
- Behavioral concerns
 - Heart complications
 - Heart disease
 - Changes in heart rhythm
 - High blood pressure
 - Heart failure
 - When long standing get screening echocardiograms

Central sleep apnea

FIGURE 1

Central Sleep Apnea event with Cheyne-Stokes respirations



Representative Central Sleep Apneas with notable absence of both airflow and respiratory effort during these periods. Note the pattern of crescendo-decrescendo pattern of breathing that is an example of Cheyne-Stokes respirations.

Deep breathing is thought to be part of an exaggerated response to a normal or slightly elevated pCO2 (ventilatory instability or "high loop gain")

- Predominates in infants and children with PWS who are less than 2 years old
- Occurs when the part of the brain that controls your breathing does not respond appropriately during sleep.
- Oxygen was an effective treatment for CSA in PWS.

PATHOLOGY & CAUSES

- Recurrent sleep phenomena (e.g. sleepiness/dreaming) during wakefulness
- Associated with a lack of orexin (neuropeptide)
- Orexin (A and B) increases state of wakefulness when binding with postsynaptic neurons
- Individuals fall asleep faster and enter REM faster

CAUSES

- Damage to orexin-transporting neurons
 - By autoimmune process/injury

RISK FACTORS

- Genetic factors, low levels of histamine, infections, autoimmune diseases

SIGNS & SYMPTOMS

- Daytime sleepiness
- Cataplexy (strong emotions cause muscle weakness)
- Hallucinations
 - **Hypnagogic**: happen when falling asleep
 - **Hypnopompic**: happen when waking up
- Sleep paralysis
 - Regaining consciousness while body's muscles are paralyzed during sleep

DIAGNOSIS

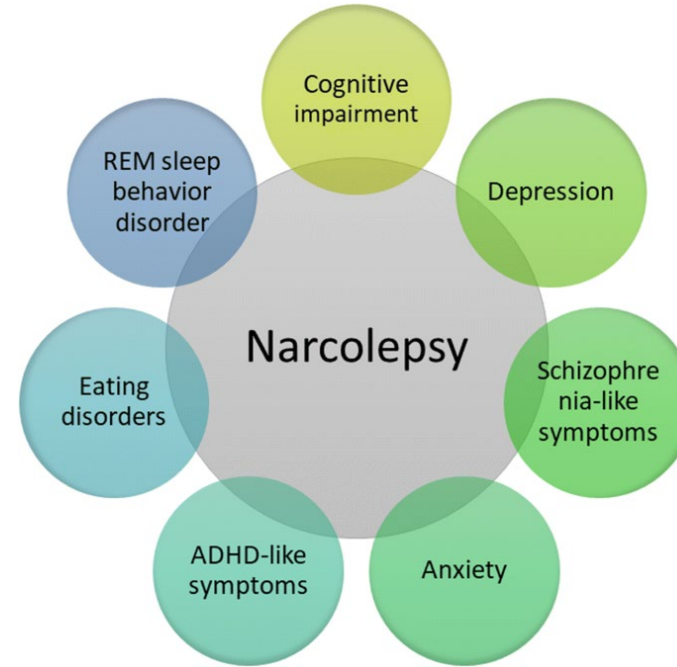
OTHER DIAGNOSTICS

- Recurrent feelings of sleepiness during daytime > three times/week ≥ three months
- ≥ one of following
 - Cataplexy
 - Hypocretin deficiency
 - Short rapid eye movement (REM) sleep
- Not caused by other condition/substance

TREATMENT

MEDICATIONS

- Selective serotonin reuptake inhibitors (SSRIs), stimulants (e.g. modafinil)



A word about narcoleptic/cataplectic features

Sleep disordered breathing

Feature	
Excessive Daytime Sleepiness	Increased nocturnal sleep Behavioral problems Issues related to learning and safety Narcolepsy/cataplexy-like features
Disorders of Arousal	Reduced awakening to low oxygen levels and high carbon dioxide
Sleep disordered breathing	Obstructive sleep apnea Sleep related hypoxia Hypoventilation Reduced ventilatory response to low oxygen and high carbon dioxide

Poll

- How might narcolepsy/cataplexy commonly present in from age 0-2 in individuals with PWS?
- A. Immediately falling asleep and falling to the ground
- B. Closing eyes and head drops as if falling asleep when eating
- C. Laughing and falling asleep immediately
- D. All of the above

A word about hyperphagia

- Individuals with PWS report feeling full, but not being able to stop eating
- There are times when individuals with PWS have more food seeking
 - Anxiety plays a role
 - Boredom
- Restricting access (such as locking) decreases anxiety in the household



Nutritional principles

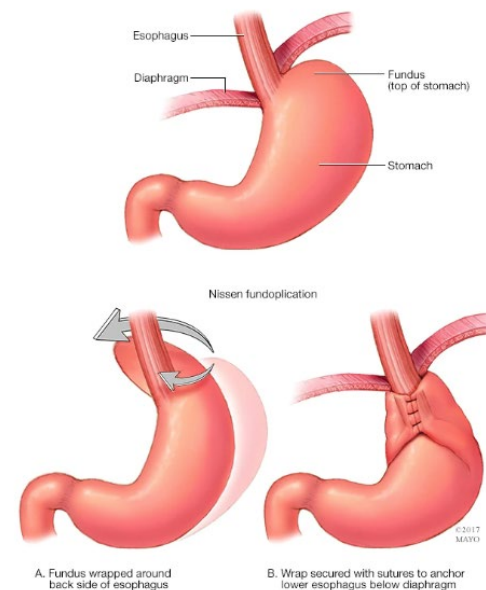
- Make picture schedules that include all activities including meals.
- Start small
 - Eliminate added sugars
 - Decrease portions sizes
 - Add a lean protein to every meal
- We often recommend starting with a low glycemic index diet
 - Net carbs= total carbs – fiber
- Counting calories is often needed for weight loss.
 - This can even be needed early
 - Remaining active does help

Gastroesophageal reflux

- Present in 90% of individuals with Prader-Willi (Saeves, 2018).
- Reflux precautions:
 - Upright for 30 minutes after a feed
- Medications
 - Maximizing treatment may include use of multiple medications
 - Proton-pump inhibitors to stop production of acid
 - H₂-blockers neutralize the acid

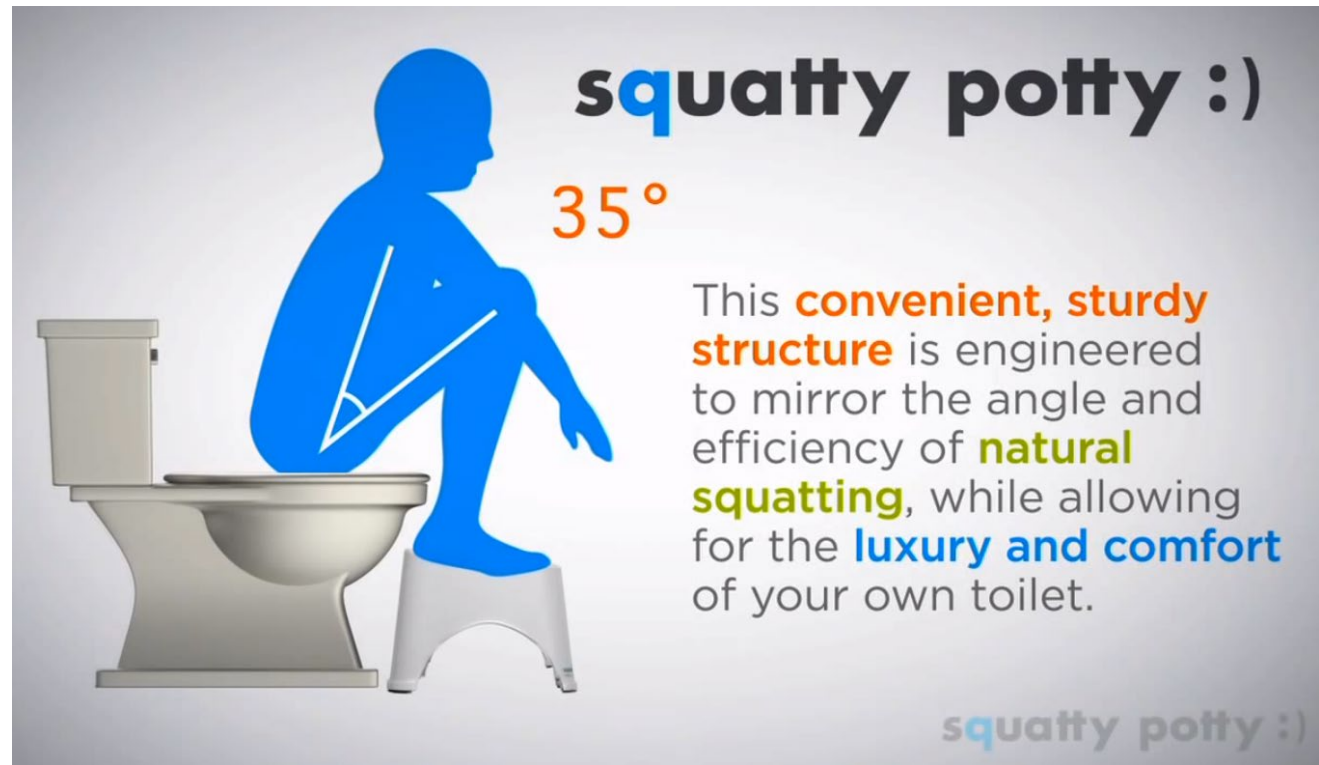
Nissen funduplication

- This procedure is not recommended
- Early post-operative dysphagia (difficulty swallowing) is common
- Later may make delayed gastric emptying worse



Constipation

- Sometimes presents with episodic gastric distension even when kids are stooling regularly
- Can also present as diarrhea and soiling
- Treat early with natural supplements
 - MCT oil works but has calories
 - Magnesium
 - Senna
- X-ray to look for constipation can be helpful



Gastroparesis

- Slowed emptying
- Chronic episodic gastric distension
- Very common
 - Rarely progresses to be life threatening
- Diagnosis can be made with a gastric emptying study or scintigraphy, gastric emptying breath test
- Treatment
 - Diet
 - Aggressive treatment of constipation
 - Erythromycin
 - H₂ blockers (e.g. famotidine)
 - Prokinetics (erythromycin, prucalopride, relamorelin) in severe cases

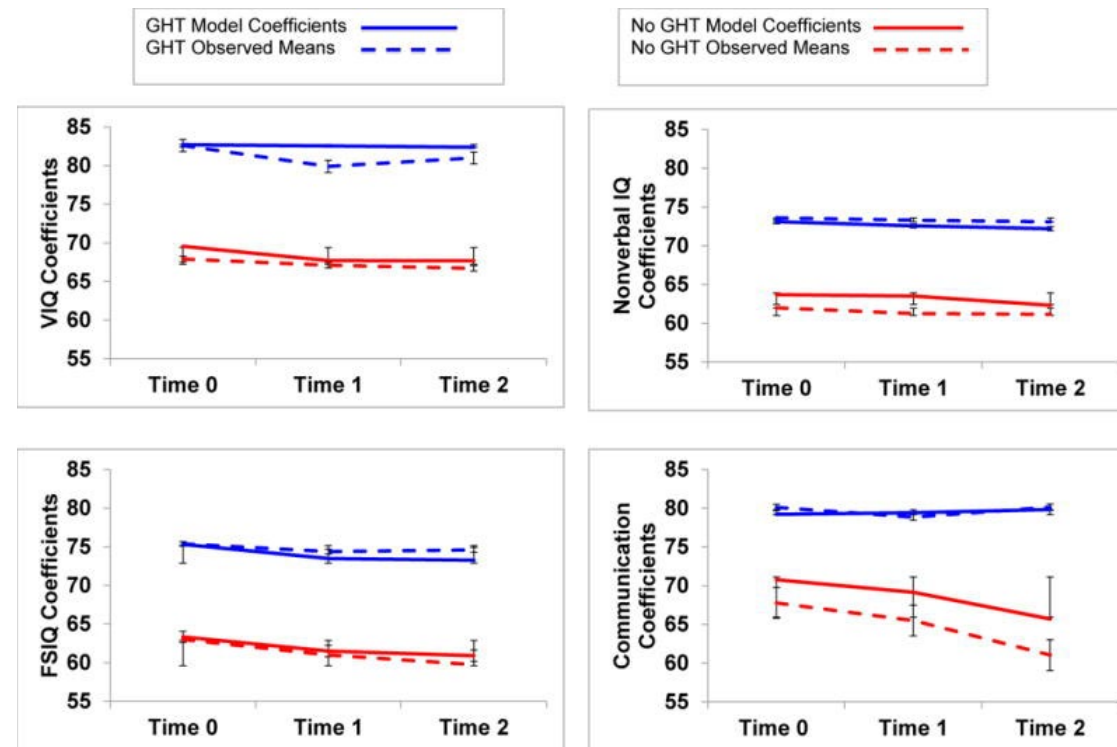
Gastroparesis

- Small frequent meals
- Soft food, eat solids earlier in the day
- Sit up while eating
- Chew foods thoroughly
- <https://my.clevelandclinic.org/-/scassets/files/org/digestive/gastroparesis-clinic/diet-for-gastroparesis.ashx?la=en>

Growth hormone makes a difference

- The only standard of care in the care of individuals with PWS
- FDA approved
- Treatment throughout life (dosing changes over time).
- Recent randomized controlled trial in patients <24 months
 - rhGH treatment for 52 weeks in infants and toddlers with PWS improved growth, body composition, and motor and cognitive development, and efficacy and safety outcomes of Eutropin were comparable to those of Genotropin (Yang, 2019)
- Improved cognitive outcome, in particular verbal IQ and composite IQ (Dykens, 2017).
- Initiation of GHT in infants with 4.5mg/m²/week was beneficial and comparable in terms of auxological response to a dose of 7mg/m²/week. Regular monitoring pre and post GH initiation assisted in early detection of adverse events. IGF-I levels increased with the lower dose but not excessively, which may lower potential long-term risks (Scheermeyer, 2017).
- Most patients had improvement of sleep disordered breathing on GH, but a subset may have worsening after starting growth hormone (Miller, 2006).

GH has benefits outside of growth



Sex Hormones: Girls

- Starting hormone replacement therapy is based on the baseline estrogen levels
 - Start often with a patch for consistent and stable delivery
 - Monitor labs and consistently increase delivery of hormone over time
 - Can transition to pills when on a full patch if desired
 - Still need to have a withdrawal bleed every 4 months
- Needed for bone health
 - We recommend getting yearly DEXA scans to look at bone health
- This is unlikely to impact mood, but it is challenging given the age of delivery
- This is often desired by girls with PWS because they want to have periods and experience the same things as their peers

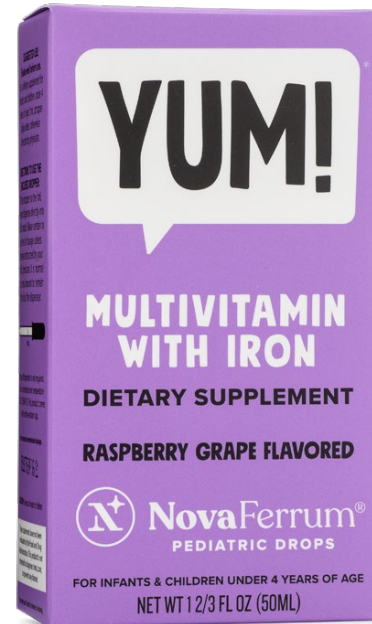
Sex hormones: Males

- Testosterone is recommended in males
 - Can be helpful for males to gain confidence and feel more similar to their peers
- In patients who do not produce any testosterone, we usually start low:
 - 50 mg IM monthly
 - Topical administration

Supplements

- Don't introduce more than one at a time (give each a two week trial before adding another one)
- There are many out there, and very little data to suggest their use makes sense in PWS.

multivitamin



dietary supplements You might hear about...

Coenzyme Q10

Levocarnitine

MCT oil

B vitamins (in particular B12)

Fish oil (omega 3 fatty acids – DHA)

Probiotic/prebiotics

Multivitamin

N-acetylcysteine

Insoluble fiber

Creatine monohydrate

Coenzyme Q10

- Serum sampling identified no significant differences in CoQ10 levels between individuals with PWS, obese individuals, and sibling control groups (Miller, 2011).
- Theoretically support the power house of the cell (mitochondria). There may be mitochondrial dysfunction in PWS (Yazdi, 2013).
- May improve duration of suckling in infants
- Daytime energy level
- Same impact as growth hormone on psychomotor development (Eiholzer, 2008).
- Dose is 20-50 mg/kg/day for mitochondrial disorders
- Different recommendations in PWS: some use 100-200 mg/day including for infants
- No randomized control trials in PWS.

Levocarnitine

- Serum sampling identified no significant differences in total and free carnitine or CoQ10 levels between individuals with PWS, obese individuals, and sibling control groups (Miller, 2011).
- Reduction in carnitine seen in infants with PWS (Ma, 2012).
- Essential for shuttling of fats for break-down in the body
- Daytime energy and alertness
- Deficiency linked to nonsyndromic autism (Beaudet, 2017)
- 50 mg/kg/day divided in 2 doses daily
- No randomized controlled trials in PWS.

MCT oil

- A diet high in MCT may affect the transformation of inactive to active (acetylated) ghrelin
- In PWS, ghrelin is elevated throughout the nutritional phases, and more recent studies suggest a role for the active form in disease pathogenesis.
- Studies in overweight individuals indicate that MCT oil supplementation may reduce appetite and food intake.
- Source of fuel for the brain.
- Start 1/2 teaspoon twice daily and titrate up to 1 teaspoon up to 3 times daily as the child gets older.

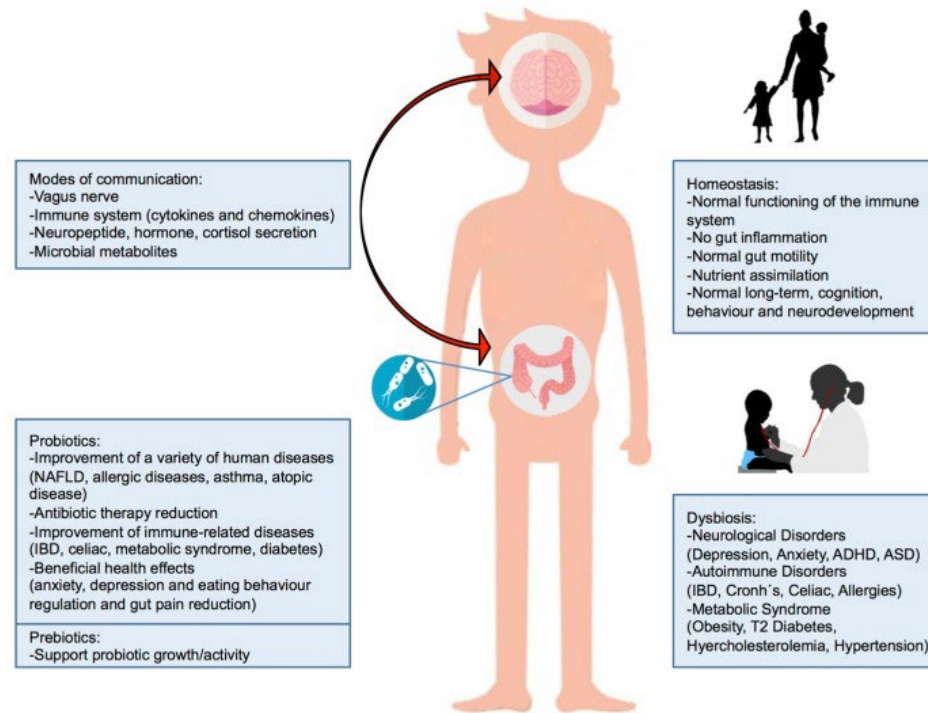
B vitamins

- B-vitamins are cofactors for many reactions in the body including the synthesis of neurotransmitters
- You can see cognitive difficulties, fatigue and problems with balance in individuals who are B12 deficient
- Individuals with PWS (on or off supplements) seem to have high levels
- Some argue this is not indicative of total body status and recommend B12 supplements
- No data is available

DHA

- A low DHA supply seems to negatively affect childhood neurodevelopment in specific conditions and increase the risk and the severity of autism or attention deficit hyperactivity disorder (Martins, 2019).
- Case-control studies have consistently observed low erythrocyte (red blood cell) EPA and/or DHA levels in patients with major depressive disorder, bipolar disorder, schizophrenia, and attention deficit hyperactivity disorder. Corrective treatment with fish oil-based products has resulted in improvements in psychiatric symptoms without notable side effects (Messamore, 2016).
- DHA supplementation appears to offer a safe and effective way to improve reading and behavior in healthy but underperforming children from mainstream schools (Richardson, 2012).
- No specific data on PWS.

Biotics

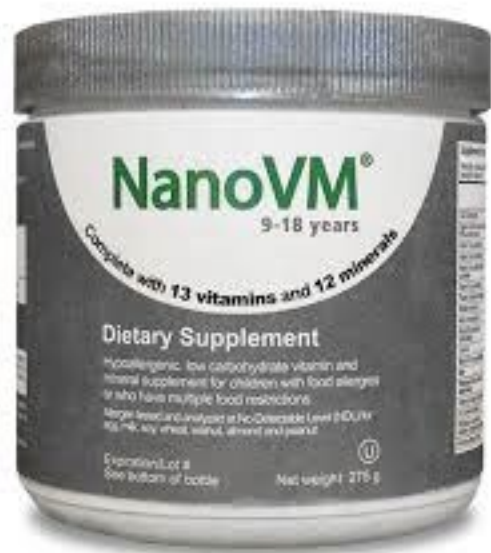


- Gut microbiota play a very important role in the development and function of the central nervous system (CNS) through specific channels, such as metabolic, neuroendocrine, and immune pathways (Vuong, 2017).
- It is still not clear whether manipulations through probiotics and prebiotics administration could be beneficial in PWS.

Skin picking

- N-acetylcysteine:
 - May be effective for skin picking (Miller, 2014; Bonnot, 2016)
 - Pharmacology less available
 - We usually try at the height of skin picking and then stop when/if skin picking is resolving
- Treating anxiety
 - This can help tremendously

multivitamin



Poll

How might narcolepsy/cataplexy commonly present in children and adults with PWS?

A. Irritability

B. Closing eyes and head drops as if falling asleep when eating

C. Leaning and falling asleep

D. Change in school performance

E. All of the above

Other treatment considerations

- Scoliosis
 - X-ray when the child can sit up on her/his own
 - Regular x-rays every 6 months if this is identified
 - Can have a difficult to detect S-shaped curve in which one might notice shoulder or chest asymmetry
 - Yearly x-rays are indicated
- Allergies
 - Common in this population and may require allergy testing and an Epi-Pen available
 - Eosinophilic esophagitis
- Viscous saliva
 - Dental visits every 3 months starting at 1

Oxytocin

- Interest due to a decrease number of oxytocin-expressing neuron in the hypothalamus in individuals with PWS (Swaab, 1995).
- Sucking assessed by the Neonatal Oral-Motor Scale was abnormal in all infants at baseline and normalized in 88% after treatment. The scores of Neonatal Oral-Motor Scale and videofluoroscopy of swallowing significantly decreased from 16 to 9 ($P < .001$) and from 18 to 12.5 ($P < .001$), respectively. Significant improvements in Clinical Global Impression scale scores, social withdrawal behavior, and mother-infant interactions were observed. (Tauber, 2017). Dose 4 IU per day
- All scales factor improvement from Day 3 to Day 6 favored oxytocin over placebo. No single factor showed a statistically significant difference ($P < 0.05$) between groups at Day 6. The drug effect appeared to be diminished at Day 14. " (Miller, 2017) Dose 4 IU per day
- At doses of 24-48 IU/day there was no significant effects of oxytocin on social behavior or hyperphagia were found. However, in the 17 children younger than 11 years, parents reported significantly less anger ($P = 0.001$), sadness ($P = 0.005$), conflicts ($P = 0.010$) and food-related behavior ($P = 0.011$), and improvement of social behavior ($P = 0.018$) during oxytocin treatment compared with placebo.
- Carbetocin®


Resources

Molecular Genetics & Genomic Medicine

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A multidisciplinary approach to the clinical management of Prader-Willi syndrome

Jessica Duis , Pieter J. van Wattum, Ann Scheimann, Parisa Salehi, Elly Brokamp, Laura Fairbrother, Anna Childers, Althea Robinson Shelton, Nathan C. Bingham, Ashley H. Shoemaker, Jennifer L. Miller

First published: 29 January 2019 | <https://doi.org/10.1002/mgg3.514> | Cited by: 1

Review > [Curr Pediatr Rev. 2019;15\(4\):207-244. doi: 10.2174/1573396315666190716120925.](#)

Prader-Willi Syndrome - Clinical Genetics, Diagnosis and Treatment Approaches: An Update

Merlin G Butler ¹, Jennifer L Miller ², Janice L Forster ³

Affiliations + expand

PMID: 31333129 PMCID: [PMC7040524](#) DOI: [10.2174/1573396315666190716120925](#)

[Free PMC article](#)

Practice Guideline > [Pediatrics. 2011 Jan;127\(1\):195-204. doi: 10.1542/peds.2010-2820.](#)

Epub 2010 Dec 27.

Clinical report—health supervision for children with Prader-Willi syndrome

Shawn E McCandless; Committee on Genetics

Collaborators + expand

PMID: 21187304 DOI: [10.1542/peds.2010-2820](#)

Our goal is to create resources for the management of Prader-Willi so care is standardized and close to home.

There are lots of exciting reasons to be excited for the future!

- DCCR (open label extension presented at FPWR 2021)
- Pitolisant (already some data in PWS)
- >10 drugs in phase I-III trials
- Many companies have drugs for PWS in preclinical development

Questions



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