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Inpatient Crisis Intervention for Persons with Prader-Willi Syndrome

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Editor's comment: The authors have summarized their clinical experience in caring for several hundred persons with Prader-Willi syndrome (PWS) who were hospitalized for crisis intervention. It is emphasized that this experience was with a referral population in crisis and does not reflect the population of persons with PWS in general. Crises in persons with PWS appear to be most often associated with extrinsic factors.

Inpatient care of persons with PWS has afforded a unique opportunity to obtain detailed historical information, to review extensive medical records including prior hospitalizations, and to observe firsthand and in depth the complex phenomenology of PWS. While clear patterns of PWS crisis have emerged and are described here, the interventions and recommendations are far more variable and must be individualized based on each patient's unique personality and circumstances. Inpatient hospitalization is at times the only way to evaluate in adequate detail the circumstances leading to crisis in PWS and to identify or create the resources necessary for crisis resolution.

At the time that this work was done at The Children's Institute of Pittsburgh, Pa., the clinical leadership consisted of a developmental pediatrician who functioned as attending physician and team leader, a developmental neuropsychiatrist, an internist (nephrologist), a head nurse, a psychologist, and case manager(s). There was an integrated collaboration of these disciplines meeting as often as three times per week in addition to a more typical patient-centered staffing model, which included other rehabilitation disciplines such as physical therapy, speech and language therapy, and occupational therapy.

Extended hospitalization (usually 1 to 6 months in duration) provided a unique venue to evaluate treatment interventions in situ. Outpatient follow-up through office visits, telephone, and e-mail communications enabled the clinical evaluation of treatment results across time for a large number of patients manifesting the more severe problems associated with PWS.

Crisis intervention requires involvement in complex scenarios and problems that do not lend themselves easily to systematic investigation. The relative contribution of patient factors and environmental factors leading to crisis is

[+]Deceased.

an area worthy of study. The authors offer their experience as an aid for clinicians addressing these complex problems perhaps for the first time and for researchers who may choose to investigate the sources and resolution of crises in individuals with PWS.

The Nature of Crisis in Prader-Willi Syndrome

Crises in persons with Prader-Willi syndrome (PWS) involve deterioration in level of functioning across medical, behavioral, and/or psychiatric domains, or in the person's support system. Crises most often appear to be the result of extrinsic factors interacting with the typical features of PWS, while a smaller number of cases appear to involve the more severe behavioral spectrum of the disorder or frank psychiatric illness. Usually several areas of deterioration must be addressed simultaneously in order to stabilize the patient. Frequently outpatient interventions may not be comprehensive or sufficiently intensive to effect a sustained improvement.

A crisis for an individual with Prader-Willi syndrome may be abrupt or, as often occurs, the culmination of multiple contributory events. Because of the unique and complex problems associated with PWS, these situations may benefit from a specialized approach implemented by a multidisciplinary team experienced with the disorder.

The goals of crisis intervention include the following:

- Reversal of medical, psychiatric, or behavioral deterioration
- Restoration of an existing support system or prevention of breakdown in a potentially overwhelmed system
- Development of a realistic and comprehensive post-hospitalization plan that supports the above goals for the foreseeable future

Reasons for Referral

Medical Crises

Medical crises in persons with PWS stem primarily from the consequences of a fundamental disorder of satiety.[21] Rarely, stomach rupture from overeating has occurred (see Chapter 6). More often there is an unrelenting weight gain leading to morbid obesity. Persons with Prader-Willi syndrome usually have *exceptionally low caloric needs*, resulting from decreased muscle mass and physical activity, as well as varying degrees of excessive food-seeking behavior. The latter is sometimes extraordinary. Overestimates of actual caloric needs by caretakers and professionals can add to the problem. Persons with Prader-Willi syndrome are at risk for sleep-disordered breathing (SDB)[14,15,19,20,30,33] (see discussion in Chapter 5). Clinical experience also indicates that obese persons with PWS and a body mass index (BMI) greater than 35 appear to be at increased risk for complications resulting from SDB (BMI = weight in kg/height in meters^2). These breathing abnormalities, if untreated, can eventually lead to obesity hypoventilation and right heart failure *(cor pulmonale)*, which may first present as sudden critical

illness, prolonged hospitalizations, chronic disability, and sometimes death. Children appear to tolerate obesity less well than adolescents and adults; persons of all ages, including young children with Prader-Willi syndrome, can die of obesity-related complications.

Food-Related Behavioral Crises

Food-seeking behavior may include foraging for food in and out of the home and consuming spoiled, raw, frozen, or otherwise inedible foods. Older children and adults may steal food or money or use their own money to buy additional food. They may "phone out" for food, elope in search of a restaurant, or enter a stranger's home to seek food. Persons with PWS may pick and break locks or steal keys to enter a locked kitchen. They may display violent outbursts or aggression related to food acquisition or to attempts to set appropriate limits. The more success/notoriety they experience, the more persistent they are in attempting to obtain additional food. In some cases, once this process has begun, the more families attempt to intervene and the more persons with PWS may exhibit behaviors that become intolerable. Families often find themselves in a situation that is spiraling out of control. Law enforcement may become involved, further complicating management.

Behavioral and Psychiatric Crises

Individuals with PWS appear to be more vulnerable to stress. Cognitive deficits (specific learning disabilities) often diminish their ability to adapt to change. Persons with PWS are exceptionally dependent on others to provide structure and control of their environment. Transitional periods such as family moves, changing schools, or moving from school to work environments can all result in a loss of structure and consistency. Limited coping mechanisms may result in extreme maladaptive behaviors that are uncommon in persons without PWS. Dangerous, aggressive, destructive, disruptive, and otherwise intolerable behaviors are sometimes symptoms of psychiatric illness. Self-endangerment, self-mutilation, and rectal-picking can all result in additional medical complications. Stress appears to be a contributing factor in the onset of major psychiatric disorders such as adjustment disorders, anxiety disorders, mood disorders, psychoses, and impulse-control disorders such as intermittent explosive disorder. Accurate psychiatric assessment and diagnosis is greatly aided by a familiarity with the common personality features of the syndrome, including the propensity of persons with PWS to engage in manipulation and falsification of facts.

Medical Problems Requiring Intervention

Editor's note: Selected medical terms are defined in the Glossary at the end of this chapter.

Morbid Obesity

Morbid obesity is defined as a degree of excess body fat that is associated with a high risk for obesity-related complications. In the general adult population, a BMI of 40, or 200% of ideal body weight is often used as a boundary for defining morbid obesity, although obesity-associated morbidities certainly occur at lower levels of BMI. In PWS, the additional factors of substantially reduced lean body mass at any given level of BMI, inactivity, and behavioral characteristics may further exacerbate or interfere with the management of some types of obesity-related morbidities. Such morbidities include the following:

- Sleep-disordered breathing, hypoventilation, pulmonary hypertension and cor pulmonale
- Leg edema, skin breakdown, cellulitis, and venous stasis disease with risk for thrombotic events
- Type 2 diabetes and associated complications
- Hypertension
- Intertrigo (skin breakdown, yeast and bacterial infections in deep fat folds)

Obesity Hypoventilation and Cor Pulmonale

Disordered breathing and respiratory compromise are the most commonly encountered PWS-associated medical crisis requiring inpatient management. Virtually every kind of sleep-disordered breathing has been described in persons with PWS,[13,19,20,32,33,36,37] including individuals who do not meet BMI criteria for obesity. In our experience, morbidly obese persons with PWS at any age may be particularly susceptible to nocturnal hypoxia and edema. The onset may be rapid or slow. In some patients, especially the young, respiratory failure can develop quickly in a situation of steadily worsening obesity. More typically, gradually increasing weight is accompanied by decreasing stamina, reduced activity, and the insidious onset of cardiopulmonary abnormalities. In older persons, long-standing mild obesity can result in chronic dependent edema and venous and lymphatic damage. Recognition is aided by a high index of suspicion for sleep-disordered breathing in obese patients.

Koenig[25] describes the clinical picture of hypoventilation in obese persons as oxyhemoglobin desaturation in the absence of abnormalities in the pattern of breathing. Hypoventilation is characterized by "constant or slowly diminishing oxyhemoglobin desaturation without the cyclic, episodic or repetitive changes in oxygen saturation associated with apneas and hypopneas or the arousal that terminates these abnormal breathing events." This sustained hypoxia can be seen on sleep pulse oximetry and is the typical pattern that we have observed in obese patients with PWS, but is relatively uncommon in non-PWS obese persons.[25,38] Hypoxia has long been known to cause increased pulmonary vascular resistance which, over time, leads to right heart overload.[10]

In PWS, cardiomegaly on chest radiograph (Figure 17.1) is a late finding in the course of obesity hypoventilation and may indicate right heart failure. In these patients, the right ventricular failure (cor pulmonale) of obesity hypoventilation usually occurs in the presence of healthy, *asymptomatic* lungs. Even when daytime and nighttime hypoxemia is profound, there may be wheezing in some, but frank pulmonary edema is usually absent and the left ventricle is generally healthy. Diagnostic modalities that are clinically useful in identifying left heart failure are less helpful in this condition. Right ventriculomegaly or evidence of increased pulmonary artery pressures on echocardiography depend on a good view of the right ventricle, which is often difficult to obtain in a very obese person.

The clinical picture of cor pulmonale is of shortness of breath, worsening daytime sleepiness, leg swelling and cardiomegaly. Unrecognized right heart failure undoubtedly contributes to some cases of sudden death, pneumonia, and reactive airway disease in obese patients with PWS. Healthy persons with PWS sometimes have a low normal hematocrit of 33% and a hemoglobin of 11g per dl. For those with obesity hypoventilation and whose hematocrit and hemoglobin usually fall in the low normal range, levels of 36% and 12 g per dl or greater, respectively, may represent an elevation in response to hypoxia. The usual carbon dioxide (CO_2) combining power is 25 mmol/L or less, but in those with early CO_2 retention it is 29 mmol/L or higher. These subtle changes may help identify individuals at significant risk for CO_2 narcosis if given amounts of supplemental oxygen (O_2) sufficient to normalize oxygen saturations. Overuse of oxygen causing iatrogenic CO_2 narcosis has led to intubation and admission to critical care with consequent deconditioning, markedly worsening and prolonging this crisis. Recovery and reconditioning become especially difficult if a tracheotomy is performed in a PWS-affected person.

The physiology of obesity hypoventilation syndrome (OHS) has not been fully illuminated.[4,25] Many variables have been studied in compar-

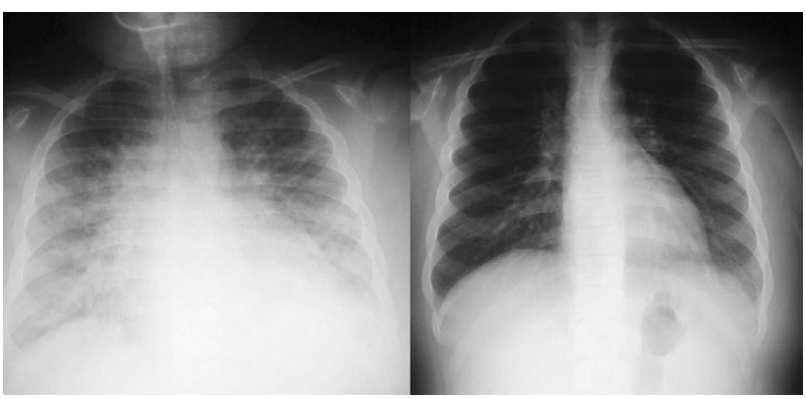


Figure 17.1. A young patient (shown in Figure 17.4) had cardiomegaly on radiograph (left), which resolved to normal heart size (right) after 5 months of rehabilitation. Normalization of pulmonary hypertension was demonstrated by echocardiogram shortly afterwards.

ing persons with OHS with obese persons who do not develop OHS. One common finding appears to be that persons with OHS ultimately develop reduced lung volume.[3,22] It is not clear why some obese persons (non-PWS) develop the disorder and others do not,[31,34] implying multiple mechanisms.[4] It is likely due to a combination of factors causing hypoventilation including congenitally decreased musculature,[24,35] increased work of breathing due to decreased chest wall compliance and, in some cases, partially obstructed airway anatomy.[32] There is some evidence for decreased central or peripheral ventilatory response to hypoxia and hypercapnia,[2,28] an abnormality also reported in non-PWS persons with obesity-hypoventilation.[27,31,39] Other factors may exist. Obstructive hypopneas or apnea during sleep may be present but are clearly not necessary.[4,24]

The late stages of obesity-hypoventilation have been termed "Pickwickian syndrome"[8] after the boy "Joe" who appears in Chapter 4 of Charles Dickens' *The Pickwick Papers.* Numerous authors have suggested that Joe was modeled on a child with Prader-Willi syndrome. Despite its historical and literary interest, the term is best avoided as it has confused parents and other caretakers by suggesting that the patient has acquired yet another "PW" syndrome.

Clinical Presentation

The clinical presentation of OHS in PWS has been delineated from a large number of patients with PWS cared for by the authors with various degrees of hypoventilation and right heart failure. The sequence of events leading to morbidity, disability, and critical illness from obesity hypoventilation is fairly typical and can be observed in reverse during rehabilitation. The sequence can develop over a period of months in the face of rapid weight gain and severe SDB or slowly in patients whose weight has been more stable but in the obese range for many years:

Stage 1—asymptomatic nocturnal hypoxia (detectable only by pulse oximetry study during sleep)
Stage 2—fluid retention (clinical edema, nonpitting increase in tissue turgor); decreased endurance
Stage 3—daytime hypoventilation and hypoxia; edema may be massive
Stage 4—respiratory failure, which may be subtle or brought on suddenly by illness or overuse of oxygen therapy

Stage 1. Nocturnal Hypoventilation and Hypoxia: A maximum "safe" weight for obese persons with PWS has not been defined but, based on our experience, appears to be something less than 200% of IBW (ideal body weight) based on the 50th percentile weight for height. Hypoxia first appears during REM phases of sleep[19]. This finding is subclinical and not evident unless detected by specific testing with pulse oximetry. Full sleep studies are needed to recognize obstructive and apneic events, however. Not every sleep lab is aware that significant hypoxia may occur in the absence of apneas and arousals.

Stage 2. Fluid Retention: In the PWS population, edema often is the earliest clinical sign of obesity-hypoventilation in this population; *it is frequently missed*. The reason for this appears to be the visual subtlety of edema in the obese child or adult. One useful way to describe this type of edema is that "the fat gets hard" as the turgor (firmness) of dependent tissues increases. In our experience, *pitting is usually absent*. Manual comparison (not compression) of tissue in the lower part of the body to the upper extremities will demonstrate an increased density of the tissue in the lower part of the body to the level of the knees, thighs, hips, waist, or higher. This finding is not always appreciable in children. In the absence of diuretic use, the level of edema correlates fairly well with the severity of hypoxia. Therefore detection of a lesser degree of edema to the knees or thighs is especially valuable as an early sign of increased pulmonary artery pressures. These patients typically have normal resting oxygen saturations during the day but pulse oximetry testing during exercise will sometimes demonstrate desaturation. In the presence of *any* recognizable edema, nocturnal oxygen desaturations are usually quite extensive, especially in children and adolescents, and may be present throughout the night without arousals (Figure 17.2).

Decreased exercise tolerance can also be a sign of obesity hypoventilation. However, decreased tolerance is difficult to differentiate from the noncompliance with exercise often displayed by persons with the syndrome. Families do not always perceive the symptom because young children are adept at appearing to carry out their usual activities while conserving their energy. Similarly, orthopnea (sleeping with extra pillows or sitting up) and symptoms of OSA (obstructive sleep apnea) are only sometimes present. Rapid weight gain in an individual with PWS that is not explained by increased access to food may also be a sign of fluid retention.

Stage 3. Daytime Hypoxemia, Clinical Cardiopulmonary Compromise: Even in this late stage, obese patients with PWS sometimes come to medical attention with only complaints of reduced exercise tolerance. Ambulatory patients with daytime oxygen desaturations often have edema (nonpitting) to or above the level of the thighs and hips. Extensive nonpitting edema to the level of the chest can still be subtle enough to be missed (Figure 17.3), but other patients visibly display massive edema, especially in the lower extremities, causing secondary morbidity: weeping sores, cellulitis, and most ominously, impaired ambulation. Some patients are quite sedentary and increased daytime sleeping may be a prominent symptom. Inactivity further impairs the quality of ventilation both during the day and at night. Oxygen saturations when the patient is awake and sitting quietly may be well below 85%, dropping still lower with activity. Cardiomegaly on chest X-ray sometimes still appears "mild." As persons reach the stage of daytime hypoxemia, they will typically increase their resting respiratory rate, but this tachypnea >25/min is not readily appreciated since it is not accompanied by a visible increase in respiratory effort. At rest the tidal volume is small.[31] Resting breath sounds are often barely audible with the stethoscope.

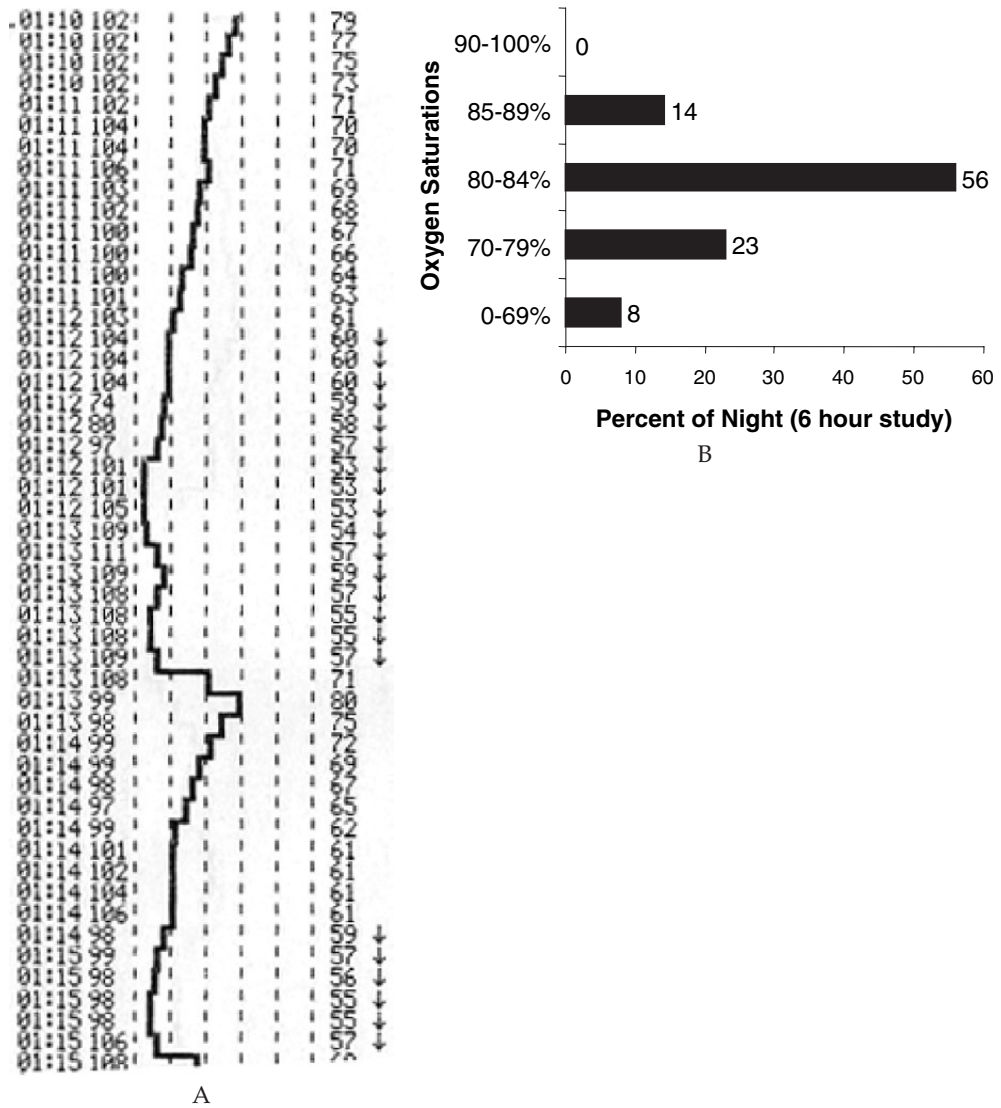
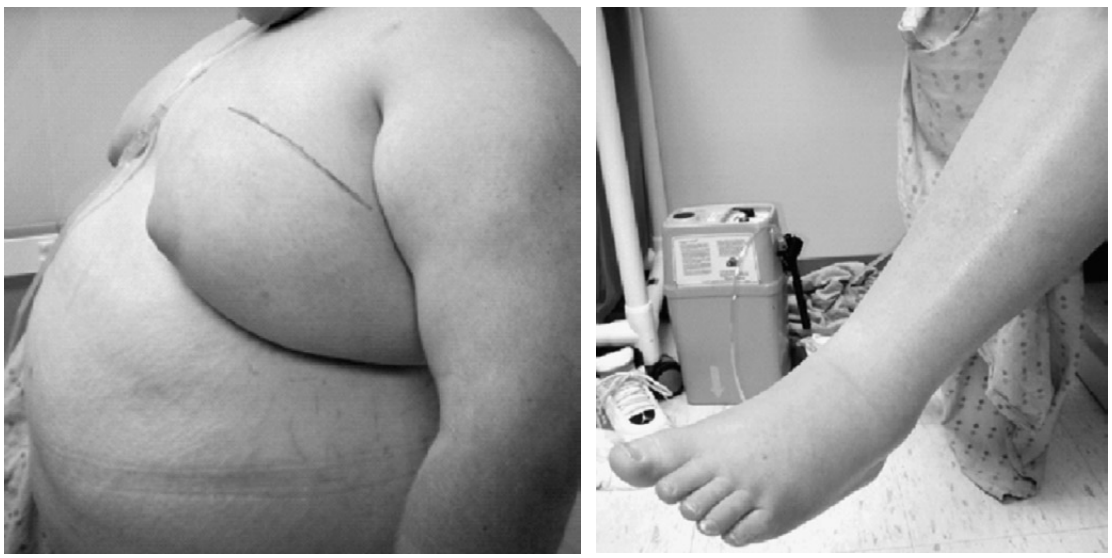


Figure 17.2. A. Pulse oximetry studies during sleep are very useful in identifying low blood oxygen in obese patients with PWS. These studies are relatively inexpensive and may be arranged at home while waiting for a formal sleep study. This 5-minute sample from a 6-hour study shows the severe hypoxia with oxygen saturation dipping below 60% (normal 93%–96%), which took place in a severely obese teenager who was only slightly symptomatic. She had mild shortness of breath with exertion and a subtle increase in tissue turgor of her lower body (fluid retention from early right heart failure). **B.** The bar graph depicts the data from a 6-hour night time study of the same teenager. The graph shows that once asleep she spent the entire night with oxygen saturations below 90%, most of the night (56% of the 6-hour study) with oxygen saturations in the 80%–84% range, and 8% of the time under 70% (0%–69% range). These abnormalities in oxygenation may take place without obstructive or non-obstructive sleep apnea and are primarily due to poor ventilation. Hypoxia is sometimes overlooked on sleep studies because there are no "events" in the form of apnea or arousals.



A B

Figure 17.3. A. This young man with PWS had severe nocturnal and daytime hypoxia and palpable edema (increased tissue density) to the upper chest (marker line). **B.** Lower extremity edema may not be visually impressive (same patient) and is easily overlooked.

With activity, however, increased respiratory effort is more evident and often reported by family members as shortness of breath.

Stage 4. Respiratory failure: Respiratory failure with CO_2 retention is a life-threatening condition that may be acute or chronic. Obese persons with PWS may continue to survive in a compensated state in Stage 3 for years without evidence of respiratory failure *if* their obesity is stable and *if* they remain active. However, they will deteriorate eventually or they may suddenly become critically ill when decompensation is precipitated by an intercurrent respiratory illness or an injury resulting in decreased ambulation. Our clinical experience indicates that both inactivity and overuse of oxygen therapy may cause worsening daytime and nighttime hypoventilation with worsening CO_2 retention. (See Management section, below.)

We have rehabilitated a number of patients from very late and chronic obesity hypoventilation and cor pulmonale and believe that as long as a patient can be made to be ambulatory and be calorically restricted so that weight loss occurs, the condition is usually reversible. Clearly the younger the patient and the earlier the intervention, the better the prognosis for full recovery from critical illness.

Management of Obesity Hypoventilation and Cor Pulmonale

Activity and Diet

Two primary modalities are effective in reversing the cardiopulmonary deterioration of obesity hypoventilation. These are calorie restriction and ambulation. Rehabilitation to a higher level of physical activity is

essential for recovery. Even the most seriously ill patients, if conscious, will benefit from this process immediately upon hospitalization. Patients who are critically ill, edematous, and short of breath are understandably reluctant to move. The typical Prader-Willi behavioral traits of stubbornness and manipulation may become immediately life-threatening when patients refuse to cooperate. Therefore skilled therapists working in teams of two or three may be needed to initiate activity in a nonambulatory patient (Figure 17.4).

Every effort should be made to encourage ambulation and physical activity, and patients with PWS should not be fed in bed unless absolutely required by their medical condition. Nurses and therapists will need to work together; consistent behavioral rewards and consequences should be used by the nursing and other hospital staff. Tactics may include delaying meals until modest therapy goals are achieved. Communication with the patient should take into account the personality traits typical of the syndrome to avoid nonproductive efforts. Rehabilitation consists of gradually increasing demands for physical activity beginning, if necessary, with walking a few steps to a chair for meals. Physical and occupational therapists should be given adequate support from nursing staff and adequate time to wait out the inevitable PWS

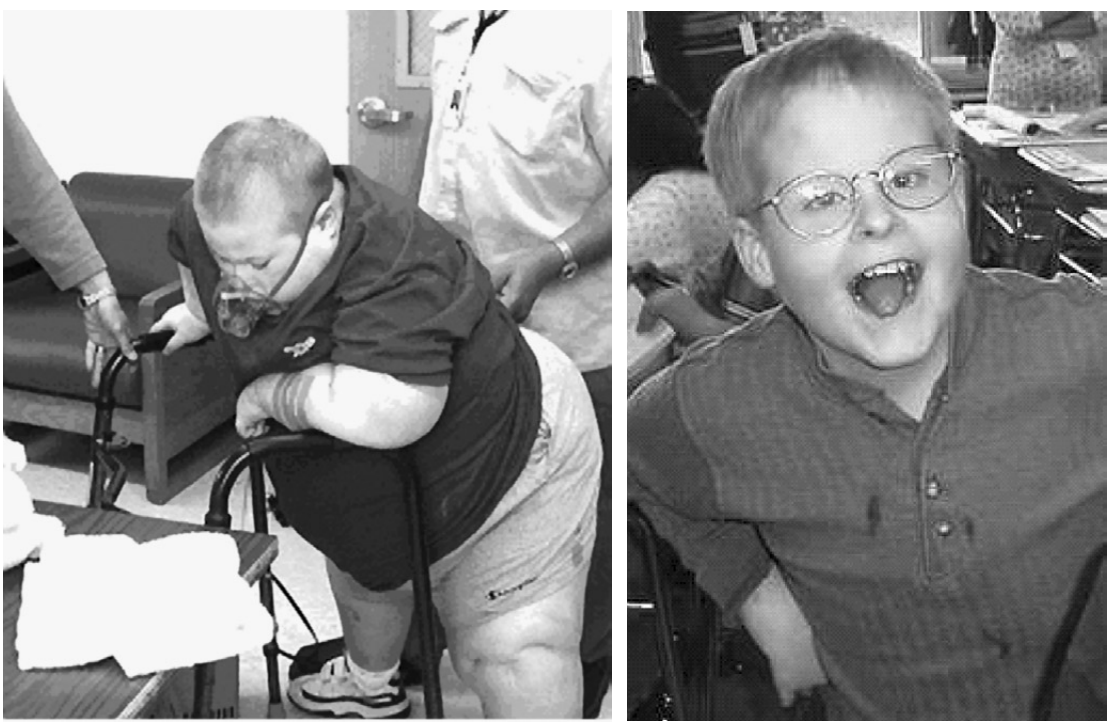


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Figure 17.4. A. Nine-year-old boy with massive edema, profound hypoxia, and dangerous levels of CO_2 retention from obesity hypoventilation and cor pulmonale. Physical activity is an essential component of management and recovery, even in the critically ill patient. **B.** Six months after presenting in critical condition this same 9-year-old boy was active and healthy in school.

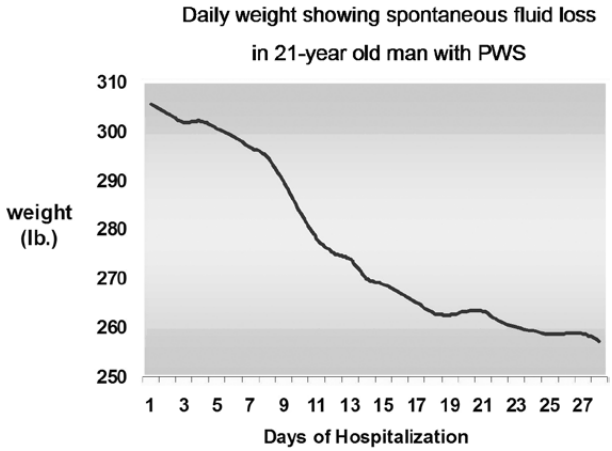

Figure 17.5. This graph shows the daily weight measurements of a patient (pictured in Figure 17.3), beginning at the time of his admission to a rehabilitation unit. He lost 48 pounds in his first 28 days of rehabilitation, with rapid improvement in his endurance and hypoxia. This massive fluid loss is achieved without the use of diuretic medications and appears to be a response to calorie restriction and increased physical activity, which improves ventilation.

behaviors such as whining, crying, delaying, manipulation, and frank refusals. Additional behavioral incentives also may be required. A crisis intervention team approach can help to facilitate this process.

Our experience is that a daily intake of 600–800 kcal provides adequate early nutritional maintenance in the obese, ill patient with PWS. Higher caloric intake is not needed, even for healing of self-injury wounds or decubiti (bedsores). The reader is referred to Chapter 6 for additional discussion of diet and nutrition in PWS.

Spontaneous Diuresis

Spontaneous diuresis of edema fluid and improving oxygen saturation are hallmarks of recovery. The known natriuretic effects of a low-calorie diet[23,26] combined with increased activity[29] result in a diuresis that is at times dramatic (Figure 17.5). In our experience, patients have eliminated as much as 2 liters of fluid per day without diuretics during the initial stages of rehabilitation. Half a kilogram weight loss per day is typical. In the absence of drugs that alter renal function, such as diuretics or topirimate, this rapid diuresis has not been associated with electrolyte abnormalities. The time frame for this diuresis is variable. While it is usually seen within days, in several severely affected individuals, diuresis was delayed many weeks despite early ambulation and strict diet. Further, we have observed that in this patient population, use of diuretics appears to delay this diuresis rather than assist it, even if azotemia is avoided.

Use and Misuse of Oxygen Therapy

The fundamental pathophysiology of OHS should be kept in mind in order to avoid mismanagement. Patients are hypoventilating, day and

night. Underlying this condition is congenitally weak respiratory musculature. Adiposity thickens the chest wall thereby further restricting excursion (Figure 17.6), and in some cases there is additional tissue stiffness with loss of compliance brought on by edema fluid, as seen in Figure 17.3. In sum, the respiratory drive is inadequate to overcome the increased work of breathing. Oxygen therapy and inactivity worsen the condition of decreased respiratory drive.

In the edematous PWS patient, hypoxemia may be assumed to be chronic (present at least at night for months or years) and need not be corrected too quickly. It is sometimes thought that oxygen therapy used to treat a young person with hypoxemia and no lung disease can do no harm. However, our experience indicates that hypoventilation may gradually and subtly worsen over hours or days in patients with hypoxemia who are given more than 1 liter/minute of oxygen (24%). Hypoventilating patients who are deteriorating do not appear distressed; the only indications of excessive use of oxygen are dropping O_2 saturations and lethargy with seemingly increased O_2 "requirements" to maintain "normal" saturation. Although it may appear clinically reasonable to increase the rate of oxygen flow such action can lead to worsening CO_2 retention, with worsening lethargy and potential respiratory arrest. An alternate response to this situation is to decrease the oxygen flow and get the patient up and moving. If needed, assisted external positive airway ventilation (BiPAP and CPAP) is preferable to intubation because it is more compatible with keeping the patient awake and mobile.

In our experience, patients in Stages 3 and 4 appear to benefit from 1 liter/minute of oxygen without worsening their hypoventilation, provided increased activity is also demanded of them. One liter of O_2 per minute by nasal cannula may raise oxygen saturations to the high

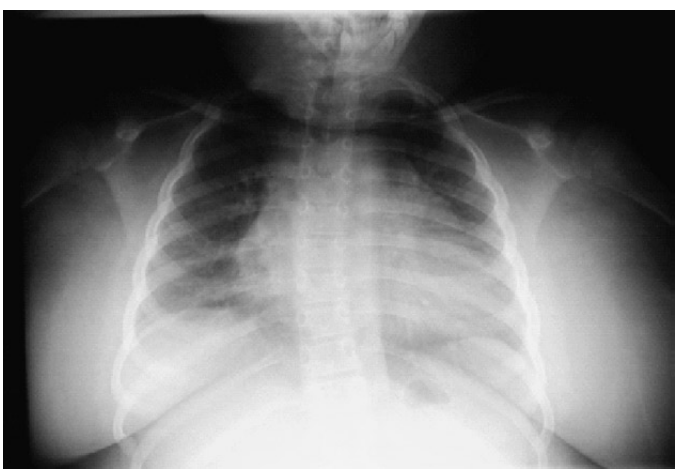

Figure 17.6. This chest radiograph illustrates the thickening of the chest wall in a severely obese patient with PWS. Excessive subcutaneous fat changes the energy requirements for breathing, causing hypoventilation in obese persons with the disorder.

70s or low 80s and this appears to be adequate while rehabilitation takes place. Oxygen saturations will be lower during activity, and by our observation, this is neither harmful nor does it hamper recovery. Patients should have their electrolytes checked especially if they are on oxygen therapy. After 2 to 3 days on oxygen therapy, bicarbonate levels may rise as the kidneys produce a compensatory metabolic alkalosis. This finding confirms a respiratory acidosis from CO_2 retention; furosemide and other diuretics may mask this effect. Unfortunately, prior to referral, some patients who refuse the BiPAP are then treated with nocturnal oxygen alone without being checked to see if their bicarbonate is rising. Prior to hospitalization, external positive airway ventilation definitely improves nocturnal ventilation in some patients, but this benefit should not be allowed to delay definitive therapy of rehabilitation and weight loss.

Many patients who initially refuse these modalities (CPAP and BiPAP) have successfully accepted these treatments with behavioral training. Sleep studies show improved ventilation and some patients report more comfortable sleep. Other patients who have completely refused therapy have also been fully rehabilitated despite ongoing profound nocturnal hypoxia. Nocturnal ventilation improves (sometimes rapidly) once rehabilitation with increased activity is underway. We do not recommend tracheostomy; the majority of persons (6 of 7 in our experience) with PWS given tracheostomies have pulled out their own tubes or otherwise endangered themselves by injuring the stoma and airway.

Use and Misuse of Diuretics

If used at all, diuretics must be administered with a clear understanding of their benefits and risks. Excessive use of diuretics decreases intravascular volume with little impact on the interstitial edema of the lower body. Further, diuretic use risks the development of renal and hepatic hypoperfusion. Pulmonary edema is not characteristic of right heart failure and should not be cited as a reason to give diuretics unless left heart dysfunction has been established.

The doses of diuretics that produce azotemia also produce hepatic ischemia with rising levels of transaminase. Diuretics should be tapered and ACE inhibitors and non-steroidal anti-inflammatory drugs (NSAIDs) should be discontinued immediately. In our experience, the typical teenage and older person with PWS who has not been on growth hormone (GH) or testosterone has a serum creatinine of 0.5–0.7 mg/dl; if the creatinine is greater than 0.9 mg/dl then renal hypoperfusion/injury should be considered.

Positioning

Ventilation is well known to deteriorate in the reclining position.[25] Very obese, edematous individuals may further compromise their own ventilation if the abdominal mass is resting on their thighs in a hospital bed. Patients benefit from sleeping in a recliner rather than a hospital bed so that their legs can be supported from below on a footstool and the abdomen can remain pendulant so as not to impinge on lung volume. These measures generally apply only to persons in Stages 3 or

4 of obesity hypoventilation. Obese persons with PWS who prefer sleeping at night in an upright position (orthopnea) can be assumed to be in danger from their obesity.

Obesity-Associated Conditions

Although the following medical conditions are not inpatient crises per se, they may be commonly observed in patients with PWS who are hospitalized for medical or psychiatric problems.

Leg Edema and Cellulitis

Leg edema in a person with PWS may accompany sleep-disordered breathing. Longstanding edema results in chronic tissue changes of the lower body including legs and lower abdomen (Figure 17.7). The result-

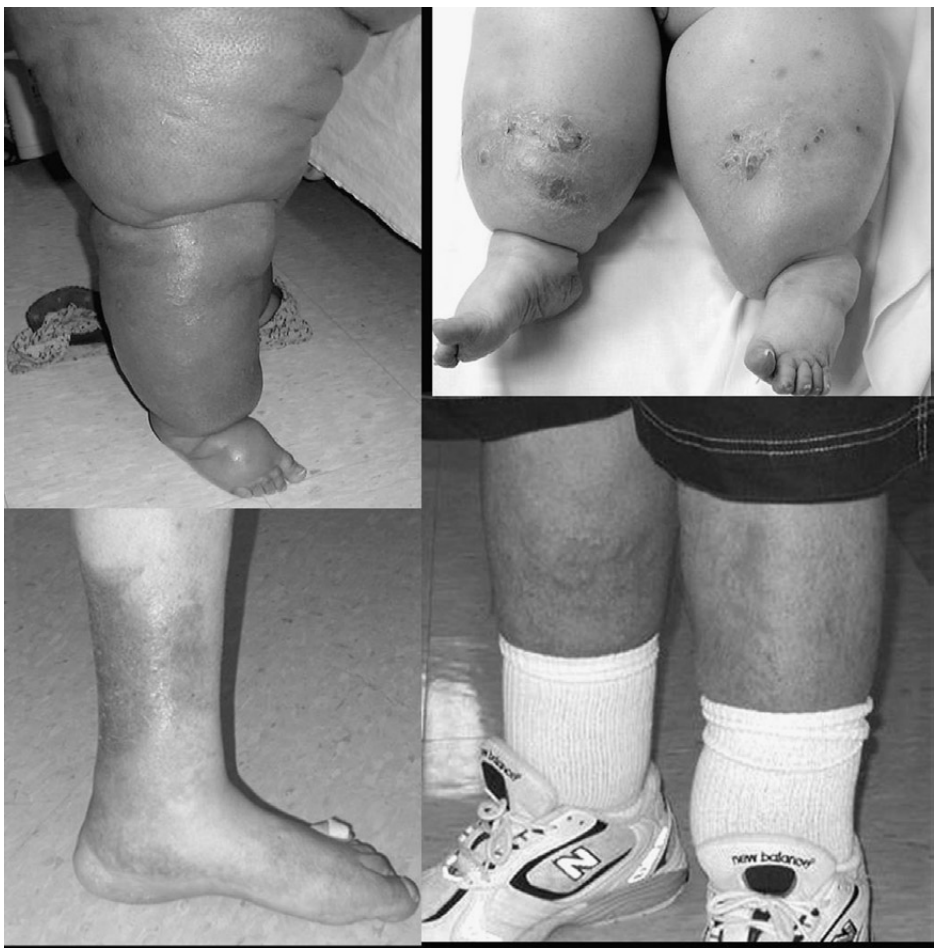

Figure 17.7. While some edematous patients retain fluid throughout their subcutaneous tissue as in Figure 17.3, others demonstrate severe leg swelling. In either case, longstanding (probably 10 or more years) and often unrecognized obesity hypoventilation results in changes in the lower extremities that are irreversible. These include dilated veins, damaged lymph vessels, and chronic stasis changes of the skin.

ing venous stasis and lymphatic damage predispose tissue to ulcers, thrombosis, and cellulitis. Intervention to prevent the prolonged condition of obesity hypoventilation is essential to avoid irreversible damage to the lymphatic and venous systems of the lower legs. There is no question that skin-picking behavior in those with PWS, while not usually resulting in infection in other parts of the body, is a major contributor to some episodes of leg cellulitis.

Direct pressure techniques to the legs or use of support hose appear to be of limited use unless they are part of a medical protocol for treatment of lymphedema. In some cases, support stockings may be counterproductive, causing tissue breakdown from pressure or constriction of fluid outflow.

Signs of cellulitis can be difficult to ascertain in the very obese individual since the legs are often already chronically swollen, indurated, and discolored. A high index of suspicion and close daily examination of the legs by caretakers seeking changes in feel or appearance is essential. Patients do not always exhibit fever or pain. Limited cases of cellulitis, diagnosed early, can be managed with oral antibiotics sometimes in combination with an antifungal agent (such as fluconazole). Preventative use of antibiotics is discouraged to prevent development of resistant strains of bacteria. However, intravenous antibiotic may be necessary in severe cases, especially if there is evidence of systemic infection. In all cases, an attempt should be made to identify the causative organism.

Maintaining and increasing physical activity and leg elevation when the patient is sitting have proven useful adjuncts in the management of these difficult conditions. Cellulitis and superficial venous thrombosis are not reasons to limit activity; rather, the reverse is true. Patients who have ceased to walk for any reason are at high risk for thromboembolic events and prophylactic anticoagulation should be considered. Rehabilitation to some level of ambulation is the highest priority.

Diabetes

Elevated blood glucose or Type 2 diabetes, seen in 25% of adults with PWS,[9] is frequently indicative of excessive calorie intake. In our experience, the vast majority of patients achieve normal glycemic control without medication when exercise and diet are implemented. In patients requiring diabetes medications, increasing dose requirements may be a sign of a crisis with the patient's intake and weight given the rapid rate of weight gain possible in persons with this syndrome. Patients who are on insulin are at risk for hypoglycemia if their access to excess calories is suddenly interrupted by hospitalization or other intervention.

Hypertension

Most hypertension in PWS is directly related to obesity and requires definitive intervention with diet and exercise. As with diabetes, the need for medication usually indicates inadequate intervention for the patient's deteriorating clinical condition. In our experience, the hypertension is usually labile and resolves with adequate weight loss. The

vasodilating effects of most antihypertensives only add to the amount of accumulating edema, and in some individuals their use delays the onset of the diuresis that occurs with increasing activity and caloric restriction.

Intertrigo

In the very obese individual, the deep fat folds are prone to monilial and bacterial infections with occasional severe ulceration. The physical effort required to cleanse and dry deep fat folds may be beyond the capability of a single caretaker; sometimes two persons are needed to support the adipose tissue while another person performs hygiene. Obviously this is beyond the capabilities of most families, especially if the patient is resisting care.

Management of severe intertrigo includes daily or twice-daily cleansing of nonulcerated skin using a dilute (1:3 ratio) vinegar and water spray and air-drying with a heat lamp or hair dryer. Clotrimazole or powdered nystatin applied two or more times per day is also useful, especially if there is evidence of fungal infection. On rare occasions, oral antifungal or antibiotic agents may be needed if the area of involved skin surface area is great or there is ulceration. Severe ulceration may require aggressive inpatient nursing care.

PWS Medical Issues Not Related to Obesity

Renal Dysfunction

There is, at present, little evidence of any kidney dysfunction directly related to PWS. Renal problems seen in this population have included obstructive uropathy of congenital origin, glomerulonephritis post-infection, "diabetic nephropathy" (i.e., persons with longstanding hyperglycemia and elevated glycohemoglobin levels but without the retinopathy), renal tubular acidosis from psychotropic medication (topiramate) and Syndrome of Inappropriate Antidiuretic Hormone (SIADH) with hyponatremia from psychotropic medications, especially oxcarbazepine and carbamazepine (Trileptal and Tegretol), but also from selective serotonin reuptake inhibitors (SSRIs). Patients have developed azotemia from the volume depletion of aggressive diuretic use that at times may be greater than 70mg/dl without postural symptoms. Renal biopsy has been rarely attempted, possibly due to concerns about both patient cooperation and massive overlying fat. Persons with PWS who have not had GH treatment have a low serum creatinine due to low muscle mass. For these patients creatinine of 0.9 to 1.0 should be considered abnormal in this syndrome where typical values are 0.5–0.7.

Skin Picking

The "skin picking" behavior of PWS has a wide range of severity from patient to patient and may vary in the same patient over time.[17] Some patients have occasional minor skin picking while others maintain large open wounds.

Skin picking is an activity that goes on continuously, intermittently, or clandestinely when the patient is calm; typical skin picking in an

individual with PWS does not appear to be an expression of emotional distress. It has been related to boredom and anxiety but objective evidence for this is difficult to establish. No specific intervention has been uniformly effective. In some cases extremely frequent picking behavior itself interferes with the patient's other activities. Severe disfigurement, recurrent infection, and anemia are reasons to consider more intense efforts to modify the behavior with hospitalization or a medication trial.

The behavior often is extinguished, at least temporarily, if healing of the wound(s) is achieved. There has been limited success using protective dressings and an intense program of alternative activity until wound healing occurs. Some wounds have healed with frequent application of an antibacterial ointment, which functions as a lubricant and interferes with picking.

Behavioral interventions targeted at the activity itself are difficult to implement. Some parents have reported success by attaching a major reward to the healing of a lesion. This approach is compatible with the basic principle that no attention, positive or negative, should be paid to the behavior itself other than to require the patient to observe social conventions and good hygiene. Spontaneously or in search of a reward, patients may cease the behavior or substitute another area of skin to pick. In rare cases, primary reinforcers have been used effectively.

Self-Mutilation

Sudden self-injury or self-mutilation, with or without an emotional outburst, is a different phenomenon representing more serious pathology. Self-mutilation does not differ from skin picking in severity of the wound but in the circumstances under which it is inflicted. The actual injury may be mild (hitting self in the head) or severe (gouging a deep wound with a pen, knife, or fingers). The patient may verbalize distress, anger, self-hatred ("I'm so stupid!") or appear to be in a dissociative state. Psychiatric assessment and treatment of underlying conditions is indicated. Some patients have reported auditory hallucinations as triggers for these behaviors.

Rectal Self-Injury

Rectal self-injury is a problematic behavior occurring in some persons with Prader-Willi syndrome. The behavior is not well understood. Fortunately it becomes serious in only a small number of persons with PWS. This includes patients with frequent rectal digging/injury that results in medical problems such as bleeding, infection, or fecal incontinence[5].

We have made the following observations with respect to this behavior in individuals with PWS:

1. Indirect evidence of the behavior can aid in the diagnosis of unexplained medical symptoms, even if the behavior has never been observed.
   - Excessive time spent in the bathroom (a PWS trait without rectal picking)

- Feces or bloody smears on hands, toilet, fixtures, shower, bath tub, or bed linens
- Bowel incontinence, urgency, or diarrhea (due to reflex bowel emptying following rectal stimulation)
- Rectal bleeding

2. Anemia from chronic blood loss, while rare, can be severe. Acute hemorrhage or perforation has not been reported. Chronic ulceration is well documented by endoscopy and has been misdiagnosed and treated as inflammatory bowel disease (IBD). Clinical experience in the referral population has been that all cases of rectal bleeding or ulceration have proved to be from self-trauma and not from IBD.
3. The behavior appears to be obsessional and compulsive; however, medications targeting OCD have not been helpful.
4. Rectal picking/digging does not appear to be a sexual behavior, nor is it a behavioral sequela of sexual abuse.
5. Rectal picking/digging does appear to be a nonspecific stress symptom. Marked increases in the behavior have been observed in association with ongoing interpersonal conflict and punitive disciplinary approaches, as well as during episodes of psychosis and mood instability. Diminution and/or elimination of the behavior has occurred when the underlying illness or stressor is addressed effectively.

Special Considerations

There are a number of unusual characteristics in patients with PWS. Familiarity with these issues is necessary for the clinician to respond appropriately.

Unreliable Self-Report

Abnormal pain awareness and *unpredictable fever response* can lead to underreporting of pain and missed diagnoses of serious conditions that would normally be expected to produce severe pain or fever. Diagnoses of acute surgical abdominal conditions, fractures, and serious infections have been delayed due to the failure of the patient to report pain or to show a fever. Therefore, any fever or a refusal to walk (after an injury or fall) should be taken seriously, and a good clinical examination and close follow-up are indicated until serious illness or injury has been ruled out. Patients who show decreased interest in food should be considered potentially seriously ill, medically or psychiatrically. Manipulative refusal to eat has also been observed.

Somatic complaints are frequent among individuals with PWS who often report numerous symptoms for which objective evidence is lacking. When there is a marked discrepancy between objective findings and subjective stress, discomfort, or functional impairment, malingering should be considered. Malingering is the intentional production of false or grossly exaggerated physical or psychological symptoms motivated by external incentives.[1] For the individual with PWS, external incentives may include obtaining food or medication, escaping

structure in order to procure food, or avoiding demands for exercise or other tasks.

Factitious disorder is differentiated from malingering by the absence of external incentives. Individuals with factitious disorder need to maintain the sick role because of intrapsychic needs.[1] They may engage in pathological lying about their symptoms or their personal history. Sometimes for no apparent reason an individual with PWS will provide an inaccurate medical history, reporting events or procedures that never happened. Therefore clinicians should try to verify presenting symptoms and history independently.

Suggestibility is common among patients with PWS, and they may falsely endorse complaints when asked during a routine interview about symptoms of disease. The symptoms may be variable in their occurrence (present only when asked or examined). This suggestibility in persons with PWS complicates both their medical and psychiatric evaluation and management.

Medication seeking is prominent with some patients (usually higher-functioning individuals) and can result in massive polypharmacy for miscellaneous complaints. These are usually conditions for which objective evidence is difficult to obtain: pain, allergies, reflux disease, constipation, and urinary symptoms. Complaints of pain and requests for analgesia are common. Consequently adult patients in the referral population were frequently on an excessive number of prescription drugs and over-the-counter and topical preparations. Persons with PWS are often very attached to their medication regimens and will sometimes vigorously resist change. They sometimes request liquid medications that are sweet to the taste. Prescriptions for symptomatic relief should therefore always be time limited and dose limited. Patients with a clear pattern of medication seeking should not have unsupervised visits to a physician. Persons with the disorder cannot be allowed to dose themselves with "as needed" medications. Nondrug therapies are preferred: heat, cold, massage, sympathy, or reassurance.

On the other hand, individuals with PWS can be truthful and reliable historians. A careful interviewer takes seriously reports of abuse, serious physical symptoms, delusional thinking, or the experience of hallucinations.

Abnormal Temperature Regulation

As discussed in Chapter 5, temperature dysregulation may occur more frequently in individuals with PWS, perhaps related to a defect in thermogenesis. In two well-described cases,[16] hypothermia began with a change in behavior followed by decreasing activity proceeding to near coma. The patients did not want to eat, did not complain of being cold, felt cool to the touch, and became ashen. Hypothermia (81°F–94°F), decreased blood pressure, bradycardia, and slow respirations were observed. Laboratory studies revealed decreased hemoglobin, low white blood cell count, decreased platelets, hyponatremia without acidosis or hyperkalemia, and elevated renal and liver function tests. All of these changes returned to normal levels over several days as the

patients were rewarmed. Sepsis was suspected but blood cultures were negative. Neuroleptics may have played a role.

Hypothermia has usually occurred when the outside temperature was cool. In our experience, some patients have repeated episodes during the winter and experience relief during the summer months, but have recurrence during the following late fall. Bray et al.[7] have made similar observations.

Hypersomnia, Daytime Sleepiness

Abnormalities in the sleep of persons with PWS have been documented at all ages with and without obesity.[11] Excessive daytime sleepiness appears to be a characteristic of PWS, but excessive medication and obesity hypoventilation should be ruled out as contributing to the symptom. Some patients meet criteria for narcolepsy and benefit from appropriate medications.[18] In our experience, stimulant medications and modafinil have been useful in selected cases, keeping in mind the risk of mood activation in susceptible patients. It is certain that some patients use their capacity for short sleep latency as an escape-avoidance mechanism at will and can respond to behavioral incentives to stay awake in the classroom or workshop.

Behavioral Problems and Psychiatric Crises in PWS Requiring Intervention

Stress Sensitivity

Individuals with PWS are *stress sensitive;* they rely on the predictability, consistency, and stability of their environment. A stress response will occur if the integrity of the environment deteriorates for any reason. The stress response can be nonspecific (increase in typical PWS behaviors), specific (emergence of atypical behaviors), or outrageous (individuals with PWS who are stressed have the potential for outrageous behavior, which should not be attributed automatically to severe psychopathology). Because the individual with PWS is dependent on environmental structure, and because their problem-solving ability is limited by impaired judgment that exceeds the deficit predicted by their intellectual deficiency and/or learning disability, individuals with PWS are usually not candidates for complete independence. Their life goal is *maximal function with support*. Among the referral population, the most common cause of functional deterioration in adults with PWS has been a misunderstanding of this principle.

Caring for an individual with Prader-Willi syndrome exhausts the resources of many families. Controlling food access and dealing with other difficult behaviors is an ongoing challenge. The price tag of "keeping the peace" or "giving in" is the inadvertent reinforcement of disruptive behaviors and the spiraling pattern of obesity and its morbid complications. The mainstay of behavior management for this syndrome is an environmental buffer in the home, school, workshop, and community that prevents rather than reacts to behavioral problems. On

an inpatient unit, this environmental buffer is called the *therapeutic milieu*. Crisis intervention provides an opportunity to have an impact on both the individual and the home environment by reestablishing the structure and consistency of rules and mutual expectations needed to effectively manage the most common behavioral issues.

The basic premise of intervention acknowledges that *at no time can a person with Prader-Willi syndrome be expected to voluntarily or independently control his/her own food consumption*. Extensive experience with a referral population has demonstrated that once food access is controlled and the principles of food security are implemented, acceptance of restrictive programming is usually excellent. Appropriate social skills and compliance with an exercise program, activities of daily living, chores, and personal hygiene are all supported by the therapeutic milieu. The experience of success is built into the program; patients receive rewards for their progress, and families are rewarded by a decrease in their level of stress.

Psychiatric Crises

Among persons with Prader-Willi syndrome the proportion who develop serious psychiatric illness requiring hospitalization is unknown. The literature is replete with case reports of serious psychiatric illness concurrent with PWS. Among the referral population, psychiatric crises are not limited to those who have severe psychiatric illness. Persons with PWS have limited coping mechanisms due to cognitive rigidity, variability in adaptive functioning and sensitivity to stress that can result in a precipitous deterioration in mental status. Sometimes precipitating events can be identified, such as life stressors associated with leaving school, failure in a workshop, change in educational or caretaking staff, or death or illness in the family. Some presenting symptoms leading to hospitalization include depression, suicidality, aggression, property destruction, elopement, increased irritability and explosiveness, hypomania, delusional thinking and hallucinations, and self-mutilation or self-endangerment. Persons with PWS are prone to a variety of mood disorders often presenting with psychotic features.[6,12] In addition, psychiatric illness in this population is often accompanied by a range of behaviors usually restricted to severe and chronically mentally ill persons: attempts to swallow inedible objects, severe self-mutilation, running into traffic, fecal smearing and throwing, coprophagia, rectal self-injury, psychogenic water intoxication, deliberate property destruction, hunger strikes, refusal to move, etc. Despite the seriousness of the presenting symptoms, the prognosis is quite variable: many patients stabilize in a structured, low-stress environment either with or without psychotropic medication. At the other end of the spectrum, a small number of patients have refractory symptoms despite appropriate environmental management and multiple trials of medications.

Individuals with PWS who develop serious psychiatric crises may display behaviors that are difficult to manage even in psychiatric facilities. The therapeutic milieu of most general psychiatric units is not

designed for and often does not meet the needs of persons with PWS. Subtle but significant cognitive deficits may not be recognized, and individuals with PWS may not benefit from traditional group and individual psychotherapeutic interventions. Some patients undergo weight gain because they have access to too much food. They may forage freely from other patients. Access to recreational and exercise facilities is often limited. Among the referral population, reports of weight gains of as much as 20 pounds have occurred in a matter of days during the course of a psychiatric hospitalization. Syndromal behaviors are often misunderstood as manifestations of more severe psychopathology, or they are not adequately addressed with potentially beneficial behavioral techniques.

Even in the absence of a specialized program, most patients with PWS show an immediate improvement in their behavior upon admission to a hospital. They respond to the predictable regimen. They often have no demands made on them, and they receive too much food. This response should not be interpreted as an end to the behavioral crisis.

A Specialized Therapeutic Milieu

A specialized therapeutic milieu, an essential element in inpatient crisis management, is dependent upon a trained, experienced staff. *Consistency* is the gold standard; every health care worker, nurse, physician, and therapist should understand the behaviors typical of PWS and respond to their occurrence in a low-keyed manner. For example, behaviors such as screaming and verbal abuse are best ignored. All statements made to patients should be framed in a positive rather than punitive context. It is important to assure that the patient's attempts to manipulate or triangulate personnel are unsuccessful. Even housekeeping and dietary staff members can be trained so that they will not be tricked or manipulated. Important questions about length of stay, family visits, dietary orders, and disposition plans should be answered only by designated staff. Clear lines of communication with the patient, the family, and the staff are critical. Families and other caretakers should be incorporated into the milieu through training that may involve "homework." These assignments may involve observation of direct care in the hospital or the design of a daily schedule, meal plan, or behavioral contract for use in the home. Telephone contact after discharge can assist in the maintenance of structure and the ongoing monitoring of treatment goals and interventions.

The ideal inpatient treatment plan for a patient with PWS has six major components: (1) milieu management, (2) behavioral interventions, (3) psychological therapies, (4) psychotropic medication, (5) family/staff intervention, and (6) disposition/systems intervention.

1. Milieu management

Milieu management is an essential tool for the inpatient treatment of individuals with PWS. The milieu contains several components:

- Rules of conduct
- Daily schedule of activities

- Psychological food security
- Mandatory supervised exercise
- "The Day Stops Here"

Rules of Conduct: The rules of conduct for patients on the unit are explained and posted next to the patient's bill of rights in the individual's room.

Daily Schedule of Activities: This modality consists of a predetermined time line of activities including wake up, grooming, therapies, meal times, exercise, leisure, rest, and bedtime. It defines the *flow* of the day and establishes structure, consistency, and predictability. This timeline is best presented to the patient in a concrete form; a wall chart may be supplemented by a written schedule which the patient carries with him through the day. The planned flow of activities is continuously reinforced by the verbal prompts of staff and therapists to "check the schedule."

It should be assumed that the patient with PWS could have difficulty with the timely completion of ADLs (activities of daily living). Some will need assistance with grooming activities depending upon the degree of obesity as well as the level of dyspraxia.

Because individuals with PWS have hypothalamic hypogonadism, their physical and emotional sexual maturation may not be age appropriate. Many of them appear to be younger than their stated age, and their gender may appear to be ambiguous because of obesity and poorly developed secondary sexual characteristics. Among our referral population, both males and females tend to be immodest, and they may require verbal reminders to maintain privacy for grooming and dressing. Also, this privacy is essential to prevent other patients who do not have PWS from making destructive comments leading to discomfort.

Psychological Food Security: Psychological food security is an essential component of the management of individuals with PWS; the goal is to maintain food security across all settings both in and out of the hospital. Food security is one of the most basic skills taught to the patient's family or other caretakers.

Food security is achieved when food access is controlled to the extent that three criteria are established:

1. There is *no doubt* when, what, and how much the person with PWS will eat;
2. There is *no hope* of receiving any more; and
3. There is *no disappointment* due to false expectations.

Food security = No doubt + No hope + No disappointment

When food access is restricted, individuals with PWS require *no doubt* about their meals and snacks. Menus are planned ahead and posted; calories are controlled, but the amount of food presented can still be generous. Although the timing of the meals and snacks remains fixed,

it is not focused on the clock; it is set by the sequence of activities across the day. This concept is critical to the achievement of *flow* through the day.

The quantity of food presented aids *psychological satisfaction*. The Red, Yellow, Green Diet (see www.amazingkids.org/) is an excellent meal plan that provides large quantities of "green foods" (lettuce, green beans, tomatoes, broccoli, cauliflower, peppers), moderate amounts of "yellow foods" (lean meats and complex carbohydrates such as fruits, grains, fat free dairy, mushrooms), and extremely infrequent or minimal amounts of "red foods" (high-fat, high-calorie foods such as fats, oils, most deli meats, cheeses, desserts). The food is presented with controlled access to low-calorie, fat-free seasonings and dressings as well as salt, pepper, and hot sauce. (Individual packets eliminate discussions about the quantity of these condiments.) Sugarless gum and diet beverages including Crystal Light®, coffee and tea, and diet soda are limited, and measured quantities are used as reinforcement for exercise compliance and effort.

Mandatory Supervised Exercise: Mandatory supervised exercise must be scheduled into the daily plan. Walking is by far the best aerobic exercise for individuals with PWS. Two different periods for exercise are scheduled through the day.

The Day Stops Here! This concept is *the* most effective milieu management program for hospitalized individuals with PWS. It requires 1:1 staff for implementation. If the flow of the daily schedule is interrupted by a behavioral situation (refusal, "shutdown," or outburst), the daily schedule stops at that point until the individual has regained motivation and behavioral control to return to programming. Individuals are encouraged to return to scheduled therapies; if the therapies have ended, prescribed "make-up work" must be accomplished before moving to the next activity. *It is essential to delay meals until make-up work has been completed.* Sometimes individuals with PWS stage behavioral shutdowns that can last for as long as a full day. However, nourishment is never withheld and an alternative calorie source is provided even if the privilege to attend mealtime is lost.

2. Behavioral interventions

Behavioral interventions are an essential tool for a successful treatment plan. Noncontingent reinforcement (NCR) is the delivery of reinforcers independent of an individual's response. It is a powerful tool for establishing rapport. Typical noncontingent reinforcers include talking to the individual (nonspecific topics such as orientation, daily schedule, current events, weather; specific topics such as clothing, grooming, leisure interests) and providing leisure activities (puzzles, magazines, paper, markers).

Contingent reinforcement is the delivery of reinforcers dependent upon the individual's response. It is a powerful tool for shaping appropriate behaviors. Extinction, selective attention, praise, and differential reinforcement of other behaviors (DRO) are examples of contingent

reinforcement. For example, the patient is praised for all appropriate behaviors, especially those facilitating daily transitions such as the timely completion of ADLs, grooming, exercise effort, social skills, following unit rules and directives, and working toward psychological treatment goals. A token economy works well as a structured system for delivering contingent response to behavior. For oppositional behavior among individuals with PWS, a response cost intervention is recommended. It will be necessary to post the rules and expectations; delineate rewards (tokens) for achieving expectations, and define the cost (loss of rewards) for not achieving the desired results.

3. Psychological therapies

Throughout inpatient hospitalization, individual and group therapy sessions focus on acceptance of and building expectations for a continuation of the therapeutic milieu following discharge. An appreciation for intellectual level and learning style is essential; adapting the daily plan to meet the individual's unique pattern of strengths and weaknesses can lead to better compliance during the hospital stay. For example, an individual with receptive and expressive language disability will not perform well in a group context. Psychological testing should be available by history to ascertain overall intellectual ability. Neuropsychological testing can be requested to elucidate learning disorders, and strategies for adaptation can be tested during the hospital stay and taught to the family or other caretakers before discharge.

The utility and effectiveness of psychological interventions is based entirely upon an individual's verbal and intellectual abilities. High-functioning individuals with PWS may benefit from all psychotherapeutic and behavioral modalities. Clinical experience suggests that young adults with PWS have the capacity to realize that their syndrome may limit their potential for independence and that many of the life goals that they share with typical peers and siblings may never be actualized. They need support as they grieve the loss of a "normal" life. Social and family situations that are usually joyful such as college graduations, marriages, and births, may be reminders of unachievable milestones and precipitate dysphoric responses. These situational crises can be addressed through traditional psychotherapy using interpersonal and cognitive strategies with the individual and the family.

Lower-functioning individuals with limited insight may require individual therapy with supportive and psychoeducational goals such as minimizing stress, enhancing coping abilities, and improving participation and compliance with the inpatient program. Strategies and modalities for relaxation (progressive muscle relaxation, deep breathing, and occasionally visual imaging), anger management, social problem solving, and social skills training may be prescribed, taught to the individual with repetition and drill, woven into the fabric of the daily plan, and implemented with prompts, cues, and supervision.

4. Psychotropic medication

The use of psychotropic medication is determined by (1) the patient's response to behavioral and eco-environmental interventions, (2) psy-

chiatric diagnosis, (3) the nature of targeted symptoms, and (4) severity of impairment. There is no syndrome-specific medication. Effort is directed toward eliminating unnecessary medications that may be producing unwanted side effects as well as selecting the best medication for improving adaptive function.

Several observations about the use of psychotropic medication in the referral population of individuals with PWS are offered. First, dose titrations should be made in small increments because individuals with PWS may respond to lower doses of psychotropic medication. Second, clinical experience with the referral population suggests that activation as well as discontinuation syndromes occur with selective serotonin reuptake inhibitors (SSRIs), nonselective serotonin reuptake inhibitors (NSRIs), and even some psychostimulants at a rate that exceeds the neurotypical population. Third, it is assumed that the sedating side effects of some agents could increase respiratory compromise due to hypoventilation in obese individuals. Finally, the risk of hyponatremia associated with the use of certain classes of medication (anticonvulsants, SSRIs, and atypical neuroleptics) should be kept in mind, especially during upward titration of the dose.

Pharmacokinetic variations that should be considered among individuals with PWS are summarized below:

- High fat/lean ratio in body composition (even in normal weight individuals with PWS) may affect metabolism and bioavailability of fat-soluble medications.
- Low muscle mass may alter the presentation of extrapyramidal side effects of typical and atypical neuroleptics.
- Doses of medication and schedule of administration should take into consideration persistent prepubertal status due to hypothalamic hypogonadism.
- Concurrent administration of calcium for osteoporosis may affect absorption and action of the psychotropic medication.

5. Family/group home staff involvement

Preparation for discharge begins before admission. Family education is an intense process that continues throughout hospitalization. Training sessions are attended by parents, step-parents, and siblings, as well as involved extended family members (aunts, uncles, and grandparents). School personnel, in-home support personnel, local mental retardation and developmental disabilities (MRDD) staff, as well as supervisors, school nurses, nutritionists, group home staff, and mental retardation program administrators also are invited.

The goal of this training is to teach the caretakers how to devise, within the limits of their own situation, a therapeutic milieu similar to the one shown to be effective during hospitalization. The plan mimics the hospital program by providing the same special structure, expectations, consequences, and schedule. The hospital exercise program to which the patient has become accustomed is duplicated or modified as needed for the home environment.

Psychoeducational intervention is the keystone of relapse prevention. Eco-environmental interventions (i.e., the treatment plan) can be developed only after a thorough review of predisposing, precipitating, and perpetuating factors. This information provides a basis for understanding the strengths and weaknesses in the system of care. The results of the patient evaluation and the comprehensive formulation are provided to the family/staff to assist their understanding of the acute and chronic aspects of the crisis that precipitated hospitalization. In this way they are prepared to make the changes that will be required to meet the individual's needs. Finally, the family/staff work with the team to develop an action plan for how to change the environment, the daily structure, and the existing behavioral patterns in order to meet the individual's needs. The degree of additional support necessary to implement the treatment plan is assessed and a therapeutic network of professional and extended family supports may be identified for recruitment as needed.

6. Disposition planning

Disposition planning includes an examination of all available short-term and long-term resources and living arrangements. Outpatient treatment, school- and/or workshop-based interventions, and wrap-around or habilitative services help families to provide for the needs of their child in the home. Residential treatment or group home placement is explored when appropriate, especially in the case of patients with an exceptionally high need for structure and supervision. Persons with PWS are rarely well managed in facilities that do not have prior experience with the syndrome or a commitment to develop a program specifically suited for individuals with the syndrome. The Prader-Willi Syndrome Association (USA) is a valuable resource for families, and membership is encouraged.

Psychiatric follow-up for individuals with PWS can be challenging. "Finding Psychiatric Help for Your Child" is a monograph pertaining to this topic available at the PWSA (USA) Web site (www.pwsausa.org).

Conclusion

Prader-Willi syndrome is a genetic disorder with neurologic abnormalities affecting cognition, behavior, and energy balance. The complications of the disorder, when environmental controls are not in place, are chronic disability and cardiopulmonary deterioration from morbid obesity in addition to the complications of uncontrolled diabetes. Inpatient crisis intervention is briefest when done early on during the process of deteriorating food control and weight gain and prevents a pattern of multiple acute-care hospitalizations.

Behavior problems complicate the management of persons with PWS and sometimes necessitate inpatient hospitalization. Psychiatric vulnerability appears to be a direct result of the stress sensitivity associated with this condition. A specialized team with experience working

with Prader-Willi syndrome can provide successful intervention for patients in medical or behavioral crises who are not responding to outpatient interventions. The therapeutic milieu is the definitive intervention for both food and behavioral management. Although it is typically implemented during an inpatient hospitalization, it can be translated through training to other settings including the home, school, and community living situations.

The use of psychotropic medication is based on psychiatric diagnosis and the nature and severity of psychiatric symptoms. The diagnosis of Prader-Willi syndrome does not determine the selection of psychotropic medication but rather informs the interpretation of symptoms and the resulting diagnostic formulation, which in turn guide the psychiatrist in the choice of medication.

Glossary

ACE inhibitors—(angiotensin converting enzyme inhibitors) medication used in treating left heart failure.
adipose—fat tissue.
asymptomatic—without symptoms.
azotemia—a build-up of nitrogen waste products in the blood when kidney function is deficient.
BiPAP and *CPAP*—Bi-level Positive Airway Pressure and Continuous Positive Airway Pressure.
cardiomegaly—enlarged heart.
cellulitis—infection of tissue, often a complication of venous stasis and lymphedema (serum).
creatinine—a measure of kidney function.
CO_2 narcosis—toxicity of the brain from excessive amounts of retained CO_2, resulting in decreased breathing.
dissociative state—a mental condition causing an incomplete awareness of pain or other stimuli.
echocardiography—sonar exam of the heart; gives dynamic information about heart function.
edema—excess fluid in tissue.
deconditioning—weakness and loss of flexibility from inactivity.
glycemic—pertaining to blood sugar.
heart failure—the pump function of the heart is not adequate to meet the body's needs.
hematocrit—measures the proportion of red blood cells to serum in the blood.
hemoglobin—measures the oxygen carrying capacity of the blood.
hepatic—having to do with the liver.
hypercapnia—high CO_2; very high levels of CO_2 cause coma and cessation of breathing.
hyperkalemia—high potassium in the blood.
hyperglycemia—high blood sugar.
hypoglycemia—low blood sugar.

hyponatremia—low sodium in the blood.
hypoperfusion—undersupply of blood to tissue due to low pressure.
hypothermia—low body temperature.
hypoxemia, hypoxia—low oxygen in the blood.
iatrogenic—caused by medical intervention.
interstitial—the space in tissue between the cells.
intubation—breathing tube placed in windpipe, enables the use of a ventilator.
ischemia—inadequate oxygen to tissue, usually due to inadequate blood flow.
lymphatic—the vessels in the body that carry tissue fluid back to the heart.
lymphedema—fluid build-up in one part of the body as a result of damage to the lymphatic vessels.
monilial—yeast, produces red rashes and skin breakdown in areas of skin that are allowed to remain moist.
pitting—finger pressure on edema will often produce a depression that remains visible for several seconds or longer; physicians often use this sign to help detect edema.
pulmonary edema—excess fluid in the lungs.
pulmonary hypertension—increased blood pressure in the lungs.
pulmonary vascular resistance—roughly positively related to the blood pressure in the lungs.
radiograph—X-ray picture.
REM—rapid eye movement, one of the deeper stages of sleep associated with dreaming.
renal—having to do with the kidneys.
respiratory failure—breathing is inadequate to rid the body of CO_2, which builds up in the blood.
superficial venous—pertaining to the veins near the surface.
thrombosis—blood clot formation.
thromboembolic—pertaining to blood clots that travel to another part of the body.
tracheotomy—surgical opening in neck to bypass the upper airway.
transaminase—a measure of liver function.
venous stasis—poor return of blood through the veins in the legs.
ventilation—breathing.
ventricular failure—the right or left ventricle of the heart is unable to meet the body's demands.
ventriculomegaly—enlarged ventricle.

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