



What is Short Bowel Syndrome or SBS?

Short Bowel Syndrome or SBS is a medical condition that affects people who have a sizable piece of their small intestine missing. The large intestine is sometimes called the *large bowel*, and the small intestine is sometimes called the *small bowel*. The small intestine and large intestine are parts of your digestive tract (see Figure 1).

People with SBS have trouble absorbing nutrients, including water, from food and drink. Nutrients keep the body healthy and provide energy. Some examples of nutrients are vitamins, minerals, electrolytes, proteins, carbohydrates, and fats. Water is also a nutrient. Your body needs the right amount of water, too, in order to keep working right.

SYMPTOMS OF SBS

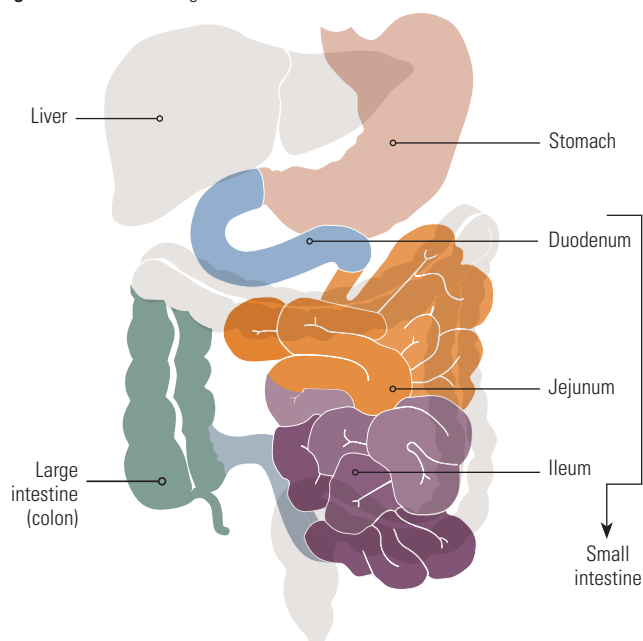
Because people with SBS have trouble absorbing the right amounts of nutrients and water, they can develop symptoms. Not every person with SBS has the same symptoms, but some symptoms are more common than others.

In most patients, the main symptom of SBS is diarrhea. Other common symptoms include:

- Dehydration
- Malnutrition
- Weight loss
- Fatigue
- Excessive stomach or intestinal gas
- Oily, fatty, or sticky stool that can smell foul

Patients, like you, who have had surgery and do not have a large intestine, may be more likely to have problems with fluid losses than patients who do have a large intestine, because the large intestine absorbs most of the water your body needs.

Figure 1. Parts of the digestive tract.



What can I eat and drink?

Parental nutrition is a special liquid form of food delivered intravenously into a central vein. Intravenous means that it is delivered directly into the blood through a catheter placed in a large vein near the heart. These catheters are called *central venous catheters*.

Parental nutrition does not go through the normal pathway of food through the stomach and intestine because it is a special liquid form of food that must be delivered into the blood. Parental nutrition contains the nutrients your body needs to keep working correctly. Examples of nutrients delivered in the liquid food mixture include proteins, carbohydrates (or sugars), fats, vitamins, electrolytes, and minerals.

WHAT IS THE DIFFERENCE BETWEEN COMPLETE AND PARTIAL PARENTERAL NUTRITION?

Types of parenteral nutrition	
Complete	Partial
<ul style="list-style-type: none"> • Patient relies totally on delivery of nutrients through the vein • Little to no digestion of oral food 	<ul style="list-style-type: none"> • Patient gets some but not enough nutrition from oral food • Requires some nutrition intravenously

Your health care provider will help give you a specific diet to follow while you are on partial parenteral nutrition. Because you are able to eat and digest some oral food, but not enough to meet the nutritional needs of your body, you will also need partial parenteral nutrition and possibly enteral nutrition (nutrition delivered through a tube, see page 4) to receive adequate nutrition.

Your health care team will give you specific oral diet recommendations that will help you digest and absorb as much as possible, in addition to stimulating your remaining intestine to grow. But there are some general guidelines on what to eat and drink.

- Avoid concentrated sweets and fluids (for example, fructose, high fructose corn syrup, and sugar alcohols such as sorbitol)
- Chew foods well
- Eat 5 or 6 smaller meals per day
- Limit fluids with meals
- Separate solids and liquids at meals as much as possible (solids before liquids)
- Limit or avoid alcohol and caffeine
- Eat foods with soluble fiber (for example: oatmeal, oat cereal, oat bran, lentils, apples, oranges, pears, blueberries, nuts, legumes, ground flaxseeds, chia seeds, carrots, psyllium, guar gum, pectin, and rinds)
- You may eat salty snacks
- Depending on your health care team's recommendations, you may need to monitor your intake of water and other drinks

Some foods that are good choices include the following listed in **Table 1** on page 2.

ORAL REHYDRATION SOLUTIONS

Maintaining proper hydration is important when you have SBS, especially if you are on complete or partial parenteral nutrition. Talk with your health care team about hydration. They may recommend a specific oral rehydration solution if you are dehydrated.

Is there anything I need to look out for with SBS?

Yes, SBS may cause complications in some patients. By keeping a lookout for symptoms of these complications, you can alert your health care provider early. Your health care provider can help you manage complications, which may help prevent them from becoming something more serious.

Keep in mind, though, that not all patients with SBS will have all of these complications, and every patient will experience different symptoms to a different degree. Notify your health care provider if you notice any new symptoms or a change in symptoms. Some common complications of SBS are shown in **Table 2**.

What should I be on the lookout for with parenteral nutrition?

It is important to be aware of some complications that can occur with parenteral nutrition so that you can better understand steps your health care provider may take, or ask you to take, to prevent or manage these complications.

For some patients, parenteral nutrition is needed for nutrition only in the period immediately following bowel surgery. For other patients, parenteral nutrition may be required for a longer time.

Table 1. Suggested foods.


Starches/breads	Cereals
<ul style="list-style-type: none"> Breads, pita bread, rolls Bagels, English muffins Plain waffles or pancakes Corn bread, plain muffins Tortillas—whole wheat or white flour, corn—toasted Pasta, macaroni, noodles Rice, brown rice, wild rice 	<ul style="list-style-type: none"> Unsweetened cereals (wet or eaten dry as a snack) Hot cereals: cream of rice or wheat, grits, oatmeal
Vegetables	Fruits
<ul style="list-style-type: none"> Canned or cooked vegetables Potatoes, sweet potatoes, yams Small amounts of lettuce (1/2 cup) 	<ul style="list-style-type: none"> Bananas, melons, unsweetened canned fruits (applesauce, pears, peaches, mandarin oranges, apricots, cherries)
Meat/fish/poultry	Dairy/soy
<ul style="list-style-type: none"> Meats, fish, shellfish, poultry, tuna fish 	<ul style="list-style-type: none"> Cheese, cottage cheese, plain yogurt or yogurt sweetened with artificial sweeteners, cream cheese Plain soy milk
Eggs	Nut butters
<ul style="list-style-type: none"> Poached, hard or soft cooked, omelet, scrambled 	<ul style="list-style-type: none"> Peanut, almond, cashew
Beverages	Snacks
<ul style="list-style-type: none"> Oral rehydration solutions Soups, broths—4 ounces per day Lactaid milk 	<ul style="list-style-type: none"> Crackers Pretzels, matzo Corn or potato chips Bagel snack crackers
Desserts	Miscellaneous
<ul style="list-style-type: none"> Animal crackers, graham crackers, angel food cake, vanilla wafers, shortbread, plain pound cake, cake doughnuts (with no icing), marshmallows 	<ul style="list-style-type: none"> Salt, pepper, herbs, spices, dill pickles, Splenda®, Equal®, Sweet 'n Low®

When you are in the hospital, your health care provider will monitor you for certain complications that might occur while you are receiving parenteral nutrition. Some of these complications are related to the central venous catheter used to deliver the parenteral nutrition into the large vein. Other complications are related to the parenteral nutrition.

Some common complications of parenteral nutrition are infections, venous thrombosis (or blood clots in a vein), and liver disease. In addition, some patients—particularly those who have a colon—are also at increased risk for kidney stones because they are more susceptible to dehydration. The increased risk of kidney stones is just one of the many reasons that staying hydrated is important for patients with SBS.

Infections

Infections may be due to bacteria or fungal contamination of the central venous catheter used to administer the parenteral nutrition. Your health care provider will measure your temperature and carefully inspect your catheter to make sure it is not infected. You will also likely receive instructions on how to care for your catheter and how to keep it clean.

 **Notify your health care provider immediately** if you have any fever, chills, or pain, or redness or swelling at or around the catheter insertion site.

Venous thrombosis

Venous thrombosis is a medical term for a blood clot that forms in your veins. These blood clots can sometimes occur in patients who are receiving parenteral nutrition through a central venous catheter. When venous thrombosis does occur, it most often forms in the blood vessel or vein with the central venous catheter. Your health care provider will monitor you for venous thrombosis. But you can also monitor yourself for any signs of a blood clot.

Some signs of a venous thrombosis include:

- Warmth and tenderness over a vein
- Pain or swelling in the part of the body affected
- Skin redness

 **Notify your health care provider immediately** if you have any of these symptoms or suspect that you have a venous thrombosis.

Liver disease

Liver disease sometimes develops in patients with SBS who are receiving parenteral nutrition. Some patients may be at greater risk for liver disease than others. Factors that increase the risk of liver disease include recurrent infections, bowel surgeries that affect the blood vessels connecting the liver and the bowel, bacterial overgrowth, and poorly regulated nutrition.

Your health care provider will use a number of different strategies to help prevent and treat liver disease associated with parenteral nutrition. Some strategies include adding tube feeding and adjusting the parenteral nutrition composition.

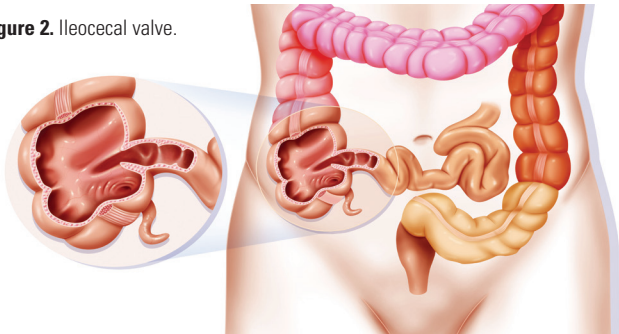
What do I need to know about weaning off parenteral nutrition?

An important goal for almost all patients with SBS is to reduce the amount of parenteral nutrition that they need over time. Some patients with SBS on parenteral nutrition can be gradually weaned off it relatively soon after surgery. Other patients will require longer term partial parenteral support.

WHAT ARE ADAPTATION PHASES?

After surgery to remove a section of the small bowel, the remaining section of the small bowel can sometimes adjust to the shorter bowel length. It does this by working harder than before. There are 3 general phases of intestinal adaptation, which can overlap and vary by patient (see **Table 3** on page 4).

Table 2. Common complications of SBS.

Malnutrition	
<p>What it means: Malnutrition means that the body is not getting all the nutrients it needs in the right amounts, and this is causing problems in how the body normally functions. You can develop malnutrition even if only one nutrient is missing from your diet.</p>	<p>Symptoms of malnutrition depend on what nutrients your diet is lacking. Common symptoms include:</p> <ul style="list-style-type: none"> • Fatigue • Weight loss • Dizziness • Changes in skin, such as rashes and sores • Changes in vision
Dehydration	
<p>What it means: Dehydration means that your body does not have enough water to function properly. Dehydration can be either mild to moderate, or severe. Diarrhea and vomiting can cause dehydration. You can also become dehydrated if you aren't drinking enough water or other fluids because you feel sick or nauseated.</p>	<p>Signs of mild to moderate dehydration include:</p> <ul style="list-style-type: none"> • Thirst • Dry or sticky mouth • Not urinating much • Darker yellow urine than usual • Dry, cool skin • Headache • Muscle cramps <p>Some symptoms of severe dehydration include:</p> <ul style="list-style-type: none"> • Not urinating, or very dark yellow or amber-colored urine • Dry, shriveled skin • Irritability or confusion • Dizziness or lightheadedness • Rapid heartbeat • Breathing rapidly • Feeling a lack of energy or interest in anything
Electrolyte abnormalities	
<p>What it means: SBS can affect how well your body absorbs electrolytes. Electrolytes are minerals that help regulate important functions in the body. Examples of electrolytes are potassium, sodium, phosphorus, and magnesium. Normally, electrolytes are balanced in the body. When you have too much or too little of one or more electrolyte, you can develop different symptoms.</p>	<p>Symptoms of electrolyte abnormalities include:</p> <ul style="list-style-type: none"> • Irregular heartbeat • Muscle weakness or muscle cramps • Headache • Nausea
Vitamin and trace element deficiencies	
<p>What it means: SBS can affect how well your body absorbs vitamins and trace elements. Vitamins are necessary for metabolizing food in your body. Sometimes, your body doesn't absorb enough of one or more vitamins, leading to vitamin deficiencies. Some vitamin deficiencies can cause serious problems, such as damage to the brain and nerves, confusion, and night blindness.</p> <p>Your body needs small but important amounts of trace elements, such as zinc, chromium, and manganese.</p>	<p>When deficiencies occur, you may experience such symptoms as skin rashes, muscle cramping, and irregular heart rhythms.</p> <p>It is important to catch vitamin and trace element deficiencies early. Your health care team will monitor you for them, but if you notice a change in how you feel, or you have increased fatigue, weakness, visual changes, skin rashes, or muscle cramps, or your heartbeat feels different, call your provider.</p>
Acidosis	
<p>What it means: Acidosis is a condition in which the level of acid in the blood is too high. People with SBS may sometimes produce more acid than normal or lose more bicarbonate than normal because of increased diarrhea. Acidosis can also result from abnormal growth of certain bacteria in the intestine (see <i>Bacterial overgrowth</i> below). Notify your health care provider if your stool output increases or you experience symptoms of acidosis.</p>	<p>Symptoms of acidosis include:</p> <ul style="list-style-type: none"> • Confusion • Blurred vision • Slurred speech
Increased amounts of stomach acids	
<p>What it means: Patients with SBS often produce increased amounts of stomach acids. High levels of stomach acid can increase the amount of secretions entering the shortened bowel, which can interfere with normal absorption of nutrients.</p>	<p>Symptoms of increased stomach acids include:</p> <ul style="list-style-type: none"> • Diarrhea • Abdominal pain • Discomfort • Nausea or vomiting
Bacterial overgrowth	
<p>SBS can result in an unusually high amount of bacteria in the small bowel because of undigested or unabsorbed food. It can also result when the ileocecal valve has been removed and bacteria from the large bowel can backflow into the small bowel. Bacterial overgrowth can cause acidosis (see <i>Acidosis</i> above).</p> <p>The ileocecal valve connects the small and large intestines and normally blocks bacteria from the large intestine from flowing back into the small intestine (see Figure 2). Patients who have had their ileocecal valve surgically removed may be at greater risk for developing small bowel bacterial overgrowth. This is because when the ileocecal valve is removed, the flow of bacteria between the large intestine and small intestine goes unchecked and more bacteria may get into the small intestine.</p>	<p>Figure 2. Ileocecal valve.</p> 



WHEN DOES WEANING OCCUR?

Weaning off parenteral nutrition most often takes place during the adaptation and maintenance phases.

WHAT FACTORS CAN INFLUENCE THE SUCCESS OF THE ADAPTATION PHASE AND WEANING?

Every patient is different. But some factors can affect the success of the adaptation phase and switching from parenteral nutrition to eating food. These factors include:

- Overall health and age of the patient
- Length of the remaining small intestine
- Presence or absence of inflammatory disease in the remaining portion of the small intestine
- Presence or length of the large intestine
- Presence or absence of the ileocecal valve

HOW WILL I BE WEANED OFF PARENTERAL NUTRITION?

Your health care team will decide when and how you will be weaned off parenteral nutrition. Depending how rapidly your bowel adapts to oral nutrition, parenteral nutrition may be weaned off in a short time. If your bowel is slower to adapt to oral nutrition, you may require a longer time to wean off parenteral nutrition.

If your health care team decides you are ready to begin tapering off parenteral nutrition, you will likely be gradually switched to tube feeding and/or oral eating. You should expect this process to be slow and gradual, much like a baby shifts from consuming milk, to pureed foods, to solids over a period of months to years.

4

What is enteral nutrition?

Enteral nutrition usually refers to delivery of liquid food to the stomach or small intestine through a feeding tube. The tube may be threaded through the nose and down into the stomach or small intestine, or the tube may be placed through the skin into the stomach or small intestine. Sometimes health care providers will refer to oral eating of food as “enteral nutrition,” too, because food is being introduced into the gastrointestinal tract. For most patients, though, enteral nutrition means tube feeding.

What is oral eating?

Oral eating means just what it sounds like—ingesting food by mouth

Small but frequent increases in enteral feeding and oral eating enable the small intestine to adapt better.

HOW WILL MY HEALTH CARE TEAM MODIFY MY DIET TO HELP DURING ADAPTATION?

Your health care team will adjust your diet as your digestive tract adjusts after surgery. Your diet will depend on the length of the remaining small intestine and how well it is functioning. See the *Nutrition* section for general guidance on foods that are good choices once your health care team tells you to start eating regular food.

ARE THERE ANY MEDICATIONS THAT CAN HELP ADAPTATION AND WEANING?

Yes, for some patients, medications may help the digestive tract adapt and enable them to gradually change from parenteral nutrition to oral eating. Your health care provider will prescribe medications depending on how well your intestine is working. Your medications may change as your intestine continues to adapt over time. Some of these medications include antidiarrheal or antimotility medications, gastric acid reducers, bile acid/salt resins, teduglutide, somatropin, human growth hormone, L-glutamine powder, and other medications.

How do I stay on track?

Staying on track with your treatment is the most important step you can take to improve your SBS symptoms, help your intestine regain function, and reduce your symptoms. Here are some tips to help you:

- Follow directions provided by your health care team about caring for your central venous catheter and administering your parenteral nutrition
 - Notify your health care provider immediately of any symptoms of fever, chills, or redness and swelling around the central venous catheter
 - Inspect the injection site every day for signs of swelling, redness, or leakage
- Take your medications as your health care team instructs.**
- Follow your prescribed diet.**
- Ask your health care team for other ideas and tips for staying on track with your treatment. They are there to help you.**

Table 3. The 3 phases of intestinal adaptation.

	Acute phase	Adaptation phase	Maintenance phase
Timing	<ul style="list-style-type: none"> • Occurs immediately after surgery • Can last to 3 to 4 months after surgery 	<ul style="list-style-type: none"> • Begins soon after surgery • During this period the bowel adapts to the loss of the removed section • Can last up to 2 years following surgery 	<ul style="list-style-type: none"> • 2 or more years after surgery
What to expect	<ul style="list-style-type: none"> • Increase in stool output • Patients will need extra fluids 	<ul style="list-style-type: none"> • Reduced stool output • Patients typically experience an increase in the ability to take oral nutrition 	<ul style="list-style-type: none"> • Patients require fewer changes to their nutrition therapy, whether it is oral eating or parenteral nutrition

Note: Full intestinal adaptation is reached when a patient can successfully digest and absorb all necessary nutrients through the gastrointestinal tract.



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