

Health Watch Table – Prader-Willi Syndrome (PWS)

Forster-Gibson and Berg 2011

CONSIDERATIONS	RECOMMENDATIONS
1. HEENT (HEAD, EYES, EARS, NOSE, THROAT)	
Children: Strabismus and myopia are common	<input type="checkbox"/> Arrange an auditory brainstem response (ABR) in newborns. <input type="checkbox"/> Undertake ophthalmology evaluation before 2 years of age, with particular attention to strabismus and visual acuity.
Adults: Visual acuity is more commonly diminished than in the general population	<input type="checkbox"/> Screen vision (DD Guideline 11) ¹
2. DENTAL	
Children: Decreased and sticky saliva flow can predispose to dental caries Delays in teeth eruption and dental overcrowding may occur	<input type="checkbox"/> Attend to oral hygiene in infants and children including use of soft foam toothbrushes, as well as dental products (toothpaste, sugarless gums, mouthwash) to stimulate saliva production. <input type="checkbox"/> Arrange regular dental visits with particular attention to crowding of teeth and dental caries. <input type="checkbox"/> Make orthodontic referral, as necessary.
3. CARDIOVASCULAR	
Adults: Cor pulmonale is a commonly reported cardiovascular complication in those who are obese or have significant obstructive sleep apnea (OSA) Cardiopulmonary compromise related to obesity is a common cause of death Hypertension is frequently reported but is uncommon in children	<input type="checkbox"/> Arrange cardiac evaluation (DD Guideline 13) ¹ including cardiology consultation for severely obese patients. <input type="checkbox"/> Manage underlying obesity (see below).
4. RESPIRATORY	
Children: At risk for sleep disordered breathing Unexpected death may be caused by respiratory obstruction early in growth hormone therapy Some tolerate upper respiratory infections poorly	<input type="checkbox"/> Arrange routine sleep studies during infancy and childhood, and before starting growth hormone therapy and 3 months after initiating it. <input type="checkbox"/> Ascertain a sleep history and then arrange a sleep study before anesthesia, and if evidence of respiratory distress, sleep apnea, or obesity is present. <input type="checkbox"/> All children with PWS who have an upper respiratory tract infection should be assessed as soon as possible.
Adults: At risk for sleep disordered breathing Cardiopulmonary compromise is the most common cause of death	<input type="checkbox"/> Ascertain a sleep history with attention to sleep disorders, obesity of any level, snoring, asthma, respiratory infections, and excessive daytime sleepiness. <input type="checkbox"/> Consider sleep study, respiratory, and ENT referral as indicated.
5. GASTROINTESTINAL AND NUTRITION	
Children: Early concerns include Gastroesophageal Reflux Disease (GERD) and reduced intake due to poor sucking Failure to thrive is common in infancy followed by the development of	<input type="checkbox"/> Ascertain a comprehensive GI and nutrition history. <input type="checkbox"/> Undertake video swallow in neonates based on clinical concerns. <input type="checkbox"/> Attend to feeding ability and need for assisted feeding. <input type="checkbox"/> Educate caregivers regarding the necessity of a lower calorie regime, and environmental controls to prevent ready access to food. <input type="checkbox"/> Attend to diet, nutrition, physical activity, and obesity including plotting weight on standard growth charts.

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<p>hyperphagia and obesity in early childhood</p> <p>~10% develop gall bladder stones</p> <p>Gastric paresis is common</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Refer to a dietitian/physician with experience in PWS, if possible, to develop an appropriate nutrition and food security regime. <input type="checkbox"/> Refer to a gastroenterologist, nutritionist, or dietician as appropriate. Behavioural management programs should be instituted.
<p>Adults: Obesity is common without a nutrition and food security program</p> <p>Vomiting often reflects very serious illness (e.g., gastric necropsy)</p> <p>Gastric paresis is common</p> <p>Anal picking is common and may lead to colonic tears/bleeding</p> <p>Constipation due to hypotonia is common</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Ascertain a comprehensive GI and nutrition history. Attend to diet, nutrition, and obesity. Refer to a gastroenterologist, dietitian/physician with experience in PWS. Implement the modified Red, Yellow, Green (RYG) 2 diet based on energy requirements (ideally measured by indirect calorimetry) and food security programs. <input type="checkbox"/> Behavioural management should be maintained with the assistance of a behavioural specialist. <input type="checkbox"/> In the event of emesis history, the adult with PWS requires immediate evaluation and possibly medical imaging. <input type="checkbox"/> Provide daily multivitamins. <input type="checkbox"/> Provide usual interventions to prevent and manage constipation.
6. GENITOURINARY	
<p>Children: 80% - 90% of males have cryptorchidism</p> <p>Precocious adrenarche may occur</p> <p>Delayed and incomplete pubertal development is common in both sexes</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Verify testicular descent before 2 years of age. <input type="checkbox"/> Refer to a urologist for cryptorchidism (i.e., absence of one or both testes from the scrotum). <input type="checkbox"/> Consider referral to an endocrinologist or gynecologist/urologist, as appropriate, regarding hormone replacement therapy (HRT).
<p>Adults: Incomplete pubertal development is common in both sexes</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Refer to gynecologist/urologist, as indicated by clinical findings, and for guidance regarding HRT for both sexes.
7. SEXUAL FUNCTION	
<p>Adults: Males and most females are infertile</p> <p>Pregnancy, though unlikely, has been reported</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Educate and, if sexually active, counsel. <input type="checkbox"/> Consider contraception in women who menstruate.
8. MUSCULOSKELETAL (MSK)	
<p>Children: 30% - 70% have scoliosis</p> <p>~10% have hip dysplasia</p> <p>Prevention of osteoporosis should start at an early age</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Assess for hip dysplasia in early infancy and before 2 years of age. <input type="checkbox"/> Evaluate for scoliosis from infancy. <input type="checkbox"/> Monitor with X-rays and refer to an orthopedic surgeon as necessary (Timing of surgical interventions are influenced by the severity of scoliosis and the degree of skeletal maturation). <input type="checkbox"/> Ensure adequate intake of calcium and vitamin D from childhood.
<p>Adults: Scoliosis and osteopenia/osteoporosis are common in both sexes</p> <p>Kyphosis may also occur</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Screen for scoliosis and kyphosis with spinal X-rays and refer to an orthopedic surgeon as necessary. <input type="checkbox"/> Assure adequate calcium and vitamin D intake. <input type="checkbox"/> Screen for osteoporosis with regular Bone Mineral Density tests. <input type="checkbox"/> Refer to an endocrinologist for consideration of sex-hormone therapy to promote bone health.
9. NEUROLOGY	
<p>Children: Hypotonia is common and leads to impaired or absent swallowing and sucking reflexes</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Undertake clinical evaluation with attention to reduced motor activity and psychomotor delay. <input type="checkbox"/> Consult relevant specialists as indicated by clinical findings. <input type="checkbox"/> Treat epilepsy as in general population.

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<p>Hypotonia gradually improves over time</p> <p>Narcolepsy/cataplexy is more common than in general population</p> <p>~10% have epilepsy</p>	
10. BEHAVIOURAL/MENTAL HEALTH	
<p>Children & Adults:</p> <p>Severe skin picking is common and tends to increase with age</p> <p>Severe maladaptive behaviours are common (including obsessive-compulsive disorders)</p> <p>Psychosis may occur in adolescents and adults. Some features of PWS (e.g., tantrums, aggression, compulsivity, anxiety and mood disorder) may be treated with specific pharmacological agents</p> <p>Risperidone, if indicated, does not usually lead to additional weight gain</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Examine skin for evidence of severe skin picking, edema and skin breakdown. <input type="checkbox"/> A behaviour management program is required to support their dietary requirements. Avoid food-related occupational and educational activities. Refer to a psychologist or psychiatrist familiar with PWS when necessary to assist in distinguishing between behaviour problems and psychiatric illness.
11. ENDOCRINE	
<p>Children: Hypothyroidism, diabetes mellitus (Type II), growth hormone (GH) and sex hormone deficiencies may occur</p> <p>Growth hormone therapy and strict dietary modifications can normalize body habitus</p> <p>~ 60% can develop central adrenal insufficiency ³</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Arrange for a PWS pediatric endocrinologist to assess for GH therapy as soon as diagnosis is confirmed. An orthopedic surgery referral may also be indicated before GH treatment is started. <input type="checkbox"/> Make ENT referral to evaluate upper airway with regards to enlarged tonsils and adenoids prior to starting GH therapy. <input type="checkbox"/> Screen before and during GH replacement for hypothyroidism, diabetes, and scoliosis. (See 4 above for other recommended assessments prior to GH replacement.) <input type="checkbox"/> Beginning at age 2, assess obese children for diabetes mellitus (Type II). <input type="checkbox"/> Refer to an endocrinologist as appropriate for consideration of sex-hormone replacement therapy (see 6 above). <input type="checkbox"/> Undertake cortisol evaluation for all children.
<p>Adults: As per children, growth and sex hormone deficiencies continue to be found</p> <p>Growth hormone therapy in adults can help to prevent obesity and improve strength and endurance</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Undertake clinical assessment with attention to thyroid function, diabetes mellitus (Type II), and hypogonadism. <input type="checkbox"/> Refer to an endocrinologist, as appropriate, including for consideration of GH and sex-hormone therapy.
12. OTHER	
<p>Molecular causes of PWS differ (e.g., in order of frequency: deletion, uniparental disomy, imprinting errors) each of which effect recurrence risks and possible clinical manifestations</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Refer to a genetics clinic for evaluation and counseling, where appropriate.

WEBSITES THAT MAY BE HELPFUL FOR FAMILIES AND CAREGIVERS

Prader-Willi Syndrome Association USA	<input type="checkbox"/> www.pwsausa.org/
Prader-Willi Syndrome Network (Ontario)	<input type="checkbox"/> www.pwsnetwork.ca/pws/index.shtml
Pittsburgh Partnership, Specialists in Prader-Willi Syndrome	<input type="checkbox"/> www.pittsburghpartnership.com

REFERENCES CITED

1. Sullivan WF, Berg JM, Bradley E, Cheetham T, Denton R, Heng J, Hennen B, Joyce D, Kelly M, Korossy M, Lunsky Y, McMillan S. Primary care of adults with developmental disabilities: Canadian consensus guidelines. *Can Fam Physician* 2011;57:541-53.
2. Balko K. Red yellow green: system for weight management. Toronto: Ontario Prader-Willi Syndrome Association; 2005.
3. de Lind van Wijngaarden RF, Otten BJ, Festen DA, Joosten KF, de Jong FH, Sweep FC, et al. High prevalence of central adrenal insufficiency in patients with Prader-Willi syndrome. *J Clin Endocrinol Metab.* 2008 May;93(5):1649-54.

PUBLISHED HEALTH CARE GUIDELINES REVIEWED AND COMPARED

- Carrel, A.L.; Lee, Phillip D.K.; Mogul, H.R., Growth hormone and Prader-Willi syndrome. 2006, 201-241, Springer-Verlag, New York, 3.
- Cassidy, S.B.; Driscoll, D.J., Prader-Willi syndrome. *Eur.J.Hum.Genet.*, 2009, 17, 1, 3-13, England.
- Chen, C.; Visootsak, J.; Dills, S.; Graham, J.M., Jr. Prader-Willi syndrome: an update and review for the primary pediatrician. *Clin.Pediatr.(Phila)*, 2007, 46, 7, 580-591, United States.
- Crino, A.; Schiaffini, R.; Ciampalini, P.; Spera, S.; Beccaria, L.; Benzi, F.; Bosio, L.; Corrias, A.; Gargantini, L.; Salvatoni, A.; Tonini, G.; Trifiro, G.; Livieri, C.; Genetic Obesity Study Group of Italian Society of Pediatric endocrinology and diabetology (SIEDP), Hypogonadism and pubertal development in Prader-Willi syndrome. *Eur.J.Pediatr.*, 2003, 162, 5, 327-333, Germany.
- Eiholzer, U.; Lee, Phillip D.K., Medical considerations in Prader-Willi syndrome. 2006, 97-152, Springer-Verlag, New York, 3.
- Goldstone, A.P.; Holland, A.J.; Hauffa, B.P.; Hokken-Koelega, A.C.; Tauber, M.; speakers contributors at the Second Expert Meeting of the Comprehensive Care of Patients with PWS, Recommendations for the diagnosis and management of Prader-Willi syndrome. *J.Clin.Endocrinol.Metab.*, 2008, 93, 11, 4183-4197, United States.
- Nativio, D.G., The genetics, diagnosis, and management of Prader-Willi syndrome. *J.Pediatr.Health Care*, 2002, 16, 6, 298-303, United States.
- Scheimann, A.O.; Lee, P.D.; Ellis, P., Gastrointestinal system, obesity, and body composition. 2006, 153-200, Springer-Verlag, New York, 3.
- Wigren, M.; Hansen, S., Prader-Willi syndrome: clinical picture, psychosocial support and current management. *Child Care Health Dev.*, 2003, 29, 6, 449-456, England.
- Wilson, Golder; Cooley, W. Carl, Prader-Willi Syndrome. 2006, 241-246, Cambridge University Press, Cambridge, UK ; New York, 2nd.

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