Fluid Volume Management in Patients With WHO Group 2 Pulmonary Hypertension

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WHO Group 2 pulmonary hypertension (PH) denotes PH caused by left heart disease, which includes systolic dysfunction, diastolic dysfunction, and valvular heart disease, and is one of the most common causes of PH. Up to 60% of patients with advanced systolic dysfunction and up to 70% of patients with heart failure with preserved ejection fraction may develop PH.[1] The development of PH in patients with left heart disease is associated with a poor prognosis.[2] In these patients, fluid volume overload is a common cause of worsening symptoms. Strict control of fluid volume balance using diuretics and a low sodium diet is a critical component of care for patients with WHO Group 2 PH.

Fluid restriction is usually used along with diuretics in the treatment of acute and chronic fluid volume overload. However, it should be recognized that there is lack of data supporting this strategy from well done clinical trials in either the PH or heart failure literature, except in the setting of symptomatic hyponatremia or end-stage patients with volume overload refractory to high-dose diuretics.[3] Furthermore, adherence to fluid restriction is very difficult for patients to maintain and can lead to increased stress, anxiety, and poor compliance with therapy.[3] Thus it is important for the health care team managing patients with frequent exacerbations of volume overload to carefully assess each patient's fluid intake and use a customized approach when giving advice about fluid restriction.[4] This is especially imperative with hyponatremic patients, where restricting fluid intake to less than 2.0 liters per day (some centers use 1.5 L) along with dietary sodium restriction has been shown to aid in maximal diuresis and to decrease length of stay in the hospital.[4] Sometimes patients have the mistaken idea that they must increase their fluid intake to compensate for excessive urine output from diuresis, or to "flush their kidneys" to keep them healthy. Patients should be educated to dispel this misconception and counseled to drink fluids in moderation.

Excessive sodium intake results in peripheral and systemic edema as well as pulmonary congestion. It has been shown that in response to a high salt diet, even patients with mild heart failure and no symptoms of congestion have impaired sodium handling and excretion as evidenced by increased left ventricular end-diastolic volume with no increase of ejection fraction and stroke volume.[5] The recommended daily sodium intake for most patients is 2400 mg or less, and 2000 mg or less for patients with moderate to severe heart failure symptoms or patients with right heart failure.[6]

Adherence to a sodium-restricted diet can improve hemodynamics and prevent exacerbations, yet little specific counseling is given to patients on how to achieve a low sodium diet. Many patients are aware that they should not add salt when cooking, baking, or eating a meal, but they are not aware of the sodium content of many foods they buy or consume, or how much sodium they should take in a day. The first step in educating a patient about how to manage a low sodium diet is to have the patient describe a day's food intake and help him or her identify sources of high and low sodium foods in the diet. Patients should be instructed on how to read a food label and be taught to take into account not just the milligrams of sodium per serving, but the serving size as well.

Many patients are unaware of the amount of sodium there is in the processed foods they eat and are misled by claims of "lower" or "reduced" sodium on the food label. Family members must be included in the education, especially if they are responsible for shopping for or preparing food for the patient. Attention must be paid to the patient's cultural background and to specific food preferences. A referral to a registered dietitian can be very helpful in teaching patients to make healthy low sodium food choices. Use the "teach-back" method to ascertain what the patient understands about his or her diet, correct any misconceptions or gaps in knowledge, and evaluate adherence to dietary recommendations.

Excellent resources are available to help patients make low sodium food choices. The American Heart Association (see: www.heart.org) has information on low sodium recipes, and how to follow a low sodium diet when eating out. The Heart Failure Society of America has an education series that includes a free pamphlet on how to follow a low sodium diet (see: www.hfsa.org/pdf/module2.pdf). Lastly, the USDA publishes a national nutrient database that has a list of the sodium content of common foods (see: www.nal.usda.gov/fnic/foodcomp/Data/SR17/wtrank/sr17a307.pdf). This is a great teaching tool to acquaint patients with the sodium content of the foods they are eating.

A systematic overview of diuretic therapy is beyond the scope of this article; however, diuretics should be given to patients with symptoms of volume overload. Although diuretics are the most common drugs prescribed for heart failure, there is little evidence to guide their use. Some observational studies suggest that diuretics may be harmful, contribut-

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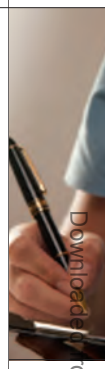

Table 1: Recommendations for a Low Sodium Diet

Foods to Avoid	
Sodium is the major ingredient in table salt, so the first step is to **take the salt shaker off your table**. The next step is to avoid foods that contain large amounts of sodium. The following foods contain a large amount of sodium and should be avoided.	
Prepared meats such as hot dogs, bacon, sausage, ham, bologna, salami, and other cold cuts	Snack foods such as potato chips, pretzels, nacho chips, and crackers
Canned soups and vegetables	Boxed foods and dinners
Canned or bottled tomato sauce and vegetable juices	Most cheese and cheese spreads
Pickles, olives, and sauerkraut	Salted peanut butter (no salt added is okay)
Most "fast foods"	Catsup, mustard, barbecue sauce, and soy sauce
Chinese food, Japanese "rolls"	Onion salt, garlic salt, and celery salt
Most frozen dinners	Any item that has sodium listed in the first 3 ingredients
Tips for Eating Out	
Foods to avoid:	**Food to ask for:**
X Smoked, cured, and salted meat, fish, and poultry X Bacon, ham, liver, luncheon meats, ground meat, hot dogs, and cheese X Fried or barbequed meat, fish, or poultry X Soup of any kind X Any foods with gravy or sauce X Fried or seasoned rice X Fast foods, including french fries, pizza, and tacos X Salad dressings X Vegetables with butter, cream, or cheese sauce X Chinese food (except if steamed) X Pancakes and waffles X Donuts, muffins, and pastries	♥ Fresh, grilled, baked, poached, or broiled meat, fish, or poultry ♥ Steamed vegetables with no added salt (assume that cooked vegetables have added salt unless you ask for them to be prepared without it) ♥ Steamed plain rice (Asian restaurants often add salt to steamed rice; be sure to ask for steamed rice without added salt) ♥ Plain baked potato ♥ Plain pasta (ask for marinara sauce on the side and add just a little) ♥ Eggs and omelets with fresh vegetables (ask to be made unsalted) ♥ Oil and vinegar, lemon juice, or low-sodium dressing ♥ Salads without croutons, meat, or cheese (order salad dressing on the side and use just a little)

Table 2: Education Talking Points for a 2-Gram Sodium Diet

Teach patients to:
• Not add salt to their food
• Read food labels for sodium content (paying attention to serving size)
• Eat foods naturally low in sodium (fruits, vegetables, unprocessed meats, poultry, and fish)
• Use resources to learn the sodium content of foods they eat
• Keep a food diary to assess sodium intake
• Look for low sodium versions of the foods they like
• Avoid processed foods and fast food
• When eating out, avoid soups, sauces, or gravies and eat baked, grilled, or poached meat, fish, or poultry and plain vegetables
• Use sodium-free spices when cooking
• Check with health care provider before using salt substitutes and over-the-counter medications
• Weigh themselves daily and report a gain of 2 pounds overnight or 5 pounds in one week
• Drink moderate amounts of fluid

ing to neurohormonal activation and worsening renal function. In spite of this, diuretics are a mainstay in the treatment of heart failure and are used to manage symptoms of congestion and volume overload.[7] Diuretic refractoriness may also be the result of nonadherence with dietary sodium restriction, or unrecognized drug interactions (eg, nonsteroidal anti-inflammatory agents) or excessively high fluid intake. Increases in body weight are associated with exacerbation of symptoms and usually precede hospitalization by a week.[9] Patients should be instructed to weigh themselves in the morning after urinating and before eating and report weight gains of greater than 2 pounds in one day, or 5 pounds in one week.

Patients with WHO group 2 PH often present with volume overload due to left sided heart disease. Most patients should be on a low sodium diet and selected patients may be prescribed a fluid restriction as well. It may be helpful to obtain a detailed diet history to determine sodium intake and then reassess knowledge and dietary adherence after education. Patients must be educated, coached, and supported in their journey toward learning the skills needed to self-manage. Health care professionals are instrumental in helping guide health behavior change and providing emotional support to patients and families during this process. Dietitians can be beneficial members of the multidisciplinary team in helping patients become adherent to their dietary recommendations. Diuretics improve symptoms and can be adjusted early when patients weigh themselves daily and report weight gain. Early recognition and management of developing volume overload may prevent or decrease the number of hospitalizations and improve quality of life for patients with PH.

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