



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 from food and drinks. 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 to keep working correctly.

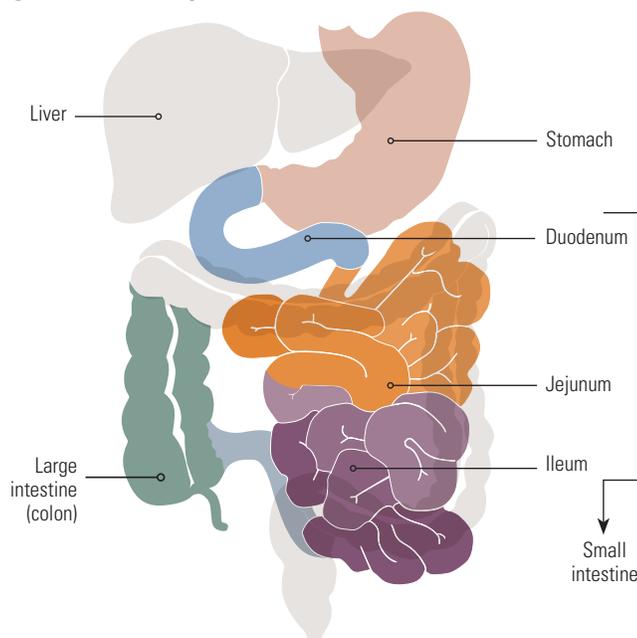
SYMPTOMS OF SBS

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

Figure 1. Parts of the digestive tract.



What can I eat and drink?

Parenteral 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*.

Parenteral 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. Parenteral 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 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 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. There are some general guidelines you can follow on what to eat and drink (see **Table 1** on page 2 for information on oral rehydration solutions):

- 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
- Limit fat intake to less than 30% of your diet; make protein about 20% to 30% of your diet; keep complex carbohydrates to more than 50% of your diet
- 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
- Depending on your health care team's recommendations, you may

need to limit your intake of foods that have a high concentration of a substance called oxalate: beets, spinach, rhubarb, strawberries, nuts, chocolate, tea, wheat bran, and all fresh, canned, or cooked dry beans

ORAL REHYDRATION SOLUTIONS

Maintaining proper hydration is important when you have SBS, especially if you are on complete or partial parenteral nutrition. You should talk with your health care team about hydration. They may recommend a specific oral rehydration solution if you are dehydrated. Some examples of recipes for homemade solutions appear in **Table 1**.

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

Yes, SBS may cause complications in some patients. By keeping a look out 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. Some common complications of SBS are shown in **Table 2**; others are listed below.

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.

2 BACTERIAL OVERGROWTH

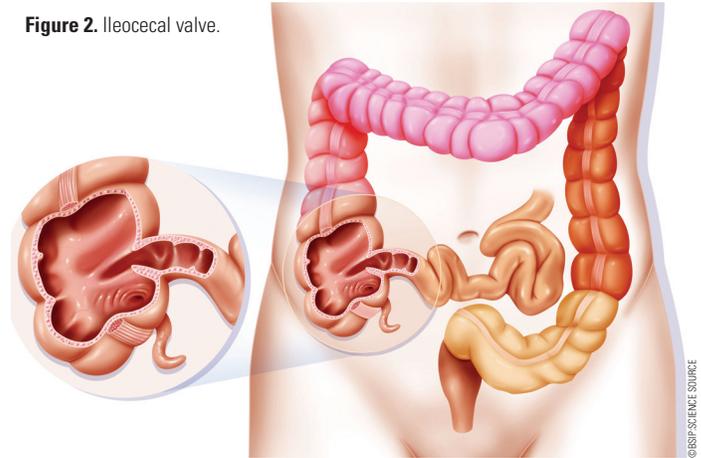
SBS can result in an unusually high amount of bacteria in the small bowel because of undigested or unabsorbed food. It can also result when the ileocecal valve has been removed and bacteria from the large bowel can backflow into the small bowel. Bacterial overgrowth can cause acidosis (see *Acidosis* in **Table 2**).

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. 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.

Symptoms of bacterial overgrowth include:

- Diarrhea
- Nausea
- Bloating
- Vomiting

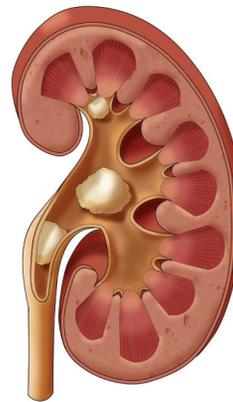
Figure 2. Ileocecal valve.



KIDNEY STONES

Kidney stones are solid masses made up of tiny crystals. Patients with SBS can develop kidney stones because they have decreased intestinal absorption of fats, calcium, and bile salts. Patients can have more than one kidney stone in the kidneys or in the tubes (also called *ducts*) leading from the kidneys that carry urine to the bladder (see **Figure 3**).

Figure 3. Kidney stones.



The main symptom of kidney stones is severe pain that may come and go suddenly. The pain:

- Is usually in the lower back, side, or abdomen
- May move to the groin area

Other symptoms of kidney stones can include:

- Abnormal urine color
- Blood in the urine
- Chills
- Fever

Table 1. Recipes for oral rehydration solutions.

World Health Organization Formula	Washington University Formula	Homemade Cereal-Based	Basic Homemade Recipe
1/2 teaspoon salt 1/2 teaspoon potassium chloride 8 teaspoons sugar 1/2 teaspoon sodium bicarbonate (baking soda) 1 liter water (4 1/2 cups) • Combine and stir until well mixed and dissolved	1/2 teaspoon salt 1/2 teaspoon sodium citrate 3 tablespoons + 1 teaspoon powdered polycose 1 liter water (4 1/2 cups) Crystal Light® to taste (especially lemonade, orange, or pineapple flavors) • Combine and stir until well mixed and dissolved	1/2 cup dry, precooked baby rice cereal 2 cups water 1/2 teaspoon salt • Combine ingredients and mix until well dissolved and smooth • Refrigerate. Solution should be thick, but pourable and drinkable	1 liter water (4 1/2 cups) 1 cup orange juice 8 teaspoons sugar 1/2 teaspoon baking soda 1/2 teaspoon salt • Combine and stir until well mixed and dissolved

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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 are different, depending on what nutrients your diet is lacking.</p> <p>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
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> on page 2). 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
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>



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.

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.

4

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 that 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.

How do I stay on track with treatment?

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:

- **Wash your hands** with soap and water before handling your central venous catheter
- 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.

Medications are an important part of helping your intestines regain as much function as possible. Medications can also help manage your symptoms and enable you to live your life more fully. But medications work only if you take them as instructed. Some hints for remembering to take your medications include:

- Using pill boxes
- Setting alarms on your phone or computer, or using an alarm clock
- Keeping a medication calendar or diary that you check off every day

Follow your prescribed diet. Your health care team has designed a diet that will help your intestine recover function following surgery. What you eat and drink can also greatly influence what kind of symptoms you have, especially diarrhea, gas, nausea, and vomiting. Following your diet closely will not only help your intestine adapt and keep you as healthy as possible, but will also help you manage gastrointestinal symptoms.

Ask your health care team for other ideas and tips for staying on track with your treatment. They are there to help you.

