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Short Bowel Syndrome in Adults – Part 2

Nutrition Therapy for Short Bowel Syndrome in the Adult Patient

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Success of the patient with short bowel syndrome (SBS) depends on adaptation of the remaining bowel, which requires a combination of pharmacologic and nutrition therapies. Decreasing stool output by increasing absorption improves nutritional health, hydration status, and overall quality of life in these patients. Diet manipulation is one of the key elements aiding in that process, but it requires individualization based on intestinal anatomy, considerable education, ongoing monitoring, and – hopefully – patient buy-in. Although the SBS diet is quite similar for those with and without colonic segments, there are a few key differences that should be noted. This is the second article in a five-part series on SBS, the focus of which is diet intervention in an effort to enhance adaptation, increase absorption and as a result, lessen stool output.

INTRODUCTION

Without aggressive use of pharmacological agents, diet alone will generally be ineffective in curbing the voluminous diarrhea experienced by patients with SBS. Nevertheless, diet therapy is an essential component of care in these patients. The cornerstone of diet therapy is manipulation of food intake to facilitate maximum nutrient and fluid utilization by decreasing the stool output. Stool output in SBS is driven by the fluid-substrate load exceeding the absorptive capacity of the shortened bowel; but other factors also contribute. For example, in addition to the loss of absorptive surface area, feedback mechanisms that control transit and acid and bicarbonate secretion are often lost (see Table 1). A clear understanding of these factors is essential to the selection of the best therapeutic interventions.

In a recent study assessing the typical micro- and macronutrient intake from the oral diet in patients with SBS prior to entry into a bowel rehabilitation program, the patients were found to be making food and beverage choices that would be expected to worsen their diarrhea and increase PN requirements. Furthermore, each subject had received little previous dietary instruction from their healthcare providers.[1] Our role as clinicians in the care of patients with SBS is to restore as much intestinal function as possible. This is achieved by optimal use of medications and by altering diet and fluid choices as much as the patient can tolerate. Tailoring the diet to an individual's remaining bowel anatomy and providing the patient with a basic understanding of why diet and fluid modifications are important is essential to optimizing successful outcomes.

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Table 1. Factors that May Contribute to Malabsorption in the Patient with SBS

- Loss of absorptive surface area
- Dumping into the upper gut
- Accelerated intestinal transit
  - Mismatch of nutrients and pancreatico-biliary secretions
- Gastric hypersecretion (up to 6 months or so)
  - Increased volume of gastric secretions entering the upper gut
  - Lower pH than is normal
    - Denatured pancreatic enzymes
    - Destabilized bile salts
- Reduction in bile salt pool
  - Diminished micelle formation
- Small bowel bacterial overgrowth

Nutritional Assessment – Getting Started

The initial evaluation of all SBS patients should include a comprehensive nutritional assessment. Information obtained should include a history pertinent to weight change, medication usage (including supplements and over-the-counter medications), presence of GI and other symptoms that may affect oral intake or fluid loss, potential signs/symptoms of micronutrient deficiencies, and physical assessment for signs of dehydration and malnutrition. Additional information that should be collected at baseline includes pertinent past medical, psychiatric, and surgical history, including comorbidities and the presence of bowel complications such as anastomotic strictures; chronic obstructions; enterocutaneous fistulae; and peritoneal drains. A nutrition support history should also be obtained, including information regarding the enteral and/or central venous access device, formula used, route and method of administration, and known prior complications. Finally, given the high level of motivation required to adhere to the dietary, fluid and medical treatments prescribed, it is useful to inquire about their education, motivation, support system and potential economic or other barriers.

Patients with SBS should be instructed on the measurement of daily fluid intake and urine/stool output, as periodic assessment of these parameters helps guide fluid needs. It is also useful to review a food diary, preferably over a period of a few days, to determine the SBS patient's usual oral diet and daily energy intake. A baseline assessment of electrolytes and micronutrient levels (see micronutrient section below) should be obtained at the initial clinic visit. Given the high risk of metabolic bone disease in these patients, a bone density should be assessed at baseline and monitored every 1-2 years.

Oral Diet – Lessons Learned

Original evidence supporting the beneficial effects of diet therapy in patients with SBS is based on a limited number of studies that have included a small number of patients with various bowel anatomies.[2-9] These studies have generally demonstrated a decrease in stool output and an increase in absorption depending on the remaining bowel anatomy and the type and amount of carbohydrate and fat used. Specifically, those SBS patients with a colon segment remaining appear to derive the most benefit in terms of nutrient absorption and reduction in stool losses from a high complex carbohydrate, low-moderate fat diet. In an inpatient setting, Byrne et al. followed close to 400 patients over a 10 year period after providing intensive counseling and close monitoring for 2-4 weeks and further demonstrated the importance of the SBS diet on improving stool output and both nutritional and hydration status.[10] They concluded that patients with colon benefited from a different diet than those without colon.

Luminal nutrients enhance post-resection intestinal adaptation by increasing splanchnic blood flow, stimulating pancreatico-biliary secretions, gut neuronal activity, and peristalsis. They also up-regulate selective nutrient transporters and digestive enzymes and stimulate local production and release of intestine-specific growth factors.[11] Importantly, nutrient complexity (i.e., whole foods) is associated with greater intestinal adaptation, presumably due to recruitment of greater digestive activity, the effects of which may ultimately decrease the need for parenteral nutrition (PN) support in SBS.

Patients with an end jejunostomy typically absorb more nutrients than fluid, so intravenous (IV) fluids may be required at least initially. In contrast, in those

SBS patients with a jejuno-ileocolonic or jejuno-colonic anastomosis, sodium and water are absorbed more avidly, and these patients may require more supplemental nutrients than fluids. For all patients with SBS, the most important dietary interventions involve smaller, more frequent feedings, avoidance of simple sugars in any form and chewing foods extremely well. The long-term success of an optimized SBS diet requires intensive education, adequate nutrition counseling and monitoring to maintain compliance and achieve intestinal rehabilitation, PN independence, and enteral autonomy. One of the crucial roles of the dietitian is to translate all of the data into foods and meal plans that meet the individual's preferences and lifestyle. The patient needs to be informed not only of what they need to avoid, but more importantly, what they *can* eat. In general, most stable adult SBS patients absorb only about one-half to two-thirds as much energy as normal; thus, dietary intake must be increased by at least 50% from their estimated needs (i.e., "hyperphagic" diet).[12,13] However, in some, this increased intake may contribute to excessive loss of micronutrients and fluids by worsening diarrhea.[7] The establishment of daily calorie and fluid intake goals is achieved by careful monitoring. Adjustments may be needed based on tolerance, which is determined by symptoms, stool output, ongoing assessment of what they eat, and in so doing, assessment of the patients understanding of diet therapy, along with micronutrient levels, weight changes, and hydration status.

For some patients, instead of advising how many calories to eat per day, a more practical approach may be preferred. This entails a review of their normal intake followed by suggestions on where they can add actual foods, such as a half sandwich, a package of "Nabs," or a teaspoon of olive oil. Reevaluating the plan and adjusting as the patient's needs change, particularly during the adaptation period, is essential for the ongoing success of the SBS diet.

Diet Specifics

Fat

Fat is an excellent calorie source, yet depending upon the remaining bowel anatomy in a SBS patient, too much fat may exacerbate steatorrhea, resulting in loss of calories, fat-soluble vitamins and divalent minerals in the stool.[4,7,14] Medium chain triglycerides (MCT) are often recommended for use in patients with SBS as they are absorbed directly across the small bowel and colonic mucosa; however, it has been shown that only those with a remaining colon segment seem to benefit from their use.[15] Furthermore, MCT contain fewer calories than dietary fat, are devoid of essential fatty acids, are not very palatable, and do not enhance intestinal adaptation.

Protein

Protein requirements will vary depending on where the patient is in the disease course. Protein of high biological value is always preferred over plant protein. Because nitrogen absorption is least affected by the decreased absorptive surface in SBS patients, no change in dietary protein is generally necessary and the use of peptide-based diets in these patients is unnecessary.[4,8,16,17] Oral glutamine is often recommended to patients with SBS; however, its clinical benefit is controversial and there is insufficient data to support its use in patients with SBS.[18] Glutamine is also abundant and readily available in whole protein foods of high biological value such as meat, fish, poultry, eggs, and dairy.

Carbohydrate

The use of more complex carbohydrates as opposed to concentrated sweets reduces stool volume and enhances absorption in SBS.[10] Lower fiber, complex carbohydrates are more readily digested and absorbed and should be a primary calorie/nutrient source irrespective of remaining bowel anatomy. Patients with a colon segment remaining may benefit from higher soluble fiber content, but not at the expense of reduced oral intake due to early satiety, particularly if weight gain is needed.

An emerging area of interest within the carbohydrate/starch group are the fermentable, oligo-, di-, mono-saccharides and polyols, or "FODMAPs." FODMAPs are poorly absorbed, highly osmotic, and fermentable by gut bacteria. They are found in plant foods and liquid medications (e.g., sugar alcohols such as sorbitol and xylitol), as well as some enteral formulas (e.g., fructooligosaccharides, or "FOS") and are associated with gas, bloating, cramping, and increased stool losses.[19-21] A modified FODMAP restriction (see Table 3) may be worthwhile in the patient who is failing routine SBS diet therapy, although further study of this approach is needed.

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Lactose

While often restricted by clinicians in SBS, lactose has been shown to be tolerated by many SBS patients. Given the potential benefits of dairy foods, and because the symptoms of lactose intolerance are often dose-dependent, many people are able to tolerate at least some dairy products, especially if spread over the course of the day. In one report, patients with SBS were able to tolerate up to 20 grams of lactose per day (with no more than 4 grams from milk).[22,23] Of note, lactose is a FODMAP (see above) and, therefore, highly fermentable. Should a patient not tolerate lactose, it may not necessarily be due to lactase insufficiency.

Fiber

Patients with jejunostomies or ileostomies are commonly advised to add bulk-forming agents to their diet in an effort to thicken stool or ostomy output. While it may seem to improve the consistency of the stool, fiber can also result in the net loss of fluid from the bowel, as it not only pulls fluid from the mucosa, it also 'soaks up' fluid within the lumen, making it unavailable for absorption. Rather than thicken the fluid in the stool before it is lost to the patient's stomal appliance, it would be better to try to enhance absorption of that fluid.[24] Moreover, fiber may reduce the absorption of nutrients and, in those who are already having difficulty ingesting sufficient calories, the addition of bulking agents may further exacerbate the problem by leading to early satiety.

Despite the above, a trial of soluble fiber may occasionally be worthwhile in an attempt to slow gastric emptying and overall transit time in the SBS patient with rapid gastric and small bowel transit. Sources of soluble fiber include oatmeal, oat cereal, oat bran, lentils, apples, oranges, pears, strawberries, blueberries, nuts, legumes, ground flaxseeds, chia seeds, carrots, psyllium, guar gum, pectin, and rinds (especially dry citrus zest). These should be added slowly to give the patients GI tract time to adapt.

SBS patients with a colonic segment remaining can generate an additional 500-1000 calories per day from the absorption and utilization of short chain fatty acids that are produced by the bacterial fermentation of fiber and malabsorbed carbohydrates. Thus, the use of a moderate fat, higher complex carbohydrate diet containing fiber is recommended for the SBS patient with an intact colon.[6,10,25] Since it is more fermentable, soluble fiber is preferred over insoluble fiber.

Table 2. Laboratory Assessment of Possible Sodium Depletion in the SBS Patient

Persistent ileostomy/jejunostomy 24 hour urine volume > 1200 mL (reflecting potential for increased sodium losses)
Urine sodium < 10 - 20 mmol/L
Elevated plasma renin
Elevated plasma aldosterone
BUN:creatinine ratio > 20 (**late** indicator, and only after the patient is quite volume depleted)

Oxalate

Oxalate is a chemical compound found in many foods. After ingestion, oxalate generally binds to calcium within the bowel and is excreted. In patients with fat malabsorption, calcium preferentially binds to fat in the small bowel instead of oxalate. This leaves the oxalate freely available to be absorbed, but only in patients who have a portion of remaining colon, since oxalate can only be absorbed in the large intestine. After its absorption, oxalate is delivered to the kidneys for excretion (see Part I of this series). Maintaining adequate hydration and urine output is key to prevention of oxalate stones, and in some patients, dietary avoidance of high oxalate foods such as beets, spinach, rhubarb, strawberries, nuts, chocolate, tea, wheat bran, and all fresh, canned, or cooked dry beans (excluding Lima and green beans) is recommended.

Salt

Patients with SBS are at significant risk of sodium depletion. Normal stool sodium is approximately 4.8 mEq (110 mg) per day. In those SBS patients with a jejunostomy or ileostomy, daily losses can be as high as 105 mEq (2430 mg) *per liter* of stool. When persistent, sodium and fluid depletion may be associated with weight loss, failure to thrive, and impaired renal function.[25-27] Signs and symptoms of sodium depletion include low urine output, considerable thirst and fatigue. What makes sodium depletion difficult to appreciate

Table 3. Summary Diet Recommendations for SBS Patients with and without Remaining Colon

Diet Component	End Jejunostomy/Ileostomy	Colon Segment in Continuity
Meals/snacks	• 5-6+ smaller meals/snacks per day • Chew foods *really* well!	• 5+ smaller meals/snacks per day • Chew foods really well!
Carbohydrates	• ~ 50% complex CHO/avoid simple sugars including: ○ Modified FODMAP restriction (fructose, high fructose corn syrup, sugar alcohols such as sorbitol) ○ Lactose – limit if necessary	• 50%+ complex CHO/avoid simple sugars including: ○ Modified FODMAP restriction (fructose, high fructose corn syrup, sugar alcohols such as sorbitol) ○ Lactose – limit if necessary
Fat	• 30-40%; encourage fat with high essential fatty acid content • Some MCT is ok	• < 30% fat; encourage fat with high essential fatty acid content • Some MCT is ok
Protein	20-30%; high biological value	20-30%; high biological value
Fiber	Usual intake—limit if too high	Encourage soluble; 5 to 10 g/day (see fiber section)
Oxalate	No restriction	Limit, but first *ensure adequate urine output of > 1 liter daily*
Salt	Increase intake by salting foods, or using high sodium food choices	Usual intake
Fluids	ORS/high sodium fluids, *total fluid restriction* may be necessary in some (& IV fluids given)	ORS may be necessary in some; *total fluid restriction* may be necessary in some (& IV fluids given)

in these patients is that creatinine levels may not accurately reflect renal function due to the low lean body mass many of these patients exhibit. Furthermore, serum sodium levels are usually maintained within the normal range by renin- and aldosterone-mediated renal conservation of sodium, as well as the contraction of the extracellular fluid compartment, misleading the clinician.[28,29] In patients with fatigue, overall failure to thrive and high stool output, an assessment of sodium status is advised (see Table 2).

In the patient with SBS, salty snacks are encouraged and liberal use of the salt shaker can help replace sodium lost in the stool. Salt tablets have been used, but can cause vomiting in some; in those on enteral nutrition support, salt can be added to the formula.[5] Of course, ensure that SBS patients are not *restricting* salt due to comorbid conditions they had prior to developing SBS. See Table 3 and 4 for summary diet guidelines and a sample menu plan.

Vitamins/Minerals: What Makes Sense

Patients with SBS are at risk for multiple vitamin and mineral deficiencies and as such, lifelong monitoring and supplementation is needed. We recommend a baseline assessment of electrolytes and micronutrient levels (e.g., vitamins A, D, E, B_{12}, folate, zinc, selenium, iron indices including ferritin, and essential fatty acids) should be obtained at the initial clinic visit. However,

Table 4. Sample 2200 Calorie Meal Plan

Patients WITHOUT Colon	Patients WITH Some Colon
Breakfast	**Breakfast**
2 scrambled eggs	1 cup oatmeal
1 English muffin or	2 scrambled eggs
2 slices toast	1 English muffin or
6 oz lactose-free nonfat milk* (if allowed)	2 slices toast
1 tablespoon margarine	6 oz lactose-free nonfat milk* (if allowed)
1 teaspoon diet jelly (use sparingly)	1 teaspoon diet jelly (use sparingly)
4 oz coffee (if allowed)	4 oz coffee (if allowed)
Morning Snack	**Morning Snack**
1 slice bread	1 slice bread
2 tablespoons peanut butter	1 tablespoon peanut butter
½ banana	1 banana
Lunch	**Lunch**
4 oz turkey breast	4 oz turkey breast
1 hoagie roll	1 hoagie roll
2 teaspoons mayonnaise	1 oz cheese
2 oz cheese	2 slices tomato
2 slices tomato	
Afternoon Snack	**Afternoon Snack**
6 crackers	12 crackers
2 oz cheddar cheese	2 oz cheddar cheese
	2 oz deli ham
Dinner	**Dinner**
4 oz grilled salmon	4 oz grilled salmon
1 large baked sweet potato	1 large baked sweet potato
1 tablespoon butter	1 small dinner roll
	1 teaspoon butter
Evening Snack	**Evening Snack**
8 animal crackers	16 animal crackers

Note: *Beverage choices and amount should be individualized for each patient.*

those micronutrients whose serum values are influenced by inflammatory states or infection (e.g., vitamin A, possibly D, zinc, and ferritin) should not be checked until those problems are corrected. There are no evidence-based guidelines directing which micronutrients to monitor or the optimal timing of how often to monitor them. As a consequence, the frequency of monitoring will generally depend upon the presence of existing or prior deficiencies. In the stable SBS patient on or off PN, a semi-annual assessment of micronutrients and essential fatty acids is advised. Because water-soluble vitamins are absorbed in the proximal small bowel, deficiencies in SBS patients are uncommon. In contrast, fat-soluble vitamin and essential fatty acid deficiencies are more commonly encountered and may require large doses to maintain normal plasma levels. When deficiency is identified, supplementation with aqueous preparations of vitamins A, D, and E in doses that normalize the plasma level is recommended.

Supplemental zinc, and occasionally copper and selenium, may be required in the presence of excessive stool losses. Supplementation is often based on clinical suspicion as many factors alter serum levels. Iron supplementation is not commonly needed, as iron is absorbed in the upper gastrointestinal tract, an uncommon site of resection in SBS patients. Supplemental iron may be needed if oral intake of iron is inadequate or when chronic gastrointestinal bleeding is present.

Food-bound vitamin B12 absorption will be impaired in those with more than 50 to 60 cm of terminal ileum removed.[30] These patients will require lifetime administration of supplemental vitamin B12. This is usually administered by injection on a monthly basis, however, synthetic oral B12 may be a preferred option in some. If oral is used, 1000 mcg/day is recommended and should be monitored the first 3, 6 and 12 months after initiating to ensure efficacy.[31] In those plagued with small bowel bacterial overgrowth, a methylmalonic acid should be checked in addition to serum B12, as bacterial overgrowth not only vies with the host for ingested B12, but the B12 can be partially metabolized to inactive analogues that compete with B12 for binding and absorption.[32,33]

Although many recommendations for micronutrient supplementation appear in the medical literature, very little evidence exists to guide the clinician. Hence, practitioners are left with logic and common sense

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when determining their approach. Until better evidence is available, encourage patients to first eat nutritious foods, then add a therapeutic multivitamin and mineral supplement, perhaps twice daily. A chewable, crushed, or liquid form may improve its bioavailability. Multiple individual vitamin and mineral supplements should be avoided whenever possible. One has to consider not only the osmotic effects these agents can have on stool output, but also the fluid needed to take them, not to mention the sheer cost of all of these supplements and the time in one's day to take them all. For these reasons, we recommend periodically doing a "total pill count" and then asking, "is this reasonable, and does the patient have time for a life too?"

Special Consideration

Vitamin D

Patients with SBS requiring PN are at particularly high risk of vitamin D deficiency. Many factors contribute including inadequate sunlight exposure due to chronic illness; intake or tolerance to vitamin D-rich foods may be poor; dietary vitamin D may be malabsorbed; co-morbidities and medications may interfere with vitamin D metabolism; and, poor vitamin D status prior to developing SBS.[34] Furthermore, sustaining vitamin D is very difficult in many patients with SBS, in part due to the fact that PN solutions only contain 200 IU per day as part of the multivitamin preparation available. Serum vitamin D (as 25-OH vitamin D) and intact PTH with a baseline bone density scan should be done on all patients with SBS.

Vitamin D is one of the few individual supplements SBS patients may need in addition to a multiple vitamin/mineral supplement. Many practitioners use 50,000 IU per week; however, some patients may do better with daily dosing if weekly dosing does not achieve efficacy.[35] Finally, liquid vitamin D may work when nothing else will; however, some insurance companies may need justification that other forms were not effective. Finally, direct sunlight to arms and legs,[36] or controlled UV exposure with a Sperti lamp (D/UV Lamp--www.vitaminduv.com) may work in some recalcitrant patients.

Enteral Nutrition Support – When to Consider

There are few published reports of the use of home enteral nutrition (EN) support in SBS. In one recent report from a large home EN program in Canada, only 9 of 727 patients received home EN for SBS.[36] Despite its apparent paucity of use in adults with SBS, in the SBS patient who cannot meet their nutrition and/or fluid needs orally, a trial of EN should be considered in an attempt to prevent the need of a central venous catheter and either PN or IV fluid support. This intervention may be most successful in those with some remaining colon, while its use in patients with an end jejunostomy may result in increased ostomy output that interferes with sleep and further impaired quality of life. If EN is pursued, we recommend a trial of nasogastric administration before considering more permanent percutaneous access. In the diet- and medication-optimized patient, it will be quite apparent early on if this plan will be successful based on change in stool losses. Administration of the formula into the stomach via continuous infusion is recommended in order to slow nutrient delivery in order to maximize nutrient:mucosal contact time, hence, optimizing absorption while limiting diarrhea.[38-43] Overnight infusion takes advantage of utilizing the GI tract when there is nothing else to compete with mucosal receptors for absorption; plus, it does not interfere with daytime activities. The use of a lower osmolality, standard polymeric formula that contains a mixture of LCT and MCT maintains mucosal structure and function and enhances bowel adaption; the addition of fiber as part of the enteral product or as a soluble fiber supplement is recommended in those patients with some colon remaining. In addition to not being superior to standard polymeric products, the hyperosmolar nature of elemental products may actually increase stool output. Finally, as there is no suitable bile salt supplement readily available, those patients with bile salt deficiency will benefit from a lower fat formula.[44]

Parenteral Nutrition

Virtually all patients with SBS require parenteral nutrition (PN) support in the initial period following resection, and most will require PN at home after their discharge from the hospital. PN caloric requirements will depend on many factors such as need to gain (or lose) weight, ambulation/activity level, etc. and no one prescription fits all. PN should be initiated and adjusted to meet the patient's fluid, electrolyte, energy, protein, and micronutrient needs. Overall energy content and macronutrient composition will depend to some degree upon the SBS patient's oral intake and the level of repletion required. In situations of high ostomy output,

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increased fluid, potassium, magnesium, and zinc losses occur and need to be monitored and replaced appropriately. The amount of PN can be decreased when the patient demonstrates ability to take oral nutrition without excessive stool or ostomy output with appropriate weight maintenance or gain. In calculating PN volume and content, changes in the patient's weight, labs, stool or ostomy output, urine output, and complaints of thirst should be considered. These patients remain at risk for micronutrient deficiencies and require periodic monitoring and supplementation in addition to PN.[45]

Home PN is usually infused over 10 to 14 hours overnight in order to allow the patient freedom from the infusion pump during the day and potentially to reduce the risk of liver injury with long-term use. In some patients, the volume needed may cause high volume nocturnal urination. These patients may do better with less volume at night, and one or two liters of "chaser" IV fluids during the morning or evening before they hook up their PN for the night. Programmable infusion pumps are used by most consumers. Portable pumps that can be carried in a backpack or tote are also available for the PN consumer who needs to infuse during the day. Patient support groups such as the Oley Foundation (www.oley.org) are important sources of information on practical topics (e.g., body image, travel), education, and support and may reduce the risk of complications, enhance survival, and the quality of life of the patient receiving either EN or PN support.

CONCLUSION

Nutrition therapy is central to the successful management of the patient with SBS. Substantial and ongoing education at a level the patient/caregiver can understand from the outset is essential, and adequate time must be allotted for this purpose. As the bowel adapts and absorption improves, it is possible that diet interventions can be liberalized. Lifelong monitoring is necessary in all SBS patients and management goals often change over time. See Table 5 for additional SBS-related resources. ■

Table 5. Other Short Bowel Syndrome-related Resources

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  - Parrish CR. The Clinician's Guide to Short Bowel Syndrome. Practical Gastroenterology 2005;XXIX(9):67.
  - Tarleton S, DiBaise JK. Short Bowel Syndrome. In: Mueller CM, Editor-in-Chief. ASPEN Adult Nutrition Support Core Curriculum. 2nd Ed. Silver Spring, MD:ASPEN, 2012, pp. 511-522.
- **Extensive Patient Education Diet Materials**
  - UVAHS GI Nutrition Website: www.ginutrition.virginia.edu
    - Under Patient Education Materials link
- **Patient Educational Guidebooks**
  - Parrish, CR. A Patient's Guide to Managing a Short Bowel. 2nd ed. Newark, Delaware: Growth, Inc; 2013:1-65 @ www.shortbowelsupport.com.
  - Parrish CR. SBS Pocket Guide for patients (abbreviated version of SBS guide above)
    - Contact Maureen Stellwag at MStellwag@npsp.com to obtain one.
- **Oley Foundation**
  - www.oley.org (800/776-OLEY)

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