

# PRADER-WILLI SYNDROME



## MEDICAL ALERTS

**PRADER-WILLI SYNDROME ASSOCIATION** <sup>USA</sup>  
*Still hungry for a cure.*

(800) 926-4797 • (941) 312-0400  
[www.pwsausa.org](http://www.pwsausa.org)

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## PRADER-WILLI SYNDROME

Prader-Willi Syndrome (PWS) is a complex neurobehavioral genetic disorder resulting from abnormality on the 15th chromosome. It occurs in males and females equally and in all races. Prevalence estimates ranges from 1:12,000 to 1:15,000. Incidence in newborns is unknown.

PWS typically causes low muscle tone, short stature if not treated with growth hormone, cognitive deficits, incomplete sexual development, problem behaviors, and a chronic feeling of hunger that, coupled with a metabolism that utilizes drastically fewer calories than normal, can lead to excessive eating and life-threatening obesity.

At birth the infant typically has low birth weight for gestation, hypotonia, and difficulty sucking due to the weak muscles ("failure to thrive"). The second stage ("thriving too well"), with onset between the ages of two and five throughout lifetime, may show increased appetite, weight control issues, and motor development delays along with behavior problems.

Other factors that may cause difficulties include negative reactions to medications, high pain tolerance, gastro-intestinal and respiratory issues, lack of vomiting, and unstable temperature.

Severe medical complications can develop rapidly in individuals with PWS.

Prader-Willi Syndrome  
Medical Alerts  
by

Medical Specialists in  
Prader-Willi Syndrome

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## **MEDICAL ALERT**

### **Important Considerations For Routine Or Emergency Treatment**

Medical professionals can contact PWSA(USA) to obtain more information and put you in touch with a specialist as needed.

#### **Anesthesia Reactions**

People with PWS may have unusual reactions to standard dosages of anesthetic agents. Use caution in giving anesthesia. See page 14 or go to the website at <http://www.pwsausa.org> and view the Medical Alert section for two articles on anesthesia.

- ***Anesthesia and Prader-Willis Syndrome:***  
*James Loker, MD, Laurence Rosenfield, MD*
- ***Anesthesia Concerns for Patients with PWS:***  
*Winthrop University*

## **Adverse Reactions to Some Medications**

People with PWS may have unusual reactions to standard dosages of medications. Use extreme caution in giving medications, especially those that may cause sedation; prolonged and exaggerated responses have been reported. Water intoxication has occurred in relation to use of certain medications with antidiuretic effects, as well as from excess fluid intake alone.

### ***Water Intoxication***

***[http://www.pwsausa.org/support/water\\_intoxication\\_alert.htm](http://www.pwsausa.org/support/water_intoxication_alert.htm)***

## **High Pain Threshold**

Lack of typical pain signals is common and may mask the presence of infection or injury. Someone with PWS may not complain of pain until infection is severe or may have difficulty localizing pain. Parent/caregiver reports of subtle changes in condition or behavior should be investigated for medical cause.

## **Respiratory Concerns**

Individuals with PWS may be at increased risk for respiratory difficulties. Hypotonia, weak chest muscles, and sleep apnea are among possible complicating factors. Anyone with significant snoring, regardless of age, should have a medical evaluation to look for obstructive sleep apnea.

***Recommendations for Evaluation of Breathing Abnormalities Associated with Sleep in Prader Willi Syndrome: PWSA (USA) Clinical Advisory Board Consensus Statement 12/2003***

***\*<http://www.pwsausa.org/syndrome/RecEvalSleepApnea.htm>***

## **Other Problems**

Other problems that can cause respiratory difficulties in the young can be chronic stomach reflux and aspiration. Although the lack of vomiting is felt to be prominent in PWS, reflux has been documented and should be investigated in young children with chronic respiratory problems. Individuals with obstructive apnea are at more risk for reflux as well.

***Respiratory Problems in Prader-Willi Syndrome: James Loker, MD***  
***<http://www.pwsausa.org/syndrome/respiratoryproblems.htm>***

## **Lack of Vomiting**

Vomiting rarely occurs in those with PWS. Emetic may be ineffective, and repeated doses may cause toxicity. This characteristic is of particular concern in light of hyperphagia and the possible ingestion of uncooked, spoiled, or otherwise unhealthful food items. **The presence of vomiting may signal a life-threatening illness.**

\*All the information found at this website is printed in its entirety in this "Medical Alerts" book.

## Severe Gastric Illness

Abdominal distention or bloating, pain, and/or vomiting may be signs of life-threatening gastric inflammation or necrosis, more common in PWS than in the general population. Rather than localized pain, there may be a general feeling of unwellness. A condition described as **acute idiopathic gastric dilation**<sup>1</sup> has been reported. In this condition, a person with PWS greatly distends their stomach with food (slimmer people may be more at risk) and does not get the normal message of fullness or pain. They may distend their stomach to the point of cutting off the blood supply causing **necrosis**. Another risk of binge eating that can create a serious medical emergency is **GI perforation**. If an individual with PWS has these symptoms, close observation is needed. An X-ray, CT scan or ultrasound may help in differentiation. **This should be considered a surgery emergency and exploratory laparotomy may be life saving.** In addition, severe stomach pain may be caused by **gallstones** or **pancreatitis**. An ultrasound, chemistry analysis of the blood and CT of the abdomen will help with the diagnosis.

<sup>1</sup>Wharton RH et al. (1997) *Acute idiopathic gastric dilation with gastric necrosis in individuals with Prader-Willi Syndrome*. American Journal of Medical Genetics, Dec. 31; Vol. 73(4): page 437-441

## ***Medical Alert: Stomach Problems Can Signal Serious Illness***

***[http://www.pwsausa.org/syndrome/medical\\_alert\\_Stomach.htm](http://www.pwsausa.org/syndrome/medical_alert_Stomach.htm)***

### **Gastroparesis**

Another consideration is gastroparesis, a weakness of the stomach that delays emptying and may lead to dilation of the stomach size. This is a condition that is common with PWS and can be more life threatening than in the normal population. A child with Prader-Willi syndrome when diagnosed with gastroparesis may need hospitalization. Eating while the stomach is distended with gastroparesis can be very dangerous. For more information go to: <http://www.gicare.com/pated/ecdgs45.htm>

### **Body Temperature Abnormalities**

Idiopathic hyper- and hypothermia have been reported. Hyperthermia may occur during minor illness and in procedures requiring anesthesia. Fever may be absent despite serious infection.

## **Skin Lesions and Bruises**

Because of a habit that is common in PWS, open sores caused by skin picking may be apparent. Individuals with PWS also tend to bruise easily. Appearance of such wounds and bruises may erroneously lead to suspicion of physical abuse.

## **Hyperphagia (Excessive Appetite)**

Insatiable appetite may lead to life-threatening weight gain, which can be very rapid and occur even on a low-calorie diet. Individuals with PWS must be supervised at all times in all settings where food is accessible. Those who have normal weight have achieved this because of strict external control of their diet and food intake.

## **Surgical and Orthopedic Concerns**

In view of the increasing number of infants and children with PWS undergoing sleep assessments prior to growth hormone treatment and the potential rise in surgical procedures (e.g., tonsillectomy) requiring intubation and anesthesia, it will be important to alert the medical team about complications. These complications may include trauma to the airway, oropharynx, or lungs due to possible anatomic and physiologic differences seen in PWS such as a narrow airway, underdevelopment of the larynx and trachea, hypotonia, edema, and scoliosis.

Musculoskeletal manifestations, including scoliosis, hip dysplasia, fractured bones and lower limb alignment abnormalities, are described in the orthopedic literature. However, care of this patient population from the orthopedic surgeon's perspective is complicated by other clinical manifestations of PWS.

***Prader-Willi Syndrome: Clinical Concerns for the Orthopedic Surgeon;*** Martin J. Herman, MD, Department of Orthopedic Surgery, St. Christopher's Hospital for Children

***<http://www.pwsausa.org/syndrome/Orthopedic.htm>***

**Guidelines for Postoperative Monitoring of Pediatric Patients with Prader-Willi Syndrome**

***<http://www.pwsausa.org/syndrome/postoperative.htm>***

**Central Adrenal Insufficiency in Individuals with Prader-Willi Syndrome**

Individuals with Prader-Willi syndrome may be at risk for central adrenal insufficiency (CAI). The presence or absence of CAI cannot be determined by ONLY measuring an 8 a.m. cortisol level – the individual must be tested while stressed (e.g., with febrile illness) or using a stimulation test. Please consult your doctor for further advice and testing. For details go to ***<http://www.pwsausa.org/syndrome/CAI.htm>***

# **Recommendations for Evaluation of Breathing Abnormalities Associated with Sleep in Prader-Willi Syndrome**

## ***PWSA (USA) Clinical Advisory Board Consensus Statement - 12/2003***

Problems with sleep and sleep disordered breathing have been long known to affect individuals with Prader-Willi syndrome (PWS). The problems have been frequently diagnosed as sleep apnea (obstructive [OSA], central or mixed) or hypoventilation with hypoxia. Disturbances in sleep architecture (delayed sleep onset, frequent arousals and increased time of wakefulness after sleep onset) are also frequently common. Although prior studies have shown that many patients with PWS have relatively mild abnormalities in ventilation during sleep, it has been known for some time that certain individuals may experience severe obstructive events that may be unpredictable.

**Factors that seem to increase the risk of sleep disordered breathing include young age, severe hypotonia, narrow airway, morbid obesity and prior respiratory problems requiring intervention such as respiratory failure, reactive airway disease and hypoventilation with hypoxia. Due to a few recent fatalities reported in individuals with PWS who were on growth hormone therapy (GH) some physicians have also added this as an**

**additional risk factor.** One **possibility** (that is currently unproven) is that GH could increase the growth of lymphoid tissue in the airway thus worsening already existing hypoventilation or OSA. Nonetheless, it must be emphasized that there are currently no definitive data demonstrating GH causes or worsens sleep disordered breathing. However, to address this new concern, as well as the historically well documented increased risk of sleep-related breathing abnormalities in PWS, **the Clinical Advisory Board of the PWSA (USA) makes the following recommendations:**

1. **A sleep study or a polysomnogram** that includes measurement of oxygen saturation and carbon dioxide for evaluation of hypoventilation, upper airway obstruction, obstructive sleep apnea and central apnea should be contemplated for all individuals with Prader-Willi syndrome. These studies should include sleep staging and be evaluated by experts with sufficient expertise for the age of the patient being studied.
2. **Risk factors that should be considered to expedite the scheduling of a sleep study should include:**
  - Severe obesity - weight over 200% of ideal body weight (IBW).
  - History of chronic respiratory infections or reactive airway disease (asthma).

- History of snoring, sleep apnea or frequent awakenings from sleep.
- History of excessive daytime sleepiness, especially if this is getting worse.
- Before major surgery including tonsillectomy and adenoidectomy.
- Prior to sedation for procedures, imaging scans and dental work.
- Prior to starting growth hormone or if currently receiving growth hormone therapy.

Additional sleep studies should be considered if patients have the onset of one of these risk factors, especially a sudden increase in weight or change in exercise tolerance. **If a patient is being treated with growth hormone, it is not necessary to stop the growth hormone before obtaining a sleep study unless there has been a new onset of significant respiratory problems.**

Any abnormalities in sleep studies should be discussed with the ordering physician and a pulmonary specialist knowledgeable about treating sleep disturbances to ensure that a detailed plan for treatment and management is made. Referral to a pediatric or adult pulmonologist with experience in treating sleep apnea is strongly encouraged for management of the respiratory care.

**In addition to a calorically restricted diet to ensure weight loss or maintenance of an appropriate weight, a management plan may include modalities such as:**

- Supplemental oxygen
- Continuous positive airway pressure (CPAP) or BiPAP
- Oxygen should be used with care as some individuals may have hypoxemia as their only ventilatory drive and oxygen therapy may actually worsen their breathing at night.
- Behavior training is sometimes needed to gain acceptance of CPAP or BiPAP.
- Medications to treat behavior may be required to ensure adherence to the treatment plan.

If sleep studies are abnormal in the morbidly obese child or adult (IBW > 200%) the primary problem of weight should be addressed with an intensive intervention – specifically, an increase in exercise and dietary restriction. Both are far preferable to surgical interventions of all kinds. Techniques for achieving this are available from clinics and centers that provide care for PWS and from the national parent support organization (PWSA (USA) ). Behavioral problems interfering with diet and exercise may need to be addressed simultaneously by persons experienced with PWS.

**If airway related surgery is considered, the treating surgeon and anesthesiologist should be knowledgeable about the unique pre- and postoperative problems found in individuals affected by Prader-Willi syndrome**

*Anesthesia and Prader-Willi Syndrome: James Loker, MD, Laurence Rosenfield, MD*

*\*<http://www.pwsausa.org/research/anesthesia.htm>*

**Tracheostomy surgery and management presents unique problems for people with PWS and should be avoided in all but the most extreme cases.** Tracheostomy is typically not warranted in the compromised, ***morbidly obese*** individual because the fundamental defect is virtually always hypoventilation, not obstruction. Self endangerment and injury to the site are common in individuals with PWS who have tracheostomies placed.

At this time there is no direct evidence of a causative link between growth hormone and the respiratory problems seen in PWS. Growth hormone has been shown to have many beneficial effects in most individuals with PWS including improvement in the respiratory system. Decisions in the management of abnormal sleep studies should include a risk/benefit ratio of growth hormone therapy. **It may be reassuring for the family and the**

\*All the information found at this website is printed in its entirety in this "Medical Alerts" book.

treating physician to obtain a sleep study prior to the initiation of growth hormone therapy and after 6-8 weeks of therapy to assess the difference that growth hormone therapy may make. A follow up study after one year of treatment with growth hormone may also be indicated.

## **Growth Hormone Treatment and Prader-Willi Syndrome**

*PWSA (USA) Clinical Advisory Board*

*Consensus Statement – 6/2009*

*<http://www.pwsausa.org/syndrome/GHTreatmentMA-11.pdf>*

**Members of the Clinical Advisory Board are available for consultation with physicians and families through the Prader-Willi Syndrome Association (USA).**

# Anesthesia and Prader-Willi Syndrome

*James Loker, MD, Laurence Rosenfield, MD*

## *Issues Affecting Prader-Willi Syndrome and Anesthesia*

*Individuals with Prader-Willi syndrome may have health issues that alter the course of anesthesia.*

- **Obesity-** Obese individuals are more prone to obstructive apnea, pulmonary compromise, and diabetes. Each of these should be taken into account when preparing for anesthesia. The individual may have altered blood oxygen or blood carbon dioxide levels that will change their response to medications including oxygen. Pulmonary hypertension, right-heart failure, and edema may necessitate evaluation by a cardiologist or pulmonologist prior to surgery. An ECG to detect right ventricular hypertrophy may be beneficial to assess pulmonary hypertension. Frequently obese individuals with PWS may have significant body edema (extra fluid) that is not fully appreciated due to obesity. This should be carefully evaluated, and if necessary, diuretics used before and after the anesthesia. Airway management can be a particular problem when conscious sedation is used.

- **High Pain Threshold**- Individuals with PWS may not respond to pain in the same manner as others. While this may be helpful in post-operative management, it may also mask underlying problems. Pain is the body's way of alerting us to problems. After surgery, pain that is out of proportion to the procedure may alert the physician that something else is wrong. Other possible signs of underlying problems should be monitored.
- **Temperature Instability**- The hypothalamus regulates the body's temperature. Because of a disorder in the hypothalamus, individuals with PWS may be either hypo- or hyperthermic. The parent or caregiver can be helpful in letting the anesthesiologist know what the individual's usual temperature is. Although there is no indication of a predisposition to malignant hyperthermia in PWS, depolarizing muscle relaxants (i.e., succinylcholine) should be avoided unless absolutely necessary. A coma-like state has occurred in the presence of hypothermia.
- **Thick Saliva**- A common problem in PWS is unusually thick saliva. This can complicate airway management, especially in cases of conscious sedation or during extubation (when a breathing tube is removed). Thick saliva also

predisposes an individual to dental caries (cavities) and loose teeth. Oral hygiene should be evaluated prior to anesthesia.

- **Food-Seeking Behaviors-** It is vitally important that any individual undergoing general anesthesia or conscious sedation have an empty stomach. This reduces the risk of aspiration of the stomach contents into the lungs. Individuals with PWS generally have an excessive appetite and may not tell the truth if they have eaten just prior to surgery.

Any individual with PWS should be assumed to have food in the stomach unless it is verified by the caregiver that they have not eaten. A tube may need to be placed in the stomach to assure no food is present prior to attempting to place the breathing tube. Some individuals with PWS may ruminate (regurgitate some of their food) and are at higher risk of aspiration.

- **Hypotonia-** The majority of infants with PWS are significantly hypotonic. This usually improves by 2-4 years of age. The majority, however, continue to have lower muscle tone than normal individuals. This may be a problem in the ability to cough effectively and clear the airways after use of a breathing tube.

- **Skin Picking-** Habitual skin picking can be a significant problem in PWS. This can complicate healing of IV sites and incisional wounds. Usually if these remain well covered, they will be left alone. Depending on the individual's cognitive impairment, restraints or thick gloves may be needed to protect surgical wounds during healing.
- **Hypothyroidism-** Since PWS is a hypothalamic disorder, other hypothalamic functions are at risk. Although the incidence of hypothyroidism in PWS is not known, low levels of thyroid hormone could occur due to lack of thyroid stimulating hormone or thyroid releasing factor, not necessarily due to problems of the thyroid gland itself. A check of thyroid hormone levels may be beneficial in the preoperative evaluation.
- **Difficult Access-** Due to several problems including obesity and lack of muscle mass, individuals with PWS may pose difficulties with insertion of an intravenous line. A stable IV line should be present in any individual undergoing anesthesia.

Individuals with PWS may have smaller airways than would be expected for their body size.

- **Behavior Problems-** Individuals with PWS are more prone to emotional outbursts, obsessive-compulsive behaviors, and psychosis. They may be on extensive psychotropic medication, and the possible interaction of these medicines with anesthesia should be appreciated.
- **Growth Hormone Deficiency-** All individuals with PWS should be considered growth hormone deficient. The FDA has recently recognized a diagnosis of PWS as an indication for growth hormone therapy. Growth hormone deficiency does not appear to alter cortisol release in response to stress. However, due to reports of central adrenal insufficiency in Prader-Willi syndrome, the amount of cortisol produced by individuals with this syndrome may not be adequate during times of stress and should be evaluated by your physician.

## **Recover Post Anesthesia**

Drowsiness after anesthesia may be due to the underlying somnolence and a component of central apnea. For typical outpatient procedures, consideration should be given to an overnight observation.

As mentioned above, a majority of the problems are due to obesity, central and obstructive apnea, but weak muscle tone and chronic aspiration may also play a role in post anesthesia respiratory issues.

## **Summary**

In individuals with Prader-Willi syndrome, there are health issues that can alter the course of the anesthesia. The majority of complications do not appear to come from general anesthesia, which is always closely monitored, but from poorly monitored conscious sedation. Only a physician familiar with the patient and their individual medical needs should make valid medical decisions.

## **IN THE EVENT OF DEATH**

**In the case of a death or impending death, please call  
PWSA (USA) immediately at 1-800-926-4797  
for support and advice.**

## **Reporting of Deaths**

The Prader-Willi Syndrome Association (USA) has created a research database of reported deaths of individuals with PWS. Although most premature deaths are attributable to morbid obesity, cases unrelated to obesity have been noted. PWSA (USA) has a formal investigation of causes of death.

PWSA (USA) also provides bereavement support to families who have lost children with PWS.

***<http://www.pwsausa.org/research/B&TBank.htm>***

## **Organ Donation for Research**

When a child or adult with PWS dies, the family may wish to consider donation of organs for research. PWSA (USA) has established a procedure for such donations.

For donating brain tissue, contact the Brain and Tissue Bank for Development Disorders at (800) 847-1539.

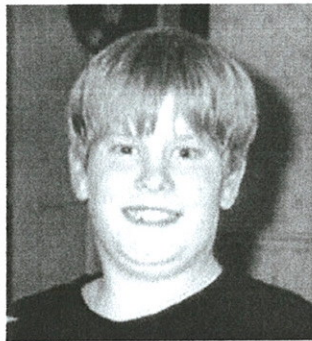
***<http://www.pwsausa.org/research/B&TBank.htm>*** for more information



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*Peter, Gayle and Amanda Girard*

*In loving memory of Jeremy Girard*



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