

# Liver Resection

## **Disclaimer**

This patient education resource is not medical advice. It shares common health facts, advice and tips. Some of the information provided in this resource may not apply to you. Please talk to your doctor, nurse or other health-care team member to see if this information will work for you. They can also answer any questions or concerns that you might have.

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HPB stands for Hepato-Pancreato-Biliary. The HPB surgery team at The Ottawa Hospital is a group of doctors who specialize in surgery of the liver, pancreas, gallbladder and biliary tract. These experts work together closely in a team with other health-care professionals to support and guide you through your surgical experience.

This booklet will help you understand:

- ❑ Your surgery
- ❑ How to care for yourself when you get home
- ❑ What problems to look out for
- ❑ Who to call or talk to if you have questions

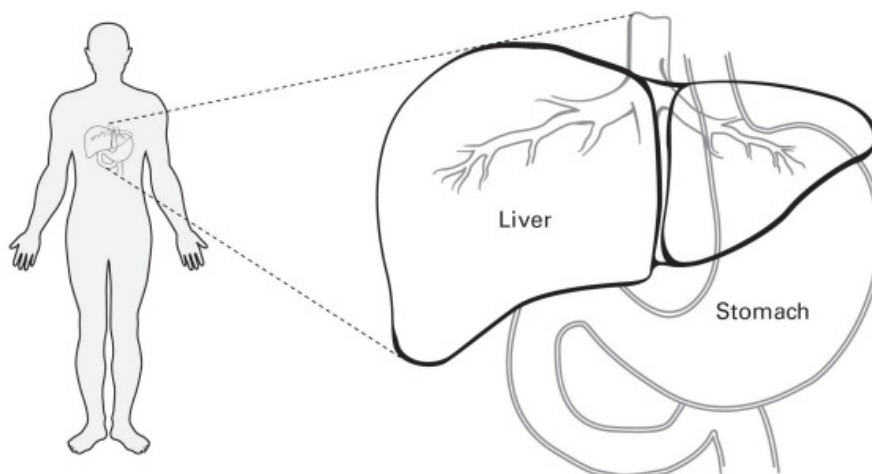
Please read the booklet carefully and share it with your care partners. Understanding your surgery will help you to get more involved in your care.

## The liver

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### What is the liver and what does it do?

The liver is the largest solid organ in the body. It is found in the right upper side of your belly. It is separated into lobes and segments.



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The liver has many jobs:

- ✓ It filters out waste (such as hormones, medicine and toxins) from the body.
- ✓ It makes bile. Bile is a liquid that helps the body with digestion.
- ✓ It helps your body take in the nutrients, glycogen (sugar), vitamins and minerals that it needs.
- ✓ It helps to keep blood sugar at normal levels.
- ✓ It supports the blood components (such as plasma, albumin and clotting factors).
- ✓ It helps you to fight off infections by making immune factors and getting rid of bacteria.

### Can the liver regrow?

The liver is the only solid organ in the body that can regrow. This means that when part of the liver is removed, the remaining liver increases in size until it returns to approximately the same size of the original liver. The bile ducts and blood vessels do not re-grow. The liver regrowth can take 2 to 3 months. Usually, it is safe to remove up to three-quarters (75%) of a healthy liver. People with liver disease, like cirrhosis, or who have had chemotherapy may not tolerate a large amount of liver being removed.

## Liver resection surgery

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Liver resection is a surgery where doctors take out a part or many parts of the liver. This surgery is done to remove:

- Tumors that are cancerous :
  - » primary tumors (tumors that start in the liver) or
  - » secondary tumors (tumor cells that spread to the liver from another part of the body that has cancer. This is called metastases).
- Tumors that are non-cancerous (benign):
  - » liver adenomas or
  - » liver cysts

## What is removed during a liver resection?

- ✓ Part of the liver containing the tumor or abnormality.
- ✓ Typically, some normal liver surrounding the tumor.
- ✓ The gallbladder, if necessary. This is called cholecystectomy.

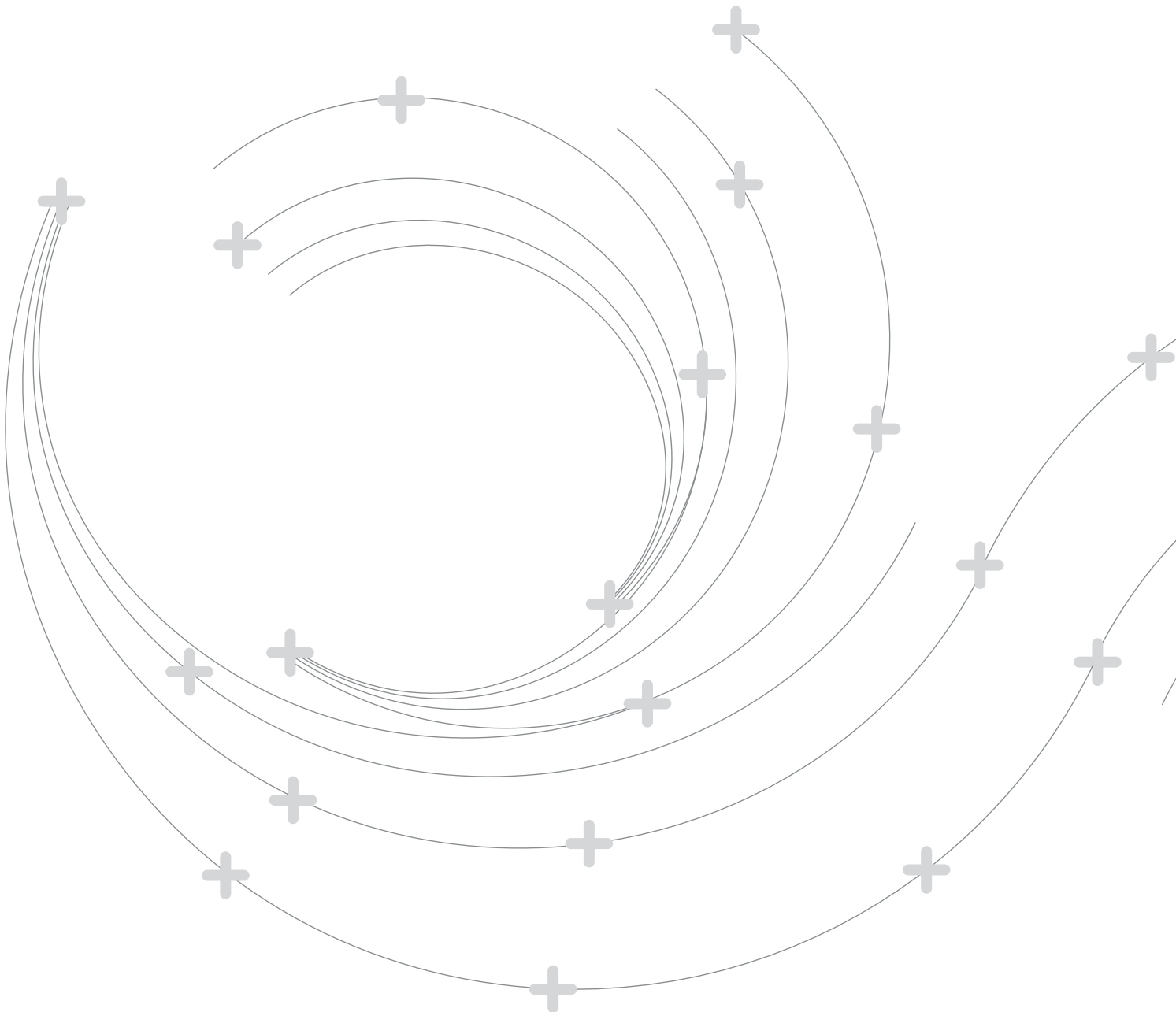
## What should you expect?

- An intravenous (IV) will be put into your vein to give you medicine and fluids.
- A health-care team member will bring you to the operating room (OR).
- To help with pain, you may get an epidural (a small tube that is put in your back to give you pain medicine).
- The anesthesiologist will put you to sleep. This will not be painful.
- You will get antibiotics to help lower your chance of infection and anticoagulants (blood thinners) to prevent you from getting blood clots.
- A nurse will put a tube (catheter) into your bladder to drain urine.
- The surgical team will make one longer surgical cut (incision) on your belly or 4 to 6 smaller cuts.
- This surgery normally takes 2 to 6 hours.

If the surgery is being done for a cancer, the goal is to completely remove the tumor(s) and some tissue around the tumor. This is called leaving clear margins. This lowers your chance of the cancer from coming back.

## What are the benefits of a liver resection for people with cancer?

- ✓ Removing the cancer and surrounding tissues increases your survival time and lowers the chances of your cancer coming back. The chance of your cancer coming back depends on the type of tumour and stage of cancer that you have.
- ✓ The organs and tissues that were removed during your surgery are tested by a physician called a pathologist. The pathologist will tell the surgeon the type and stage of your cancer. Your surgeon will talk with you about your pathology results and any other treatments that are necessary.



## What are the risks and possible complications?

During any surgery, there is a chance that things might not go as expected. Your health-care team will do their best to keep you safe and prevent any issues (complications). Your surgeon will talk with you about the possible complications and risks of this surgery. Ask as many questions as you need to fully understand. A liver resection is major surgery. Some possible complications are:

<b>Incisional Hernia</b>	When tissue or organ pushes through a weak spot in your muscles, making a little bulge on your skin. This can happen when the belly muscles are weak from the surgical cut.
<b>Complications linked with anesthetics</b>	Anesthetics are the medicines used to put you to sleep for your surgery. The anesthesiologist will speak to you about the risks linked with these medicines before your surgery.
<b>Chest infections and/or problems breathing</b>	Illness caused by an infection and/or fluid buildup around or in your lungs.
<b>Bleeding</b>	This can happen during or after your surgery. A blood transfusion may be needed.
<b>Surgical Site Infection (SSI) or Abscess</b>	Illness caused by bacteria at the surgical cut (incision) or inside the belly.
<b>Blood Clot</b>	Blood clots can happen anywhere in the body. These are also known as deep vein thrombosis (DVT) or pulmonary embolism (PE).
<b>Bile leak</b>	This is when bile from the liver leaks into the belly.

<p><b>Paralytic ileus/ Constipation</b></p>	<p>This can happen when the gut takes longer than usual to start working again after surgery. When this happens, people feel bloated and may have nausea and/or vomiting. Sometimes people need a tube put in through the nose into the stomach to remove fluids or gas that does not empty normally.</p>
<p><b>Hyperglycemia or Hypoglycemia</b></p>	<p>Uncontrolled sugar levels in your blood. This is not common in liver surgery.</p>
<p><b>Liver Failure</b></p>	<p>When the liver that remains after surgery does not work well enough to do all the jobs of the liver. This is one of the most serious complications of liver surgery. Liver failure can cause your skin to turn yellow (jaundice), fluid collection in the belly (ascites) and an abnormal blood clotting (coagulopathy). This is a very rare complication that can lead to death.</p>



## Pre-Admission Unit (PAU) visit



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Before your surgery, you will have an appointment at the Pre-Admission Unit (PAU). The nurses and/or anesthesiologist will review your medical history and give you more information about what you can do to prepare for your surgery. They will also talk to you about pain control.

# What can you do to prepare for surgery?

It is important to prepare your body for surgery. Ask your health-care team for support and consider the following:

	<b>Stop smoking and vaping</b>	
<ul style="list-style-type: none"><li>• Stop smoking before your surgery. This includes vapes, pipes, cigars, marijuana, and cigarettes.</li><li>• At a minimum, do not smoke on the day of your surgery.</li><li>• Stopping smoking will lower your risk of lung problems and infections after surgery.</li></ul> <p>If you are interested in stopping smoking, the Ottawa Model for Smoking Cessation (OMSC) can help. Their services are free. Call 1-888-645-5405 or email <a href="mailto:omsc@ottawaheart.ca">omsc@ottawaheart.ca</a> to speak to someone at OMSC.</p>		

	<b>Reduce alcohol intake</b>	
<ul style="list-style-type: none"><li>• Stop drinking alcohol 4 weeks before your surgery.</li><li>• If you drink 4 to 8 alcoholic drinks per day, do not stop drinking abruptly. Discuss reducing your alcohol intake with your health-care team.</li><li>• Reducing your alcohol intake will help you to get better after surgery.</li></ul>		



## Be active

Preparing your body for surgery through physical activity can speed up your recovery. If you are able to:

- Maintain or increase your daily activity (i.e., walk for longer periods of time than usual).
- Stretch and do mobility and balance exercises.
- Take deep breaths and cough several times a day.



## Eat well

To speed up your recovery, it is important to eat enough protein and energy-rich foods to maintain your usual body weight. If you find it is difficult to eat or you are losing weight before surgery, ask your surgeon for help. Consider the following:

- Have 3 small meals and 3 snacks each day.
- Eat protein-rich foods (meat, fish, eggs, dairy/non-dairy alternatives, tofu, nuts, Greek yogurt, etc.).
- Consider taking a nutritional supplement to prevent weight loss before surgery.

For more information about what to expect before your surgery, read the *Preparing for Your Surgery and Admission at The Ottawa Hospital* patient education booklet. You can ask your healthcare team for the booklet if you have not received one.

# What can you expect after surgery?

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After your surgery, the health-care team will take you to the recovery room (also known as the Post-Anesthesia Care Unit or PACU). You will stay here until you wake up and your pain is under control. When your room is ready, the health-care team will take you to the inpatient unit, 7 East (the Hepatobiliary Unit).



**Usually, someone who has a liver resection surgery stays in the hospital for 3 to 5 days.**

## While you are on the inpatient unit

The nurse will check on you often to make sure that you are comfortable and doing well. Your temperature, heart rate, blood pressure, pain level, and incision (surgical cut) will be checked. The nurse will also listen to your lungs to check your breath sounds and your belly to check your bowel sounds.

## Pain

- It is normal to feel some pain after your surgery.
- Your health-care team will ask you about your pain at least every 4 hours. Our goal is to control your pain enough for you to take part in your care. You should be able to rest comfortably, deep breathe, cough, turn, get out of bed, and walk.
- Before you leave the hospital, you will be taking pain medications by mouth. You will need less pain medicine as you heal.
- The Acute Pain Services (APS) team helps to manage your pain while you are on the inpatient unit.
- To learn more about managing your pain after surgery you can read the APS booklet or visit the Ottawa Hospital's MySurgery website to find this information.

## Medications

- When you are in hospital, the health-care team may make changes to the medications that you were taking at home.
- You may receive additional medications to:
  - » Help thin your blood to prevent blood clots
  - » Reduce stomach acid
  - » Prevent constipation
  - » Prevent the spread of infection
  - » Help control unwanted symptoms, like nausea or vomiting
- Please speak to your health-care team if you have questions or concerns about your medications.

## Intravenous (IV)

- You will have a tube inserted into your vein to give you fluids until you are able to drink and eat well. This is called an 'intravenous' or 'IV.'
- Do not pull on the IV tubing.
- When you are walking, use your hand that does not have the IV to push the IV pole.
- The IV tube is often left in place until you go home so that you can be given IV medications as needed.

## Oxygen

- Sometimes patients need extra oxygen after surgery. Oxygen is given through a mask placed over the nose and mouth or through small tubes placed into the nose.

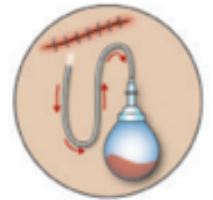
- The health care team measures the amount of oxygen in your blood by putting a small clip on your finger. This is called pulse oximetry and it does not hurt.
- This measurement will tell the health-care team if you need more or less oxygen.

## Blood sugar checks

- The nurse will check your blood sugar level by pricking your finger with a small needle to get a small amount of blood.
- If you have diabetes (a condition where you have high sugar levels in the blood), nurses will check your blood sugar regularly.
- If you do not have diabetes, nurses will check your blood sugar level until it is normal.

## Drain care

During your surgery, the surgeon may put a small drain inside your belly. The drain removes the excess blood and fluid that can sometimes collect around the area where you had your surgery.



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- The drain is attached to tube that comes out through the skin in your belly. The drain may be needed for a few days.
- Nurses will check on the drain often.
- Sometimes patients need to go home with a drain. In this situation, the health-care team will arrange home care for you. The health-care team will teach you how to take care of the drain before you leave the hospital.
- If the drain is not needed, a nurse will remove it before you go home.



## Incision and dressing

You will have a longer surgical cut (incision) or a few small cuts on your belly. These cuts will be covered with one or more dressings.

- The dressings should stay on for 3 days. After 3 days, if the incision is not leaking, the health-care team will take off the dressing. If you go home with this dressing, nurses will give you instructions on how to take care of it.
- The health-care team will check the dressings for drainage or bleeding.
- The surgeon used staples and/or stitches to close the incision.
  - » Staples should be removed 7 to 14 days after surgery depending on how quickly you heal. Staples can be taken out by your family doctor or at your follow up appointment with the surgeon. Call the HPB office at 613-739-6979 if you have any issues with staple removal.
  - » The stitches that the surgeon used are often self-dissolving and do not need to be removed.

## Urinary catheter

During surgery, you will have a urinary catheter put in to drain your urine. A urinary catheter is a small tube that is put into your bladder through your urethra (where you pee). The tube is connected to a collection bag.

- The catheter is cleaned using a wet face cloth and mild soap.
- The catheter is normally taken out by the nurse the morning after your surgery. Removing the catheter will help you move around more easily. It will also lower your chance of getting a bladder infection.
- The nurse will make sure that you are able to pee with no issues after the catheter has been taken out. Urinary retention can occur after your catheter is taken out. Let your nurse know if you have a weak stream of urine, your bladder feels full after peeing, or if you are leaking urine unintentionally.

## Eating and drinking

After your surgery, you will start by drinking clear fluids and then start to eat regular food.

- Until your appetite is back to normal, aim to eat 3 small meals plus 2 to 3 snacks every day.
- Drink plenty of fluids. Drink mostly water. Avoid sugary drinks like soda and soft drinks.
- Eat foods that are high in protein and give you energy, like meat, fish, eggs, dairy/non-dairy alternatives, tofu or nuts.
- Avoid deep-fried, greasy foods.

## Bowel movements

Your health-care team will ask you if you are “passing gas” and having bowel movements. This tells the health-care team that your bowels are working and that you are moving towards going home safely.

- Walking, drinking fluids and chewing gum can help to get your bowels moving.
- Tell your health-care team if you are having any nausea, vomiting, or bloating in your belly.

## Being active

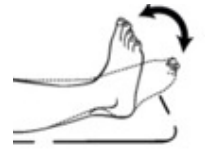
It is very important to start moving after your surgery.

- The nurse will help you to sit on the side of the bed and dangle your legs.
- You may get out of bed for a short time to walk around or sit in a chair.
- The day after your surgery:
  - » Health-care staff will help you get out of bed so that you can sit in a chair while you are eating.
  - » They will also help you walk in the hallway.
- While you are in the hospital, do the following exercises:



## Foot and Ankle Exercises

Foot and ankle exercises help to get your blood moving and will lower your chance of getting a blood clot.



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1. Point your toes down (like you are pressing downwards on a gas pedal).
2. Then, point your toes up towards your chin.
3. You can make circle motions with your feet instead.
4. Repeat these movements 10 times every hour while you are awake until your activity level increases.



## Deep Breathing and Coughing Exercises

Deep breathing and coughing exercises will help to keep your lungs healthy. These exercises work best when you are sitting upright in a chair or on the side of the bed. Do these exercises, 5 times each hour while you are awake until your activity level increases.

### Deep breathing

1. Sit upright.
2. Support your incision by holding a blanket or pillow over your belly.
3. Take a deep breath in through your nose.
4. Hold your breath for 5 seconds.
5. Breathe out through your mouth slowly with pursed lips (make a 'kissy face').



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### Coughing

1. Sit upright.
2. Support your incision by holding a blanket or pillow over your belly.
3. Take a deep breath and cough.

# What to expect on the day you leave the hospital

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- ❑ Arrange for someone to pick you up by **10:00 a.m.**

Before going home, you should:

- ❑ Not feel like throwing up (nausea) or be throwing up (vomiting).
- ❑ Be able to eat and drink as usual.
- ❑ Be passing gas and/or having bowel movements.
- ❑ Be peeing well (be passing urine).
- ❑ Know how to empty and take care of your drain(s) at home if you have them.
- ❑ Have the list of medications that you need to keep taking after your leave the hospital.
- ❑ Know how to give yourself a blood thinner injection if it is needed. Your care partner can help to give you this injection if needed.
- ❑ Have help arranged for you at home. For example, food to eat and people to help you with your daily activities.
- ❑ Have all of your questions or concerns about healing at home answered by your health-care team.
- ❑ Be able to get in and out of bed and walk like you did before surgery. You may not be able to walk as far as you did before surgery and that is fine.
- ❑ Be able to recognize the signs of not getting enough fluids (also known as dehydration). The signs are dry mouth, lips and eyes, feeling dizzy, dark or strong-smelling urine, peeing less than 4 times a day, feeling tired, and headaches.



**If you are ever worried about leaving the hospital, let the health-care team know.**

# After you leave the hospital

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## Being active

It is important that you get up and keep moving while you are at home. Your surgeon will tell you when you can return to work. This will depend on your recovery and the type of work that you do.

- ✓ Rest as often as you need. Let your body be your guide.
- ✓ Do light activities until you are seen by your doctor at your follow-up visit.
- ✓ Increase how far you walk every day.
- ✓ Return to your usual activities. Do this gradually.
- ✗ **Do not** drive a vehicle for at least 2 weeks after your surgery. You may start driving again 2 weeks after your surgery if you can shoulder check and you are not taking opioid medications for pain (for example, morphine or hydromorphone [Dilaudid]).
- ✗ **Do not** lift more than 15 pounds (i.e., one laundry bin or 2 small bags of groceries) for the first 4 to 6 weeks after surgery.
- ✗ **Do not** do any strenuous exercises including aerobics, weight training, skiing, snow shoveling, pushing a lawn mower, or abdominal exercises for 4 weeks after surgery.

## Having sex after surgery

Talk to your doctor about any specific concerns that you have about having sex after surgery. Usually, people can start having sex again when they are able to climb 2 flights of stairs comfortably. Often, people choose to wait a few weeks until they have less pain and more energy to have sex. Choose positions that do not put pressure on the muscles of your belly.

## Medications

You will receive a prescription for any new medications that the doctor has ordered before you go home. The nurse will review these medications with you to make sure that you know what they are for and when you need to take them.

- ✓ Fill your prescription and take your medications as ordered by the doctor.
- ✓ You will likely be taking new medications.
- ✓ Take your pain medication as needed, before going to bed, or before doing an activity.

## Taking care of your incision

It is normal to have some pain around your incision(s) for some time after leaving the hospital. It is important to take care of yourself, so that your incision(s) can heal.

- ✓ Clean your incision with mild soapy water.
- ✓ Gently pat the area dry.
- ✓ Take pain medication as needed.
- ✓ Tell the surgeon if you have any signs of infection. These include swelling, redness, warmth over the incision area, and/or any discharge (liquid oozing out) from the incision. **Do not ignore these signs.**
- ✗ **Do not** soak in a tub. This may slow down healing. Take showers only.
- ✗ **Do not** go in a hot tub or swimming pool until the skin has completely healed over your incision and where your drain was.
- ✗ **Do not** rub over the incision until it is completely healed.

## Eating & drinking

It is important that you eat enough food and drink enough fluids to get proper nutrition. This will help you to heal. Here are some important tips:

### Food preparation:

- ✓ If you are cooking for yourself after surgery look for meals that are quick and easy to prepare such as healthy pre-prepared frozen foods, soups, or stews that are low in sodium (salt).
- ✓ Have easy to grab snacks ready:
  - » For example: Granola or protein bars, canned tuna, cheese and crackers, Greek yogurt, peanut butter toast, commercial supplements or protein shakes, cereal with milk, nuts and fruits, or a boiled egg on toast.
- ✓ Ask the health-care team about the meal services available in your community like Meals on Wheels.

### Important tips:

- ✓ Drink at least 6 to 8 cups (1500 to 2000 mL) of fluid per day.
  - » Good fluid choices: water, milk/non dairy alternatives, V8, broth, herbal tea or decaffeinated coffee.
  - » Limit your intake of caffeinated drinks such as regular coffee, tea, or energy drinks.
- ✓ Eat protein with each meal and snack. Your body will need more protein than usual after surgery. Protein is important for healing and maintaining your strength.
  - » Foods high in protein: meat, chicken, fish, eggs, milk/non-dairy alternatives, cheese, tofu, yogurt and smooth nut butters like peanut or almond butter.
- ✓ Eat some healthy fats like vegetable oils, avocado, olives and nuts.

- ✓ Add water-soluble fiber to your diet gradually, to avoid constipation (trouble having bowel movements) from pain medication.
  - » Water-soluble fiber foods: oats, whole grains, nut butters, fruit and vegetables.
- ✓ If you feel constipated, you may take a mild laxative. Ask your community pharmacist for help to choose a mild laxative.
- ✗ **Limit** high fat, fried and greasy foods.
- ✗ **Avoid** drinking alcohol for at least 8 weeks after your surgery. If you drink 4 to 8 alcoholic drinks per day, do not stop drinking alcohol suddenly. Instead, talk to your health-care team about your alcohol intake and what you should do.

## When to get urgent medical help



**Get urgent medical help if you have any of the following:**

- Chills (feeling cold, shivering, or shaking)
- Fever (temperature greater than 38.5°C or 101°F)
- More pain than usual or any new pain
- A yellowing colour of the skin or white part of your eyes (this is called jaundice)
- Redness, swelling, or leakage around the incision
- The incision is opening up
- Trouble peeing, have blood in your urine, or your urine is dark colour
- New or unexplained symptoms like a rash, itchy dry, or discoloured skin
- Sudden shortness of breath or chest pain
- Feeling like throwing up (nausea) or throwing up (vomiting), trouble having a bowel movement, blood in your bowel movements, and/or abdominal (belly area) swelling.

# Your follow up appointment

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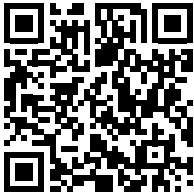

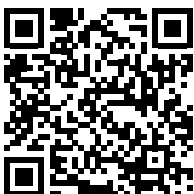
After you leave the hospital, you will see your surgeon in 2 to 4 weeks. You will be able to ask a nurse and your surgeon any questions that you have about your recovery.

If you have questions about or are concerned about your surgery or condition, phone the HPB office at 613-739-6979.

The HPB surgeon team includes:

- Dr. F. Balaa
- Dr. G. Martel
- Dr. K. Bertens
- Dr. J. Abou-Khalil
- Dr. R. Gilbert

## For more information

 Information about liver cancer and liver diseases	
<ul style="list-style-type: none"><li>• Canadian Cancer Society<ul style="list-style-type: none"><li>» <a href="https://cancer.ca/en/cancer-information/cancer-types/liver">https://cancer.ca/en/cancer-information/cancer-types/liver</a></li></ul></li></ul>	
<ul style="list-style-type: none"><li>• Canadian Liver Foundation<ul style="list-style-type: none"><li>» <a href="https://www.liver.ca/patients-caregivers/liver-diseases/">https://www.liver.ca/patients-caregivers/liver-diseases/</a></li></ul></li></ul>	
<ul style="list-style-type: none"><li>• Canadian Cancer Survivor Network<ul style="list-style-type: none"><li>» <a href="https://survivornet.ca/cancer-type/liver-cancer-primary/">https://survivornet.ca/cancer-type/liver-cancer-primary/</a></li></ul></li></ul>	

## **i** Information about cancer surgery

- Cancer Care Ontario
  - » <https://www.cancercareontario.ca/en/cancer-treatments/surgery>



## **i** Information about home care and other supports in your community

- Home and Community Care Support Services (Home Care)
  - » <http://healthcareathome.ca>
  - » 310-2222 (no area code required)



- The Ottawa Cancer Foundation
  - » <https://www.ottawacancer.ca/find-support/>







## Do you have any feedback about this education resource?

Is it welcoming and respectful of your background, culture, and identity? Your opinion is important to us. Please fill out this [survey](#) or contact the Patient Education team at [patienteducation@toh.ca](mailto:patienteducation@toh.ca)



## Do you need this information in a different format?

Please tell a member of your health-care team so that they can provide you with this information in a format that works for you. This resource is available in English and in French. Cette ressource est disponible en anglais et en français.



## Booklet information

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**Service:** HPB Surgery

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The information in this booklet is based on current Enhanced Recovery After Surgery (ERAS) guidelines from Best Practice in General Surgery (<http://bestpracticeinsurgery.ca/guidelines/all/enhanced-recovery-after-surgery/>) and Health Quality Ontario (HQP) ([www.hqontario.ca](http://www.hqontario.ca)).



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