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Multidisciplinary Approach to Psychosis, Intermittent Hyponatremia, and Polydipsia

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Abstract

The syndrome of psychosis, intermittent hyponatremia, and polydipsia (PIP syndrome), seen in the seriously mentally ill, can result in severe biopsychosocial impairment, including an excessive death rate if not identified early. Because of its impact on the health, functioning, and quality of life of the seriously mentally ill patient, all mental health care providers must be aware of the signs and symptoms of PIP syndrome. Physiological, psychological, behavioral, self-care, and social factors all play a role in the manifestation of the syndrome; it follows that a multidisciplinary approach is crucial to ensure early detection, monitoring, and treatment of this problem both in the hospital and in the community. This article explains how we have incorporated the strengths of various disciplinary strategies into a unified treatment model for managing PIP syndrome and its sequelae.

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Excessive fluid consumption was first noted as a complication of severe mental illness in the 1930s (Hoskins and Sleeper 1933; Sleeper and Jellinek 1936). Recent studies have focused primarily on the etiology of associated hyponatremia and on treatment of affected patients (Goldman 1991; Riggs et al. 1991). Up to 70 percent of institutionalized patients with schizophrenia consume greater than average amounts of water; approximately 7 percent also suffer from episodes of intermittent hyponatremia (Vieweg et al. 1988*a*, 1989*a*). These latter patients are said to suffer from the syndrome of psychosis, intermittent hyponatremia, and polydipsia (PIP syndrome) (Vieweg et al. 1985*a*).

The progression from the onset of psychosis to water intoxication follows a predictable course in schizophrenia (Vieweg et al. 1989*b*). An increase in water consumption is noted early in the illness. After 5 or more years of illness, episodic hyponatremia can occur, perhaps dependent on environmental variables (Bugle et al. 1992). Numerous medical complications may be associated with episodic hyponatremia, and an excessive death rate in otherwise healthy patients has been documented (Vieweg et al. 1985*b*). Additional studies have noted that PIP syndrome can impair the patient's cognitive and social functioning (Snider and Boyd 1991; Shutty et al., in press *b*). Unfortunately, the diagnosis of PIP syndrome is frequently missed until a generalized seizure occurs (Vieweg et al. 1984*a*). It is vital that patients be identified early and that intervention begin before the onset of the severe biopsychosocial complications of PIP syndrome.

The wide range of disabilities associated with PIP syndrome can be seen in a variety of mental health settings, crossing disciplinary boundaries. The lack of clear instruction and education of various disciplines contributes to the poor identification and management of the syndrome. Because of its impact on the health, func-

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tioning, and quality of life of the seriously mentally ill patient, all mental health care providers must be aware of the signs and symptoms of PIP syndrome. These patients have complicated needs and require comprehensive treatment planning. Physiological, psychological, behavioral, self-care, and social factors all play a role in the manifestation of the syndrome; it follows that each mental health discipline has an important role in meeting the unique needs of patients with PIP syndrome.

This article explains how we have incorporated the strengths of various disciplinary strategies into a unified treatment model for managing PIP syndrome and its sequelae. The following sections of the article highlight the unique contributions of medicine, nursing, psychology, and social work to the treatment of the syndrome. Each section outlines how a discipline manages the PIP syndrome patient through assessment, monitoring, and intervention as summarized in table 1. Our emphasis is on integrating these contributions into a comprehensive care plan.

Medicine and the PIP Syndrome Patient

The physician concentrates on applying knowledge of the pathophysiology of PIP syndrome to the care of the patient. The physician's tasks include detecting the signs and symptoms of the disorder, performing a differential diagnosis, overseeing physiologic monitoring such as body weight and serum sodium level, and prescribing pharmacologic treatment. Additionally, the physician educates other disciplines about the physiology of PIP syndrome and supervises coordination of all caregiving aspects.

PIP syndrome is manifest clinically as polydipsia and intermittent hyponatremia. Studies of the pathophysiology of PIP syndrome have found defects involving abnormal thirst regulation, inappropriate arginine vasopressin (AVP) secretion, and excessive response to AVP by the renal tubules (Goldman et al. 1988; Riggs et al. 1991). The degree to which a patient becomes acutely hyponatremic is determined by hormonal dysregulation, not just excessive water consumption. A rapid decrease in serum sodium presents the most serious risk to the patient. Acute signs of hyponatremia include impaired cognition, seizures, delirium, coma, and death. Alternatively, chronic medical sequelae that may present include hypotonic bladder, urinary incontinence, urinary tract infections, hydronephrosis, renal dysfunction, hypocalcemia, osteopenia, fractures, abdominal/gastric/bowel distention, vomiting, malnutrition, edema, and congestive heart failure (Vieweg et al. 1984*b*, 1987; Delva et al. 1989).

Physicians must be cognizant of the early signs and symptoms of PIP syndrome. Besides polydipsia, a morning specific gravity of less than 1.003 is an early sign of PIP syndrome (Vieweg et al. 1984*a*). Late afternoon exacerbation of

Table 1. Contributions to treatment by discipline

Discipline	Assessment	Monitoring	Intervention
Medicine	Identify acute and chronic medical complications. Perform differential diagnosis.	Oversee weight and serum sodium monitoring. Ensure comprehensive treatment planning.	Treat hyponatremia and medical sequelae. Manage pharmacologic intervention. Ensure implementation of psychosocial interventions.
Nursing	Evaluate self-care abilities and deficits.	Implement weight protocol. Identify needed adjustments to privileges and treatment plans.	Restrict fluid access. Administer treatment for hyponatremia and sequelae.
Psychology	Evaluate neuropsychological, behavioral, and personality functioning.	Observe patterns of fluid consumption. Identify psychological and behavioral changes.	Develop individual, group, and wardwide psychological and behavioral interventions.
Social work	Evaluate psychosocial functioning and environmental determinants.	Ensure realistic strategies transferable to less restrictive settings.	Plan discharge. Coordinate resources and services. Educate community care providers.

psychiatric symptoms also may suggest undetected hyponatremia. Factors that might precede hyponatremia include nicotine and caffeine abuse, treatment with anticholinergic or certain psychotropic medications, and substance abuse. Patients who have concurrent diagnoses of schizophrenia and alcohol abuse are particularly prone to PIP syndrome (Ripley et al. 1989). A history with these factors along with suspected polydipsia indicates the need for further evaluation.

In the differential diagnosis of hyponatremia, the physician needs to rule out other medical conditions and medication effects that can mimic PIP syndrome (Vieweg et al. 1984*b*; Illowsky and Kirch 1988; Goldman 1991). Carbamazepine therapy, commonly used in the seriously mentally ill, is a frequent cause of hyponatremia. Patients with hypothyroidism, those with adrenal insufficiency, those undergoing diuretic therapy (Müller and Lann 1991), those with syndrome of inappropriate antidiuretic hormone (due to certain carcinomas, head injury, etc.), or those using nicotine (Allon et al. 1990) also can present with hyponatremia. Polydipsia and polyuria may be caused by conditions that lead to diabetes insipidus (hypothalamic disorders, certain renal disorders, and medication side effects, particularly lithium treatment), by diabetes mellitus, or by anticholinergic medication.

Once other causes of polydipsia and hyponatremia have been ruled out, one must develop a treatment plan that is comprehensive enough to detect acute hyponatremia. Care of a PIP syndrome patient requires careful monitoring of body weight and periodically checking the serum sodium level. We use the patient's diurnal body weight change to estimate the serum sodium level. A 5 percent gain in body weight is roughly equivalent to a 10 mEq/L drop in serum sodium (Godleski et al. 1989). Table 2 outlines how the patient's change in body weight is used to estimate the serum sodium level. For example, if a patient weighs 150 pounds in the morning and 157.5 pounds in the afternoon or evening (a 5% weight gain), the serum sodium level can be estimated as 130 mEq/L. This method assumes a normonatremic or "dry" weight in the morning. When applying this formula, it is important to remember that it is the rapidity of the change in serum sodium level that presents the greatest risk to the patient (Koczapski and Millson 1989).

To prevent persistent fluid consumption, short-term interventions include redirection or restriction of free access to water. Whenever the patient surpasses the target weight that indicates a serum sodium level of 130 mEq/L, we measure the level from a blood specimen, if feasible. Otherwise, we estimate the serum sodium as described above to direct further intervention. For a level between 126 and 129 mEq/L (or a 5% to 7% increase in body weight), we give 4.5 g oral sodium chloride; for a level of 125 mEq/L or less (or greater than 7% increase in body weight), we repeat the salt dose in 2 hours. If oral salt is contraindicated, as in hypertension or heart failure, we restrict fluid intake until the excess body weight is lost. When the serum sodium level is 120 mEq/L or less, we may choose to use slow intravenous correction in an emergency room or medical unit setting. Use of hypotonic solutions may be indicated to avoid rapid correction of hyponatremia, though the risk for central pontine myelinolysis is unclear in this population (Cheng et al. 1990).

Long-term treatment objectives include optimizing medication management, increasing patient awareness and self-monitoring, and decreasing nicotine abuse through cessation plans and voluntary regulation of access. First, we rely on optimal antipsychotic and anxiolytic treatment to address the impulsive, psychotic, and anxiety-driven nature of water consumption. If this approach is not effective, we next add lithium, which blocks AVP's effect on the renal tubules, increasing free water excretion.

Table 2. Estimation of serum sodium level from weight gain

Weight gained (%)	Estimated serum sodium level (mEq/L)	Intervention
0–3	140–134	None
3–5	133–130	Redirection from water sources.
5–7	129–126	4.5 g oral sodium chloride and redirection.
7–10	125–120	4.5 g oral sodium chloride, repeated in 2 hr, and redirection/seclusion.
> 10	< 120	Slow intravenous correction and seizure precautions.

Lithium may lessen the severity of hyponatremic episodes (Vieweg et al. 1988*b*), although the effectiveness of this treatment is debated and requires further study (Alexander et al. 1991; Riggs et al. 1991). Third, we add phenytoin to decrease AVP release (Fichman et al. 1970) as well as to prevent seizures.

If these measures are ineffective, alternative treatments may be considered. Demeclocycline, which also blocks AVP's effect on the kidneys, has been used with some success (Nixon et al. 1982; Vieweg et al. 1988*c*), although a recent study has raised doubts about the efficacy of this treatment (Alexander et al. 1991). Other pharmacologic interventions that have been successful include naloxone (Nishikawa et al. 1992), captopril (Lawson et al. 1988), propranolol (Goldstein and Folsum 1991), and enalapril (Sebastian and Bernardin 1990), although large groups have not been systematically studied.

Last, we recently found dramatic improvement in both hyponatremia and polydipsia in patients with clozapine. Eight patients were monitored for 6 months before treatment and 6 months of clozapine treatment. We observed significant improvement in routinely obtained 6 a.m. and 4 p.m. serum sodium levels, as well as the average lowest levels. The estimated amount of fluid drunk was 6.67 L pre-clozapine and 4.66 L post-clozapine; the difference approached statistical significance. Seven of eight patients no longer required monitoring for PIP syndrome and were subsequently discharged (Spears et al. 1993). Though clozapine treatment requires further study, this agent may be the first identified pharmacologic intervention effective in preventing not only hyponatremia but polydipsia as well.

Although the physician is primarily responsible for ensuring appropriate medical care, the unique expertise of other disciplines is vital to the comprehensive treatment of the PIP syndrome patient. The management of such patients requires well-informed staff who cooperate in monitoring and intervention. Thorough nursing care plans must provide daily assessment and monitoring necessary to prevent sequelae. Because characterological, behavioral, and neuropsychological factors affect patient functioning and behavioral interventions, the help of a psychologist is necessary. When planning future placement options, social work staff must anticipate how changes in the social environment can affect water-seeking behavior. The physician must ensure that these factors are integrated into a well-coordinated and comprehensive treatment plan.

Nursing and the PIP Syndrome Patient

The nurse contributes to the multidisciplinary approach to PIP syndrome by providing assessment of the patient's functioning during day-to-day activities. Nursing staff assess the effectiveness of interventions, ensure modification of the treatment plan as necessary, and aid in educating the patient about PIP syndrome and self-monitoring. (Lapierre et al. 1990; Snider and Boyd 1991). To perform these tasks, the nurse must be familiar with the physiology of the disorder and how it is reflected in daily monitoring. Knowledge of how behavioral and psychological factors influence patient care, and how the social environment affects drinking behavior, is critical. Influencing how these factors affect the day-to-day functioning of the PIP syndrome patient requires careful coordination of nursing care with the other mental health disciplines.

At our facility, nurses base their assessments and treatment planning on Orem's (1985) self-care model. This model delineates four domains of patient functioning based on a patient's capacity for self-care and provision of daily needs. It serves as a schema to highlight the areas of self-care in which the patient requires intervention. The four domains of the self-care model are (1) air, food, and fluid; (2) hygiene and elimination; (3) activity and rest; and (4) solitude and social interaction. The nurse intervenes when disease or disability interferes with the patient's self-care abilities in one or more domains.

Patients with PIP syndrome have alterations in each domain. In the air, food, and fluid domain, water loading may result in increased blood pressure or pulse, shortness of breath, edema, or abdominal distention. Vital signs should be assessed if severe water loading is suspected. Fluid intake patterns can change dramatically, as estimated by frequent measurement of body weight. When weight has not been carefully monitored, we have observed gains of more than 20 pounds over 10 hours. The drive for fluid intake may lead to dangerous behaviors such as drinking out of toilets, consuming urine, and using other nonpotable sources of water. We carefully monitor bathroom privileges in patients who are actively water-seeking. Vomiting of clear liquids and malabsorption can occur, and patients who prefer fluid consump-

tion to food may become malnourished. Direct monitoring at meals may be required to ensure adequate nourishment.

In the hygiene and elimination domain, skin integrity may suffer if the patient is incontinent. Patients with nocturia are awakened during the night to void; patients with daytime incontinence are reminded to void before leaving the ward or attending activities. Urinary frequency up to several times an hour can be seen. Patients can develop hypotonic bladders and have residual volumes of up to 1 L of urine. We have found that in and out catheterization can correct bladder hypotonia over time. Gastric and bowel distention is sometimes seen, exacerbating nutritional problems.

In the activity and rest domain, the nurse may suspect that a patient is hyponatremic when the patient has afternoon exacerbation of the underlying psychiatric symptoms. Other signs of hyponatremia include restlessness, confusion, agitation, aggressiveness, and pacing. Patients can become somnolent because of frank central nervous system dysfunction. In the solitude and social interaction domain, patients isolate themselves to hide their drinking. They spend inordinate amounts of time in the bathroom or near the water fountains collecting cans, cups, and other containers to store in their bed areas or hide in the bathroom. Preventing such behavior requires frequent redirection and active observation by nursing staff.

Relying on information from the self-care-based assessment, we use an established protocol to monitor patients at risk for hyponatremia. We measure body weights at 6 a.m. and 4 p.m. using specific guidelines. Patients void and then are weighed in everyday attire without footwear or extras such as sweaters or purses. Depending on the amount of weight gained, patients may have blood drawn immediately to determine serum sodium level. In addition, nurses may observe and document individual behavioral changes that can be integrated into nursing care plans.

Nursing care plans outline strategies for individual patients. When formulating care plans, we consider the extent to which the therapeutic environment affects the patient, the patient's ability to participate in meeting self-care demands, and the knowledge deficits of the patient. Individualized weight gain protocols are set up with guidelines for interventions including restricting fluids, placing patients on one-on-one observation, or isolating patients until a certain weight loss occurs. Because of their continuous interaction with patients, nurses are in an excellent position to evaluate patients' level of functioning. The team adjusts patient privileges accordingly each week.

Nurses use several parameters to evaluate the effectiveness of plans. Physiologic factors include the frequency of low serum sodium levels in specific patients, as well as the incidence of seizures. Therapeutic milieu factors include how often patients exceed their established weight protocols and how able patients are to maintain a consistent level of functioning. Educational factors include the ability of patients to identify and follow through on fluid restriction strategies such as requesting medication when necessary or voluntarily restricting water intake.

Nurses must coordinate their interventions with the other mental health disciplines. They should understand the indications for, and use of, medications such as lithium and phenytoin for PIP syndrome. Nurses also need to know when to use low-dose benzodiazepines to treat agitation or anxiety associated with water craving, and oral sodium chloride to maintain serum sodium level within the normal range. Nurses' observation of patients' self-care ability can aid in formulating behavioral reinforcement plans with token reinforcers (Pavalonis et al. 1992). Before discharge, the nurse ensures that the patient is familiar with the medication and can participate in self-monitoring as available in the new setting. In coordination with the social worker, the nurse helps educate community providers about PIP syndrome and how to monitor the patient.

By gathering data, assessing interventions, and implementing treatment, the nurse attempts to optimize the patient's day-to-day functioning to maximize self-care and minimize the adverse consequences of PIP syndrome. The nurse shares findings with other disciplines to coordinate future treatment planning, behavioral strategies, milieu management, and community reentry.

Psychology and the PIP Syndrome Patient

The unique training the psychologist brings to the multidisciplinary team includes personality, behavioral, and neuropsychological assessment skills as well as expertise in group therapy and behavioral interventions. These skills are applied to better evaluate the psychological and behavioral variables of water-seeking and the psychological sequelae of water intoxica-

tion. In our setting, the psychologist works closely with the treatment team to design both individual and wardwide interventions that capitalize on individual patient differences uncovered during assessment. To cooperate effectively, the psychologist must be able to understand the physiology of the disorder; nursing assessments, monitoring, and treatment; and how the social environment affects the behaviors associated with the syndrome.

The psychologist uses knowledge of patient behavior in developing wardwide monitoring and treatment interventions in PIP syndrome patients. Wardwide interventions include environmental changes (e.g., limiting water sources) and the development of ward policies such as setting times for daily weight protocols. Though often considered primarily a monitoring tool, the weight protocol also operates as a behavioral intervention. Patients are rewarded with increased privileges for being within protocol, and access to reinforcers is removed when patients are over protocol. The ward-level system, which governs access to off-ward, off-grounds, and pass privileges is also tied into the weight protocol. The psychologist monitors the effectiveness of these wardwide interventions and applies individualized behavioral interventions when needed.

Individualized psychological assessment includes evaluation of the patient's unique personality, behavioral, and neuropsychological characteristics. Personality assessment typically involves a structured interview and test administration if the patient can respond to a questionnaire. We have developed a structured interview to collect information on patient self-report of drinking patterns and preferences, the complications of PIP syndrome, and the reasons patients give for drinking (Hinson et al. 1991). This information provides a basis for understanding patients' experience of drinking and for judging how a particular patient may respond to educational interventions. Education is directed at improving self-monitoring of drinking and facilitating behavioral interventions to reduce fluid intake. Standardized personality measures such as the Minnesota Multiphasic Personality Inventory (Golden and Meehl 1979) provide supplemental information about psychological functioning and coping skills that may facilitate or impede planned interventions.

In addition to personality assessment, we use an intensive behavioral observation protocol (Shutty et al. 1992). Behavioral assessment allows for direct confirmation of patients' ability to report accurately how much they have drunk during a specified period. We unobtrusively observe patient drinking and monitor concomitant psychiatric functioning to understand idiosyncratic responses that follow the ingestion of large amounts of water. This assessment is essential in tailoring behavioral interventions aimed at modifying drinking patterns to individual patients. Also, this information provides corrective feedback to patients, improves self-monitoring skills, and maintains compliance with behavioral interventions. Researchers have reported several behavioral interventions that focus on reducing fluid intake (Klonoff and Morre 1984; McNally et al. 1988; Pavalonis et al. 1992).

The psychologist also performs neuropsychological assessment of patients during both normonatremic and hyponatremic states. We have developed a brief neuropsychological screening exam (Shutty et al. 1993) that assesses rudimentary cognitive functions including sustained attention, concentration, immediate and delayed memory, mental flexibility, and visual spatial skills. We compare normonatremic baseline scores with neuropsychological functioning during acute hyponatremic episodes to characterize the patient's experience when hyponatremic. This information is used to determine which clinical signs may indicate that a particular patient is developing hyponatremia, as well as to plan intervention strategies for acutely hyponatremic patients. Finally, neuropsychological assessment helps us understand patients' self-reports of experience during hyponatremia while providing useful information about the nature of water intoxication and its potentially reinforcing properties.

The psychologist also works with direct care staff to provide ongoing education about PIP syndrome in a therapeutic group setting. Weekly group therapy for PIP syndrome patients primarily involves helping the patients identify their polydipsia as a health problem; therapy encourages them to talk freely about their drinking patterns and efforts to reduce drinking. We have found that patients can become readily engaged in talking about their PIP syndrome and can learn basic facts about the syndrome and its complications within a brief period (approximately 4 to 6 weeks). Consequently, group topics typically include repeated progress checks on patients' ability to self-monitor and control their drinking during the past week, education about hyponatremic states, and the de-

velopment of strategies to reduce drinking. Finally, group therapy provides corrective feedback and encouragement to patients involved in intensive behavioral protocols.

The psychologist's expertise aids the treatment team in determining the mental abilities and deficits of the individual patient. This knowledge helps in determining how much the patient can cooperate with medical management, how intensively to monitor the patient, and the social structure the patient needs to avert episodes of hyponatremia.

Social Work and the PIP Syndrome Patient

The clinical social worker provides a variety of unique services, including individual, group, and family therapy, and education. At the core of these services is the discharge-planning component of the treatment process. The social worker's view of the client's strengths and needs within the context of the client's environment is important in planning treatment and discharge for the PIP syndrome patient. The social worker has a unique understanding of social and environmental characteristics and how they affect a patient's communication, compliance with treatment, comfort, and access to services (Schilling and Schilling 1987). The social worker is the hospital's link to community resources and the patient's link to community living.

This link ensures that patient management is consistent with the applied knowledge gained from medicine, nursing, and psychology and prevents service gaps. Persons with a serious mental illness ordinarily require extensive discharge planning and community case management. The combination of a severe mental illness and the potentially dangerous electrolyte imbalance associated with PIP syndrome requires the development of intensive and well-coordinated discharge plans. For effective care management, both in and out of the hospital, the social worker must have a basic understanding of the physiology of PIP syndrome, its behavioral manifestations, and available treatment strategies.

The social worker is acquainted with the biopsychosocial functioning of individual PIP syndrome patients and thus understands their level of insight, investment in rehabilitation, and ability to monitor their own mental illness (as well as the manifestations of PIP syndrome). During the treatment-planning process, social work input is critical in developing behavioral treatment plans and educational interventions. A complex and staff-intensive plan implemented in the hospital may not be a suitable intervention in an adult home. Restrictive interventions that do not mimic community life, such as fluid regulation protocols, are unrealistic in the community setting. The social worker acts as a troubleshooter, helping the treatment team develop treatment plans that are realistic in a community-based setting.

As the multidisciplinary team changes its focus from hospital treatment to discharge planning, several issues arise. Managing the PIP syndrome patient in the community requires careful review of the placement setting and its resources. The level of structure and supervision the patient will require outside the hospital environment is evaluated according to the individual patient's strengths and needs. Patients who can weigh themselves several times a day and voluntarily restrict fluid intake will require significantly less supervision and structure than patients who are limited in these abilities. During community placement evaluation, the team must consider access to medical services for regular and emergency determination of serum sodium levels.

Educating the patient, family members, and community care providers is another fundamental function of the social worker. The social worker works closely with the patient's community support system (family, mental health service providers, group homes, etc.) to educate them about PIP syndrome and the patient's particular needs. Typically, each patient has an individualized weight protocol to track diurnal weight gain and estimated serum sodium level. The social worker communicates these plans to community care providers. Essential, but often overlooked, is access to a scale for implementing the weight protocol. Educational objectives include familiarizing aftercare providers with the patient's particular PIP symptoms. To avoid unnecessary changes in antipsychotic medications after discharge, it is important to differentiate between symptoms related to hyponatremia and those related to the patient's primary illness, because PIP syndrome can mimic an exacerbation of the underlying mental disorder.

After discharge, the patient will receive services from a variety of mental health and medical providers. Community-based aftercare providers need to be aware of the interventions offered to the patient, particularly because these services are often fragmented and require careful coordination. The social

worker coordinates the education of these various aftercare providers to avoid mismanagement of the patient. For example, phenytoin, typically prescribed for persons with seizure disorders, might be discontinued if the patient has no documented seizure disorder. Discontinuation may lead to hyponatremic episodes and readmission.

The social worker's role is to ensure that the required resources are in place so that the patient's transition to new surroundings goes smoothly. This role requires awareness of the mechanics of appropriate medical management, monitoring strategies, and how the patient's psychological strengths and weakness affect water-seeking behavior. These factors must be integrated to ensure constancy and protection during changes in the patient's living situation, as well as the preservation of the patient's quality of life.

Discussion

To highlight the efficacy of a multidisciplinary approach to PIP syndrome, we have examined changes in clinical variables and successful management of individual cases. Variables reflecting good outcome include a decrease in severity of hyponatremia initially and discharge success ultimately. Since instituting a multidisciplinary approach, we have admitted 15 PIP syndrome patients to our unit. Five have been admitted recently (less than 3 months ago) and are undergoing continuing intervention. Comparing the initial 6 months of management with the most recent 6 months (or the 6 months before discharge) for the remaining 10 patients, 7 had significant improvement in severity of hyponatremia. Seven patients in another group have been discharged and to our knowledge have not required rehospitalization.

Successful outcome depends on coordinated management during hospitalization. Typically a patient referred to our unit has been having persistent problems in controlling fluid intake, either in the hospital or in the community. Often these patients have received acute medical intervention for hyponatremia or have had a hyponatremia-induced seizure. Normally the patient will have several measurements of serum sodium level in the 120–130 mEq/L range before transfer. Once accepted, the patient is immediately placed into our multidisciplinary program. The severity of the patient's dysfunction is evaluated, and adjustment of medications considered. The patient is redirected from water sources, most of which are observable from the central nursing station. Body weight is obtained every 2 hours while the patient is awake, and 6 a.m. and 4 p.m. serum sodium levels are measured to begin establishing a protocol as outlined above. Patients are not allowed to have cups or other drinking materials.

Once patients have shown good control of fluid intake, as reflected by body weight, they are allowed increasing amounts of time off the unit. Psychological assessments take place as indicated, and a comprehensive and individualized treatment plan and weight protocol are developed. About this time, patients are also incorporated into a weekly group for patients with PIP syndrome to begin supportive and educational interventions. Staff encourage patients to weigh themselves and be familiar with their protocols. If a patient continues to have hyponatremia despite these interventions, further medication changes (such as addition of lithium and phenytoin) and more restrictive interventions are considered.

If a patient has shown good ability to control fluid consumption, discharge options are pursued. The patient is typically allowed a series of passes away from the hospital, during which time the patient or care provider ensures at least diurnal body weight measurements, which the hospital staff review on the patient's return. Once consistency is attained and care providers in the community are educated, the patient is discharged. Continued monitoring of patients in the community is important to ensure that further morbidity is avoided and optimal functioning continues.

An example is a 41-year-old Hispanic woman with a diagnosis of schizoaffective disorder. She had 21 previous psychiatric hospitalizations but was never noted to have polydipsia or hyponatremia. During this hospitalization, she presented with delusions of pregnancy, paranoid delusions, pressured speech, and labile affect. On the admissions unit she was noted to have excessive water consumption with daytime incontinence and nocturia. The admissions staff initiated diurnal weight monitoring and noted bizarre behaviors during times of excessive water consumption. At the beginning of her fourth month of hospitalization, she was transferred to our unit for further intervention because persisting polydipsia interfered with discharge planning. Initially her weight was measured every 2 hours, and she was assigned to a water drinkers' group. Workup for hyponatremia revealed lithium-induced hypothyroidism,

which was successfully treated and determined to be unrelated to her hyponatremia. Within 5 months, the patient attained excellent control of her polydipsia as reflected by minimal diurnal weight gain, and discharge planning was begun. Staff at the group home were educated about PIP syndrome. On an initial discharge pass, the patient began to have reexacerbation of her psychiatric symptoms that was associated with increased water intake, thought to be due in part to the amount of unstructured time during the day. She was returned to the hospital, and the weight protocol was reinstituted. The group home staff were instructed in the use of the weight protocol and interventions. Within 2 weeks, she was successfully reintroduced to the group home and to our knowledge has not required rehospitalization.

Other typical patients are those who are chronically hospitalized and cannot be discharged. Applying our multidisciplinary approach, we recently reported on the successful management of such a patient through a token system that rewards lack of excessive weight gain. Mean diurnal weight gain was 7.1 pounds during a 23-week baseline; it dropped to 4.1 pounds following 23 weeks of treatment and at a 1-year followup. Estimated fluid consumption dropped from 10 to 4 L daily, and incidents of hyponatremia decreased by 62 percent. This marked improvement in hyponatremia made possible a decrease in restrictive staff interventions and blood drawing, significantly improving the patient's quality of life (Pavalonis et al. 1992).

In summary, the multidisciplinary approach to PIP syndrome requires coordination of services from all disciplines. Patients with PIP syndrome clearly suffer from an increased morbidity related to biopsychosocial dysfunction. Medical complications; poor self-care; cognitive, behavioral, and psychological impairments; and social dysfunction together contribute to patients' poor level of functioning. By optimizing patients' functioning through coordinated multidisciplinary interventions, we have found that we can reduce the negative impact of PIP syndrome on patients' quality of life.

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