CHRONIC LYMPHOCYTIC LEUKEMIA

A TREATMENT GUIDE FOR PATIENTS AND THEIR FAMILIES
What is IMBRUVICA® (ibrutinib)?
IMBRUVICA® (ibrutinib) is a prescription medicine used to treat adults with:
- Chronic lymphocytic leukemia (CLL)/Small lymphocytic lymphoma (SLL)
- Chronic lymphocytic leukemia (CLL)/Small lymphocytic lymphoma (SLL) with 17p deletion
It is not known if IMBRUVICA® is safe and effective in children.

IMPORTANT SIDE EFFECT INFORMATION
Before taking IMBRUVICA®, tell your healthcare provider about all of your medical conditions, including if you:
- have had recent surgery or plan to have surgery. Your healthcare provider may stop IMBRUVICA® for any planned medical, surgical, or dental procedure
- have bleeding problems
- have or had heart rhythm problems, smoke, or have a medical condition that increases your risk of heart disease, such as high blood pressure, high cholesterol, or diabetes
- have an infection
- have liver problems
- are pregnant or plan to become pregnant. IMBRUVICA® can harm your unborn baby. If you are able to become pregnant, your healthcare provider will do a pregnancy test before starting treatment with IMBRUVICA®
  - Females should not become pregnant during treatment and for 1 month after the last dose of IMBRUVICA®
  - Males should avoid getting female partners pregnant during treatment and for 1 month after the last dose of IMBRUVICA®
- are breastfeeding or plan to breastfeed. You and your healthcare provider should decide if you will take IMBRUVICA® or breastfeed

Tell your healthcare provider about all the medicines you take, including prescription and over-the-counter medicines, vitamins, and herbal supplements. Taking IMBRUVICA® with certain other medicines may affect how IMBRUVICA® works and can cause side effects.

How should I take IMBRUVICA®?
- Take IMBRUVICA® exactly as your healthcare provider tells you to take it
- Take IMBRUVICA® 1 time a day
- Swallow IMBRUVICA® capsules whole with a glass of water. Do not open, break, or chew IMBRUVICA® capsules
- Take IMBRUVICA® at about the same time each day
- If you miss a dose of IMBRUVICA® take it as soon as you remember on the same day. Take your next dose of IMBRUVICA® at your regular time on the next day. Do not take 2 doses of IMBRUVICA® on the same day to make up for a missed dose
- If you take too much IMBRUVICA®, call your healthcare provider or go to the nearest hospital emergency room right away

What should I avoid while taking IMBRUVICA®?
- You should not drink grapefruit juice, eat grapefruit, or eat Seville oranges (often used in marmalades) during treatment with IMBRUVICA®. These products may increase the amount of IMBRUVICA® in your blood

What are the possible side effects of IMBRUVICA®?
IMBRUVICA® may cause serious side effects, including:
- Bleeding problems are common during treatment with IMBRUVICA® and can also be serious and may lead to death. Your risk of bleeding may increase if you are also taking a blood thinner medicine. Tell your healthcare provider if you have any signs of bleeding, including: blood in your stools or black stools (looks like tar), pink or brown urine, unexpected bleeding or bleeding that is severe or that you cannot control, vomit blood or vomit looks like coffee grounds, cough up blood or blood clots, increased bruising, dizziness, weakness, confusion, change in your speech, or a headache that lasts a long time
I have CLL and I can focus on me.

IMBRUVICA® is a medication for people with chronic lymphocytic leukemia (CLL) or del 17p. It works differently than chemotherapy by blocking a specific protein that affects the signaling in B-cells. IMBRUVICA® may slow the spread of CLL or SLL.1,2 If you have CLL or SLL, ask your doctor if IMBRUVICA® is right for you.

SLL = small lymphocytic lymphoma

**Medication Information**

**IMBRUVICA® (ibrutinib)**

**Prescription Medicine**

IMBRUVICA® is a prescription medicine used to treat:

- chronic lymphocytic leukemia (CLL) or small lymphocytic lymphoma (SLL)
- Waldenstrom’s macroglobulinemia (WM)
- Richter’s transformation of CLL or SLL

**Important Information**

Before taking IMBRUVICA®, tell your healthcare provider about all of your medical conditions, including if you:

- have heart rhythm problems
- smoke
- have a medical condition that can affect your immune system
- are pregnant or plan to become pregnant. IMBRUVICA® can harm your unborn baby.
- are breastfeeding or plan to breastfeed. You and your healthcare provider will do a pregnancy test before starting treatment. IMBRUVICA® should not be given to a breastfeeding woman.
- have or had liver problems
- have an infection
- have diabetes or a history of blood clots or stroke

**IMBRUVICA® may cause serious side effects, including:**

- Infections
- Diarrhea
- High blood pressure (hypertension)
- Tumor lysis syndrome

**Side Effects**

The most common side effects of IMBRUVICA® in adults with CLL, SLL, and MCL include:

- Diarrhea
- Muscle and bone pain
- Rash
- Nausea
- Bruising
- Tiredness
- Fever
- Muscle spasms
- Mouth sores (stomatitis)

*Diarrhea is a common side effect in people who take IMBRUVICA®. Drink plenty of fluids during treatment with IMBRUVICA® to help reduce your risk of losing too much fluid (dehydration) due to diarrhea. Tell your healthcare provider if you have diarrhea that does not go away.*

These are not all the possible side effects of IMBRUVICA®. Call your doctor for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088.

**General Information**

For more information, talk to your doctor or visit www.imbruvica.com

**References:**

**Patient Information**

**IMBRUVICA (im-BRU-vih-kuh)**

(ibrutinib)

capsules

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**What is IMBRUVICA?**

IMBRUVICA is a prescription medicine used to treat adults with:

- Mantle cell lymphoma (MCL) who have received at least one prior treatment
- Chronic lymphocytic leukemia (CLL)/Small lymphocytic lymphoma (SLL)
- Chronic lymphocytic leukemia (CLL)/Small lymphocytic lymphoma (SLL) with 17p deletion
- Waldenström’s macroglobulinemia (WM)
- Marginal zone lymphoma (MZL) who require a medicine by mouth or injection (systemic therapy) and have received a certain type of prior treatment
- Chronic graft versus host disease (cGVHD) after failure of one or more lines of systemic therapy

It is not known if IMBRUVICA is safe and effective in children.

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**Before taking IMBRUVICA, tell your healthcare provider about all of your medical conditions, including if you:**

- have had recent surgery or plan to have surgery. Your healthcare provider may stop IMBRUVICA for any planned medical, surgical, or dental procedure
- have bleeding problems
- have or had heart rhythm problems, smoke, or have a medical condition that increases your risk of heart disease, such as high blood pressure, high cholesterol, or diabetes
- have an infection
- have liver problems
- are pregnant or plan to become pregnant. IMBRUVICA can harm your unborn baby. If you are able to become pregnant, your healthcare provider will do a pregnancy test before starting treatment with IMBRUVICA.
  - **Females** should not become pregnant during treatment and for 1 month after the last dose of IMBRUVICA.
  - **Males** should avoid getting female partners pregnant during treatment and for 1 month after the last dose of IMBRUVICA.
- are breastfeeding or plan to breastfeed. You and your healthcare provider should decide if you will take IMBRUVICA or breastfeed.

T**ell your healthcare provider about all the medicines you take,** including prescription and over-the-counter medicines, vitamins, and herbal supplements. Taking IMBRUVICA with certain other medicines may affect how IMBRUVICA works and can cause side effects.

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**How should I take IMBRUVICA?**

- Take IMBRUVICA exactly as your healthcare provider tells you to take it.
- Take IMBRUVICA 1 time a day.
- Swallow IMBRUVICA capsules whole with a glass of water. Do not open, break, or chew IMBRUVICA capsules.
- Take IMBRUVICA at about the same time each day.
- If you miss a dose of IMBRUVICA take it as soon as you remember on the same day. Take your next dose of IMBRUVICA at your regular time on the next day. Do not take 2 doses of IMBRUVICA on the same day to make up for a missed dose.
- If you take too much IMBRUVICA call your healthcare provider or go to the nearest hospital emergency room right away.

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**What should I avoid while taking IMBRUVICA?**

- You should not drink grapefruit juice, eat grapefruit, or eat Seville oranges (often used in marmalades) during treatment with IMBRUVICA. These products may increase the amount of IMBRUVICA in your blood.

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**What are the possible side effects of IMBRUVICA?**

IMBRUVICA may cause serious side effects, including:

- **Bleeding problems (hemorrhage) are common** during treatment with IMBRUVICA, and can also be serious and may lead to death. Your risk of bleeding may increase if you are also taking a blood thinner medicine. Tell your healthcare provider if you have any signs of bleeding, including:
  - blood in your stools or black stools (looks like tar)
  - pink or brown urine
  - unexpected bleeding, or bleeding that is severe or that you cannot control
  - vomit blood or vomit looks like coffee grounds
  - cough up blood or blood clots
  - increased bruising
  - dizziness
  - weakness
  - confusion
  - change in your speech
  - headache that lasts a long time
**Infections** can happen during treatment with IMBRUVICA. These infections can be serious and may lead to death. Tell your healthcare provider right away if you have fever, chills, weakness, confusion, or other signs or symptoms of an infection during treatment with IMBRUVICA.

**Decrease in blood cell counts.** Decreased blood counts (white blood cells, platelets, and red blood cells) are common with IMBRUVICA, but can also be severe. Your healthcare provider should do monthly blood tests to check your blood counts.

**Heart rhythm problems (atrial fibrillation and atrial flutter).** Heart rhythm problems have happened in people treated with IMBRUVICA, especially in people who have an increased risk for heart disease, have an infection, or who have had heart rhythm problems in the past. Tell your healthcare provider if you get any symptoms of heart rhythm problems, such as feeling as if your heart is beating fast and irregular, lightheadedness, dizziness, shortness of breath, chest discomfort, or you faint.

**High blood pressure (hypertension).** New or worsening high blood pressure has happened in people treated with IMBRUVICA. Your healthcare provider may start you on blood pressure medicine or change current medicines to treat your blood pressure.

**Second primary cancers.** New cancers have happened during treatment with IMBRUVICA, including cancers of the skin or other organs.

**Tumor lysis syndrome (TLS).** TLS is caused by the fast breakdown of cancer cells. TLS can cause kidney failure and the need for dialysis treatment, abnormal heart rhythm, seizure, and sometimes death. Your healthcare provider may do blood tests to check you for TLS.

**The most common side effects of IMBRUVICA in adults with MCL, CLL/SLL, WM, and MZL include:**

<table>
<thead>
<tr>
<th>Side Effect</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>diarrhea</td>
<td>common</td>
</tr>
<tr>
<td>muscle and bone pain</td>
<td>common</td>
</tr>
<tr>
<td>rash</td>
<td>common</td>
</tr>
<tr>
<td>nausea</td>
<td>common</td>
</tr>
<tr>
<td>bruising</td>
<td>common</td>
</tr>
<tr>
<td>tiredness</td>
<td>common</td>
</tr>
<tr>
<td>fever</td>
<td>common</td>
</tr>
</tbody>
</table>

**The most common side effects of IMBRUVICA in adults with cGVHD include:**

<table>
<thead>
<tr>
<th>Side Effect</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>tiredness</td>
<td>common</td>
</tr>
<tr>
<td>bruising</td>
<td>common</td>
</tr>
<tr>
<td>diarrhea</td>
<td>common</td>
</tr>
<tr>
<td>muscle spasms</td>
<td>common</td>
</tr>
<tr>
<td>mouth sores (stomatitis)</td>
<td>common</td>
</tr>
<tr>
<td>pneumonia</td>
<td>common</td>
</tr>
</tbody>
</table>

Diarrhea is a common side effect in people who take IMBRUVICA. Drink plenty of fluids during treatment with IMBRUVICA to help reduce your risk of losing too much fluid (dehydration) due to diarrhea. Tell your healthcare provider if you have diarrhea that does not go away.

These are not all the possible side effects of IMBRUVICA. Call your doctor for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088.

**How should I store IMBRUVICA?**
- Store IMBRUVICA at room temperature between 68°F to 77°F (20°C to 25°C).
- Keep IMBRUVICA in the original container with the lid tightly closed.

**Keep IMBRUVICA and all medicines out of the reach of children.**

**General information about the safe and effective use of IMBRUVICA**

Medicines are sometimes prescribed for purposes other than those listed in this Patient Information leaflet. Do not use IMBRUVICA for a condition for which it was not prescribed. Do not give IMBRUVICA to other people, even if they have the same symptoms that you have. It may harm them. You can ask your pharmacist or healthcare provider for information about IMBRUVICA that is written for health professionals.

**What are the ingredients in IMBRUVICA?**

**Active ingredient:** ibrutinib

**Inactive ingredients:** crosccarmellose sodium, magnesium stearate, microcrystalline cellulose, sodium lauryl sulfate. The capsule shell contains gelatin, titanium dioxide, and black ink.

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CHRONIC LYMPHOCYTIC LEUKEMIA

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When people think of cancer, they often think of a mass or tumor. Blood cancers are different. They begin from cells in the circulatory system and, except for lymphomas, usually do not grow into tumors. Blood cancers, such as chronic lymphocytic leukemia (CLL), may also be called hematologic cancers or malignancies. They include leukemias, lymphomas and multiple myelomas.

Leukemia is a type of blood or hematologic cancer that begins in the blood and bone marrow. It occurs when the bone marrow overproduces excessive immature white blood cells. These immature white cells don’t fight infection like healthy white blood cells do, making an individual susceptible to infection.

CLL is a slow-growing form of leukemia that develops from lymphocytes. Lymphocytes are a type of white blood cell that makes up lymphoid tissue, which is found in the lymph nodes, thymus, spleen, tonsils and other parts of the body (see Figure 1). They are a part of the immune system and develop from lymphoblasts (immature cells found in bone marrow) into mature, infection-fighting cells.

CLL develops when immature lymphocytes mutate (change) and multiply uncontrollably. Mutated lymphocytes grow at a faster rate than normal lymphocytes, and they do not die when they should. This leads to an accumulation of abnormal lymphocytes in the blood, which interferes with the normal production of healthy cells. The abnormal lymphocytes do not fight infections like healthy cells and they tend to live longer, which is partly why they build up in the blood or bone marrow. Blood cancers usually do not form solid tumors.

The two main types of lymphocytes that can develop into leukemias are B-lymphocytes (B-cells) and T-lymphocytes (T-cells). B-cells produce protein antibodies that attach to infectious organisms, such as bacteria and viruses, marking them for destruction. T-cells attack infectious organisms directly and play a part in controlling the immune system. CLL starts from B-cells and is, therefore, often called B-cell CLL.

Bone marrow is the soft, spongy center of some bones. Not all bones have bone marrow. The bone marrow is where blood is created and is made up of blood stem cells, more mature blood-forming cells, fat cells and supporting tissues. Blood stem cells can become three main types of cells:

- Red blood cells carry oxygen from the lungs to other parts of the body.
- White blood cells fight infection.
- Platelets help with clotting to stop bleeding.

Because white blood cells fight off infection, they are part of the immune and lymphatic systems. The immune system is a network of cells, organs and tissues that work together to defend your body against germs and infection (see Figure 2).

The immune system network includes the following:

- **Plasma cells** are developed from mature B-cells that respond to infection. Plasma cells make antibodies to help fight germs and infection. Any individual plasma cell makes only one kind of antibody that targets the specific germ for which that plasma cell can attack.

- **Antibodies** are proteins created from plasma cells as a reaction to foreign substances, such as bacteria, in the body.

- **Granulocytes** are white blood cells containing small granules that help the body fight viruses and bacterial infections.

- **Lymphocytes** are cells that make up lymphoid tissue, which is found in the lymph nodes, thymus, spleen, tonsils and other parts of the body. Lymphocytes are a major part of the immune system and develop from lymphoblasts (immature cells found in bone marrow) into mature, infection-fighting cells.

- **Monocytes** circulate in the bloodstream and then change and destroy some germs by digesting them.

Although a leukemia diagnosis is overwhelming, all the members of your health care team are working for and supporting you. You are never alone at any point during treatment. Talk with them about all your questions and concerns. The more you know, the more prepared you will be to make decisions about your treatment.
Chronic lymphocytic leukemia (CLL) cells grow slowly and often cause little or no symptoms at the time of diagnosis. The disease is commonly suspected because of the results of blood tests ordered for another problem or because of findings on a routine physical examination. For example, blood tests may reveal a high number of lymphocytes, a specific type of white blood cell in the blood, which may be a sign of CLL.

DIAGNOSING CLL

A physical exam is usually the first step when diagnosing CLL. During the exam, the doctor will feel parts of your body to check for any signs of pain and any irregularity in the size of your organs. In addition to a physical exam, your doctor may run some or all of the following tests. A pathologist will analyze the results and provide your doctor with a pathology report of the findings.

- **Blood tests** can be used to diagnose and help indicate the prognosis (outlook) of CLL. A complete blood count (CBC) measures the levels of white blood cells, red blood cells (including hematocrit and hemoglobin levels) and platelets (clotting cells) in the blood. CBC with differential measures the numbers of the different types of white blood cells, including the number of the lymphocytes. A high level of lymphocytes in the blood may be an indication of CLL. Another test, a peripheral blood smear, involves studying the blood under a microscope to check for abnormalities in the size and shape of blood cells, and the number and types of white blood cells and platelets.

- **Flow cytometry**, also called immunophenotyping, is a specialized test that counts blood cells and identifies specific types of cancer cells in the blood, bone marrow or lymph nodes. It analyzes cell characteristics that help to classify the subtype of leukemia and is considered the main test used to confirm a CLL diagnosis.

- **Genetic tests** may be used to look for certain genes, proteins and changes in chromosomes that may indicate leukemia. Your doctor will use the results of these tests to choose the best treatment for you and to help determine how the disease may progress.

The following tests are not typically used to diagnose CLL but may be done before treatment begins or to determine the extent and spread of disease in certain situations.

- **Imaging tests**, such as computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET) and X-rays, can help identify where CLL is present in the body. They can also be used to determine if certain symptoms may be related to CLL and to monitor your body’s response to treatment.

- **Lumbar puncture**, also called a spinal tap, is a procedure in which the cerebral spinal fluid (CSF) is checked for leukemia cells. CSF is the fluid that surrounds the brain and spinal cord.

- **Bone marrow aspiration and biopsy** are often done at the same time (see Figure 1). During these procedures, bone marrow tissue samples are removed for examination. A bone marrow biopsy involves removing a sample of marrow from within the bone. For bone marrow aspiration, liquid bone marrow is removed.

STAGING CLL

Once you’ve been diagnosed with CLL, the next step is for doctors to determine the stage of the disease. Staging is how physicians determine the extent of cancer. Hematologic (blood) cancers generally affect all of the bone marrow in the body and, in some cases, organs such as the liver, spleen and lymph nodes. Because of this, hematologic cancers are typically classified or staged according to factors, such as the type and subtype of the leukemia, abnormalities noticed on physical examination, the microscopic appearance of the leukemia cells, lab and imaging test results, chromosome abnormalities or the results of molecular testing.

Knowing the stage and type of CLL helps your doctor determine the type of treatment that will work best. Not everyone with CLL needs to begin treatment soon after diagnosis. Low-stage and low-risk CLL may not require immediate treatment if there are no signs or symptoms of the disease (see Treatment Options, page 8).

The staging system most commonly used in the United States for CLL is the Modified Rai staging system (see Table 1). This stag-
The staging system divides CLL into one of five stages according to the number of lymphocytes and other cells in the blood and the presence of certain abnormalities noticed on physical examination. The higher the stage, the more advanced the disease.

The “risk” characteristic assigned in staging is associated with the predicted rate of growth for the disease. If tests show evidence of a fast-growing disease, it is given a higher stage and is, therefore, considered high-risk CLL. After staging, regardless of the identified risk, certain genetic tests may be performed to determine prognosis.

**GETTING A SECOND OPINION**

After receiving your diagnosis, consider getting a second opinion. It doesn’t mean you doubt your doctor. Instead, it shows you are committed to finding the best care possible. Here are three reasons to consider seeking a second opinion:

1. A second opinion from a doctor skilled in treating CLL either will confirm your initial diagnosis and treatment plan or introduce new information. Every specialist offers different experience and may favor a different approach. Another specialist may consider different tests, clinical trials or how a treatment may affect your quality of life.

2. Second opinions are common and often recommended. Most doctors support their patients seeking another professional opinion, and many will offer a referral to another specialist.

3. Some health care plans require a second opinion and may pay for a second opinion if you request it.

Always have a copy of your medical records, pathology report and test results when seeing a new doctor to prevent having to repeat medical tests. Don’t be surprised if the doctor requires your pathology slides from the biopsy procedure so that a re-review by a pathologist can confirm the accuracy of your initial diagnosis.

### EXPLORING GENETIC TESTING

Tests to identify many of the mutations that cause cancer are referred to as genetic tests. Genetic testing is getting a lot of attention across many cancer types because the findings can help drive treatment choices and help doctors better understand how to manage the progression of disease. Testing is usually requested by a doctor and may be performed on a small sample of fluid or tissue — usually blood.

For CLL, genetic tests determine whether there are chromosomal or other genetic changes in lymphocytes. Healthy cells in the body contain 23 pairs of chromosomes, but CLL cells often have abnormal chromosome changes, such as deletions or missing parts. In CLL, it is common for parts of chromosomes 11, 13 or 17 to be missing. Knowing this alerts the doctor about how slowly or quickly the disease is progressing. For example, a deletion in chromosome 13 means that the CLL cells grow slowly.

Cytogenetic testing uses the study of the characteristics of chromosomes (genetic strands) under a microscope to find changes or alterations in the leukemia cells. Your doctor will use the information from one or a combination of the following tests to help determine the treatment plan that is most likely to be effective against the CLL cells.

- **Fluorescence in situ hybridization (FISH)** is a technique that combines cytogenetic testing and fluorescent dyes which attach to certain chromosomes that commonly contain deletions. In addition to looking for abnormal genes, FISH may be used as a diagnostic test to diagnose CLL.

- **Karyotype** is a test that identifies chromosomes that are abnormal in size, shape or number.

- **DNA sequencing** looks at the order of the chemicals that make up a molecule of DNA. The test is used to identify mutations, or changes, that occur in genes. Certain changes can indicate prognosis.

- **Polymerase chain reaction (PCR)** or IGHV can be used to look for specific genetic changes.

After being examined at a laboratory, the test results are sent back to the doctor or directly to you. A combination of these different factors is used to calculate the CLL International Prognostic Index (CLL-IPI) score which provides a very accurate estimate of disease risk. Researchers are continuously working to find other changes that occur in CLL chromosomes. This will help them to predict the effectiveness of certain treatments and may provide information on how CLL develops. Identifying changes in the chromosomes may also help doctors predict how quickly or slowly the CLL will progress.
After chronic lymphocytic leukemia (CLL) is diagnosed and staged, your health care team will work with you to choose the best treatment. Because CLL often grows slowly, people who have normal levels of red blood cells and platelets may be monitored without treatment. This is called watchful waiting. Once treatment is needed, the main options are chemotherapy, immunotherapy, targeted therapy and stem cell transplantation.

Clinical trials may offer access to leading-edge treatments that aren’t yet widely available. Talk to your doctor about the possibility of participating in a clinical trial (see Clinical Trials, page 10).

**WATCHFUL WAITING**

Watchful waiting is an approach your doctor may take to closely monitor your CLL. This approach is fairly common because CLL typically develops slowly. Watchful waiting allows you to safely avoid treatment and its side effects until it is absolutely necessary. If the disease progresses, your doctor may opt for treatment with one, or a combination, of the following therapies.

**CHEMOTHERAPY**

Chemotherapy drugs are used to stop the growth of cancer, either by killing cancer cells or by preventing them from growing and dividing. This form of treatment is known as systemic therapy, meaning the drugs travel through the bloodstream and affect cells throughout the entire body. Chemotherapy drugs attack cancer cells that grow and multiply quickly, occasionally causing damage to healthy cells that also grow and multiply rapidly, resulting in side effects. Chemotherapy is usually given in cycles that consist of a treatment period followed by a break to allow healthy cells to recover.

Corticosteroids are sometimes included in chemotherapy combination regimens. A corticosteroid is not a type of chemotherapy drug. It is an anti-inflammatory drug that also appears to help cause the death of cancerous white blood cells.

Combination chemotherapy regimens often are used to treat many types of cancer, including CLL. The regimens used to treat CLL include one or more chemotherapy drugs in combination with a monoclonal antibody or corticosteroid (see Common CLL Medications).

**TARGETED THERAPY**

Also considered a systemic treatment because the drugs travel throughout the body in the bloodstream, targeted therapy drugs identify specific parts in or on leukemia cells, such as genes and proteins, and block their efforts to allow cancer cells to grow. Your doctor may suggest molecular testing to determine which targets to block. The most commonly used targeted therapies include monoclonal antibodies targeting CD-20. Other targeted strategies focus on blocking proteins (BTK and PI3K) and genetic mutations (bcl-2). This type of therapy allows your medical team to control the disease while limiting damage to healthy cells, which could result in fewer side effects.

**STEM CELL TRANSPLANTATION**

Stem cell transplantation (also known as bone marrow transplantation) is an infusion of healthy stem cells into the body, typically after high-dose chemotherapy is given. An allogeneic stem cell transplant is the most common type of stem cell transplantation used to treat CLL. In this procedure, the stem cells come from a volunteer donor whose tissue type closely matches that of the patient. The stem cells can be collected from umbilical cord blood, a family member or another donor. If available, a sibling or brother offers the best chance of a close match. If a sibling or another family member is not a good match, an unrelated volunteer donor may be found through a national registry.

People receiving allogeneic transplantation may experience graft-versus-host disease (GvHD) as a side effect of treatment. GvHD can occur when white blood cells from the donor (the graft) recognize cells in the body (the host) as foreign and attack them. This problem can cause damage to the skin, liver, intestines and other organs. GvHD can be treated with steroids or other drugs that suppress your immune system.

With autologous stem cell transplantation, a person’s own stem cells are removed and preserved so that very high doses of chemotherapy and/or radiation therapy can be given to attack cancer cells. After the conclusion of the intensive chemotherapy or radiation
therapy, the person’s stem cells are infused back into the body.

**IMMUNOTHERAPY**

Immunotherapy uses the body’s own immune system to slow the growth of and kill cancer cells. To do so, the immune system uses substances made either by the body or in a laboratory to find and destroy cancer cells, much like it fights off foreign bacteria. Although no immunotherapy treatments are currently approved for CLL, a great deal of research is underway in clinical trials (see Clinical Trials, page 10).

**ADDITIONAL RESOURCES**

- American Cancer Society: www.cancer.org
- American Society of Clinical Oncology: www.cancer.net
- CLL Treatment Options
- Leukemia & Lymphoma Society: www.lls.org

**COMMON CLL MEDICATIONS**

**CHEMOTHERAPY**

- bendamustine (Bendeka, Treanda)
- chlorambucil (Leukeran)
- cladribine (Leustatin)
- cyclophosphamide
- doxorubicin hydrochloride
- fludarabine phosphate (Fludara)
- mechlorethamine (Mustargen)
- methotrexate (Trexall)
- vincristine

**POSSIBLE COMBINATION THERAPIES**

- BR: bendamustine (Bendeka, Treanda) and rituximab (Rituxan)
- CHOP: cyclophosphamide, doxorubicin hydrochloride, vincristine and prednisone
- CVP: cyclophosphamide, vincristine and prednisone, sometimes with rituximab (Rituxan)
- FC: fludarabine phosphate (Fludara) and cyclophosphamide
- FCR: fludarabine phosphate (Fludara), cyclophosphamide and rituximab (Rituxan)
- FR: fludarabine phosphate (Fludara) and rituximab (Rituxan)
- ibritinib (Imbruvica) with bendamustine (Bendeka, Treanda) and rituximab (Rituxan)
- idelalisib (Zydelig) and rituximab (Rituxan) for patients with recurrent CLL
- obinutuzumab (Gazyva) and chlorambucil (Leukeran) for older patients
- PCR: pentostatin, cyclophosphamide and rituximab (Rituxan)

**CORTICOSTEROIDS**

- dexamethasone
- methylprednisolone (Depo-Medrol, Medrol, Solu-Medrol)
- prednisone

**GROWTH FACTORS**

- filgrastim (Neulasta, Neupogen)

**TARGETED THERAPY**

- alemtuzumab (Campath)
- ibritinib (Imbruvica)
- idelalisib (Zydelig)
- obinutuzumab (Gazyva)
- ofatumumab (Arzerra)
- rituximab (Rituxan)
- rituximab (Rituxan) and hyaluronidase human (Rituxan Hycela)
- venetoclax (Venclexta)

**MEDICATION ADHERENCE**

> **Medication adherence is taking the right dose** of the right drug at the right time. Most drug regimens for cancer treatment and pain management are designed to maintain a specific level of drugs in your system for a set period of time, based on your cancer type, stage, previous treatments and several other factors. Following drug therapy exactly as your doctor prescribes is important because you’re enabling the medication to be fully effective and work as it is intended.

There are several types of cancer medications available now to choose from, including some which require you to be in a medical facility and others that you can take at home. Following your doctor’s instructions is extremely important for all treatments. Doing so can sometimes be easier when you are required to show up for an appointment to get an injection or receive an IV medication. At-home options including oral medicines and pumps, rely on you, the patient, to remember when to take them.

Being able to stick to the schedule may depend on your understanding of the treatment regimen, your financial situation and your ability to manage the potential side effects. Always learn as much as you can about your specific medication, and ask your doctor, nurse or pharmacist for assistance whenever necessary.

Because CLL is a chronic disease, you may find that you’d like to manage it with a medication taken directly from your doctor’s office if possible. Though this allows you to attend fewer medical appointments, it does make you even more responsible for ensuring that you are complying carefully with your treatment instructions.

The most serious consequence of medical non-adherence is running the risk that your treatment will be ineffective. Studies show that not following a treatment regimen, as prescribed, can lead to cancer progression or recurrence. Because of how the drugs work, even small alterations to a treatment plan can have an unwanted impact.

This may seem like a simple concept, but it takes effort and coordination. Whether you receive your medications at your doctor’s office, treatment center or hospital, or you take them at home, here are some things you can do to help stay on schedule.

> **Make a list** of your medications, along with the names and contact information for the doctors who prescribed them. Let a caregiver, family member or friend know where you keep the list.

> **Learn** about your medications, and ask questions about anything you don’t understand before starting them.

> **Set reminders** for when to leave for appointments or when to take medications. You have many options for reminder tools, such as setting a timer on your telephone, using an alarm clock or wearing a watch that vibrates to alert you. If you have a smartphone, explore the many medication reminder apps that are available. Many are free.

> **Track when you take medication.** Using tools, such as the downloadable “My Medical Journal” (see page 4), will help you stay on schedule with your medications.

> **Keep your appointments** for testing and monitoring. These visits allow your doctor to track your progress and analyze the cancer’s response to the medication you’re taking. Use your appointments as an opportunity to ask your health care team about your medications and any side effects you’re experiencing.

> **Involve your caregiver** or another person who can remind you of your schedule. Adherence is easier when someone can help you.
Scientists and doctors are working to learn more about how chronic lymphocytic leukemia (CLL) begins, how it can be prevented and the best ways to treat it. New drugs to treat CLL and to ease the side effects and symptoms of the disease and its treatment are being studied in clinical trials. Kinase inhibitors and immunotherapy drugs are continuing to be evaluated for effectiveness against cancer cells, and allogeneic stem cell transplantation and chimeric antigen receptor T-cells (CAR T-cells) are being studied to reduce complications associated with treatment. Many clinical trials aim to improve the complete remission rates, and more research is being conducted for refractory CLL. If you decide that a clinical trial is right for you, ask your doctor about the risks and benefits of investigational treatment.

Research conducted in these trials may provide information about the disease and offer new options for people with CLL.

UNDERSTANDING CLINICAL TRIALS

Clinical trials are research studies that do the following:

- Evaluate the safety and effectiveness of a medical strategy, treatment or device.
- Develop “standards of care” by helping identify which treatments work best for certain illnesses or groups of people.
- Offer opportunities to access cutting-edge treatments that are not yet widely available.

There are three types of clinical trials: treatment trials, quality-of-life trials, and prevention, screening and diagnostic trials.

Treatment Trials evaluate whether a new type of treatment (drug, surgery, radiation therapy) or a combination of treatments is better than the treatment options that are currently available.

Quality-of-Life Trials study ways to improve the quality of life for people being treated for cancer who experience cancer-related and treatment-related symptoms. This type of trial may evaluate the effects of such things as nutrition, group therapy or counseling.

Prevention, Screening and Diagnostic Trials assess ways to reduce the chance of getting cancer in general. In these trials, which may be treatment or nontreatment trials, many participants do not have cancer, but some have had cancer and are at risk of the cancer returning (recurring) or a second cancer type developing. Sometimes these trials consist of simply completing questionnaires and providing medical information.

WHAT TO EXPECT

Clinical trials are carefully thought out, planned and performed in an extremely consistent manner so that all patients are treated exactly the same, from medication dosage and schedule to the frequency of follow-up appointments. Institutional review boards or ethics committees carefully set up safeguards to make sure that all patients in the clinical trial remain safe throughout the process. Whether you’re at a small rural hospital or a large facility in a metropolitan area, your medical team is responsible for diligently following all of the same protocols and safety measures for your treatment plan across the board. You will be carefully monitored throughout the clinical trial. Even after the treatment ends, you will continue to be in close contact with the medical team.

When you volunteer to participate in a clinical trial, you will receive specific instructions and an Informed Consent form. The Informed Consent information should be explained in easy-to-understand language and will describe the study’s purpose, the length of time of the study, predictable risks, possible benefits, expectations, protocols, alternative beneficial procedures or treatments, your rights, where more information can be found and answers to additional questions about the research. The document will also include information about how you will be monitored and what side effects to expect, the best standard regimen of care for that stage of disease, regardless of the doctor or institution, and the safeguards in place. You should have a reasonable amount of time to review the trial’s information and ask questions before volunteering. Use this time to check with your insurance providers to determine what procedures are covered and what you are expected or required to pay out of pocket. You are encouraged to ask questions about anything you don’t fully understand before signing and returning the form. This is the ideal time to talk with your medical team about the many falsehoods that persist about clinical trials. For example, although there is fear to the contrary, participants are guaranteed to receive, at minimum, the current standard of care during the trial.

Participation in clinical trials is always voluntary, even after the study begins. Even though you sign an agreement saying that you understand the potential risks involved, you can decide to leave the trial at any time. If your expectations aren’t met or if you experience too many side effects, you can withdraw and return to standard of care treatment.

FINANCIAL CONSIDERATIONS

Cost is a common concern when considering participating in clinical trials. Routine patient care costs typically include those related to doctor visits, hospital stays and some testing procedures that are part of standard care and may be covered by your insurance. Research costs, which are directly related to the clinical trial and include drugs and procedures, are typically covered by the trial sponsor. Sponsors of clinical trials include government agencies (such as the National Cancer Institute), independent groups of doctors and health care institutions, or the pharmaceutical or biotechnology industries. Before dismissing the idea of participating because of the cost, research available resources and explore your insurance plan benefits. You may find that you can have access to an innovative treatment and be an integral part of cancer research without incurring a great deal of additional expense.

ADDITIONAL RESOURCES

- Center for Information and Study on Clinical Research Participation: www.searchclinicaltrials.org
- CenterWatch: www.centerwatch.com
- Leukemia - Chronic Lymphocytic
- ClinicalTrials.gov: www.clinicaltrials.gov
- My Clinical Trial Locator: myclinicaltriallocator.com
- TrialCheck: www.trialcheck.org

Rise in Clinical Trials

The number of clinical trials being conducted is skyrocketing.*

*Clinical Trials.gov, as of October 2, 2017

All clinical trials, not exclusive to cancer

PatientResource.com
Physician’s Desk

John Byrd, MD, is a board-certified hematologist whose areas of focus are chronic lymphocytic leukemia (CLL) and acute myeloid leukemia (AML). As the D. Warren Brown Chair of Leukemia Research, he serves as a Distinguished University Professor of Medicine, Medicinal Chemistry and Pharmacy for The Ohio State University. He is also a member of the National Cancer Institute’s Leukemia Steering Committee, Chair of the Leukemia and Correlative Science Committee within the Alliance for Clinical Trials in Oncology and a member of the American Society of Clinical Investigation. Dr. Byrd and his team have extensive experience treating patients with novel therapeutics. As part of clinical trials, and he has been intimately involved in the development of drugs that are changing the course of CLL treatment.

CLL treatments have been in the spotlight recently. Can you explain why these treatments are considered groundbreaking?

CLL is the most prevalent type of leukemia in older adults, and it often goes unrecognized for a long period because it is asymptomatic, which means the patients don’t show any symptoms. Once it is diagnosed, it can either be indolent (slow growing) or aggressive.

The treatments you refer to center around the vast improvements in targeted medicine. The immunotherapy drugs that have been developed recently have really impacted people’s lives. In treating CLL with immunotherapy, we’ve seen greatly improved response and prolonged survival.

What do you tell your patients when they are diagnosed with CLL?

I talk about the different tests we will run to find out how their type of CLL will behave. I try my best to reassure them about the treatments and how they may be affected.

I make them aware of the risk of secondary cancers, and I encourage them to keep up with their regular health care needs, such as getting the flu vaccine – although avoiding live vaccines is very important – and staying on top of preventive cancer screenings, such as seeing their dermatologist for skin cancer checks and melanoma prevention.

Seeking second opinions is always good advice and, along with that, I encourage patients to find a center that has experience treating CLL. They can continue to see their local oncologist, but I recommend adding in visits with someone who specializes in the disease. So many advancements are happening all the time with every type of cancer. It’s impossible for an oncologist to be on the forefront of every cancer type, especially a less common one like CLL.

I also encourage patients to learn about CLL. Do research, read and ask questions. The more they understand, the better they will feel about what is ahead.

With the new treatments available, do you recommend clinical trials?

Absolutely. How we choose treatment depends on the individual’s characteristics, such as age and if certain genetic mutations are present, but clinical trials are how we got to this point. We still have questions to answer, so new trials that combine novel therapies, such as CAR T-cells, are underway. These are exciting trials, and the results are promising. We are seeing abbreviated therapies and longer remissions. The ultimate goal is complete remission and to be off therapy.

Some people still believe that clinical trials are a last resort. If they come to me with that impression, I tell them about how far we’ve come from the clinical trials of 20 years ago. The trials are much more risk-averse now. On top of that, patients who choose to be on them get the benefit of seeing their regular doctor along with a whole group of people who are working with the trial.

How important is support when you have CLL?

Having family support is always helpful. There are also organizations, such as the Leukemia & Lymphoma Society, the CLL Foundation and local centers, that offer additional support. For example, there are programs that put newly diagnosed patients in touch with other patients so they can hear firsthand how others are managing their disease. Patients can tap into these types of resources to access educational information, too, about things like autoimmune complications and possible side effects.

I always tell patients they have every right to be scared and nervous, but I try to alleviate some of that fear by telling them about all the incredible progress we’ve made treating CLL. With that in mind, I advise them not to do something they hadn’t already planned to do, such as retire or run off and spend their life savings in Atlantic City. Instead, I tell them they have something we expect them to be able to live with.

Do you expect this positive trend in CLL treatment options to continue?

I do, in large part because of clinical trials. One particularly successful therapy has a 90+ percent response rate, and it enables patients to treat CLL much as they would high blood pressure, with a daily oral pill.

We’ve been blessed in the CLL world to have a lot of support for research by the National Cancer Institute and philanthropic organizations. Along with their involvement, grants and the support of the CLL community, in general, we are able to take our research to the next level and continue to develop these life-altering therapies. It’s very satisfying to contribute to research that directly impacts patients’ lives.

I’m happy to be in the CLL research field. Academic medicine is competitive, and that’s a good thing. It keeps things prioritized.

Best of all, I see a direct correlation between these improvements and the number of patients I see each week in clinic and in treatment. We’re gaining new patients all the time, but, more important, we’re not losing them. It’s humbling to be a part of it.
Preventing and managing side effects is extremely important. When you feel better, you’re more likely to complete your treatment as planned, which offers a greater chance for a successful outcome.

Some treatments are more likely to cause side effects than others. Your doctor can help you anticipate the most common side effects, so that you are prepared if they occur. Tell your medical team as soon as any symptoms or side effects begin, even if you consider them trivial.

It may be helpful to keep a diary of your symptoms so that your doctor can better assist you in managing them. Write down when your symptom starts and what you were doing at the time. Include where the symptom occurs, how long it lasts and how severe it is. Also include if any activities make it better or worse.

**ABDOMINAL PAIN**
The abdomen is located between the chest and pelvis, and some treatments can cause pain in this area of the body. The pain can be the result of increased or decreased motility (movement) of the intestines, the destruction of beneficial (good) bacteria in the gut; ulcers; an intestinal perforation; or cramping of the bowel. Dull aches and cramping are common, but a sharp pain that does not go away in a few minutes may indicate a more serious problem. If that occurs, call your doctor immediately.

**ALOPECIA (HAIR LOSS)**
Some treatments may cause loss of hair on the head, face and other parts of the body. Think about how you want to handle this before it happens. You may choose to cut your hair or shave your head, or you may be more comfortable wearing a scarf, head wrap or hat. Ask your oncologist for a prescription for a wig. Using certain phrasing, such as “cranial (or skull) prosthesis due to alopecia caused by chemotherapy for cancer” may make the wig eligible for insurance coverage. Contact the American Cancer Society to ask about free wigs for patients undergoing cancer treatment.

**ANEMIA (LOW RED BLOOD CELL COUNT)**
Anemia is an abnormally low number of red blood cells in the blood. Red blood cells carry oxygen to the body’s tissues. Anemia can cause many symptoms, most often fatigue and weakness, and can be temporary or long lasting.

**APPETITE CHANGES**
Depending on the type of cancer treatment you have, including corticosteroids, you may experience increased or decreased appetite, which may result in weight gain or loss. Talk to your health care team if you are unable to control your weight gain or loss.

**ATRIAL FIBRILLATION (PALPITATIONS)**
Some targeted therapy treatments may cause your heart to beat irregularly. If you notice an abnormal heart rhythm or feel dizzy or light-headed, contact your doctor immediately. If you have a history of hypertension or atrial fibrillation, consult with your cardiologist.

**COGNITIVE DYSFUNCTION (CHEMO BRAIN)**
People being treated for cancer often refer to “chemo brain” when they can’t think clearly or have trouble remembering details, such as names and dates. It is associated with chemotherapy but can occur in people receiving all types of treatments. Even though it is treatment-related, some people don’t experience it until months or even years after treatment ends.

Use a daily planner to keep track of things. Solve crossword puzzles or number games to help strengthen your mental ability. Record memory and attention problems to determine when you’re most affected. Don’t multitask; instead, focus on one thing at a time.

**COUGH**
Coughing can be a treatment-related side effect of CLL. Your doctor may prescribe medications or recommend over-the-counter medications you can take to treat a cough, such as an antitussive, expectorant or decongestant.

**DIARRHEA**
When mild, diarrhea is an inconvenience. If left untreated, it can lead to serious problems, such as dehydration, loss of important nutrients, weight loss and fatigue. Your doctor may check you for a Clostridium difficile (C. diff) colon infection.

Over-the-counter medicines and fiber supplements are available to control diarrhea, but ask your doctor before taking anything. If diarrhea is severe, your doctor may prescribe other medications or choose to stop your cancer treatment temporarily until your diarrhea is controlled.

You may be able to anticipate bouts of diarrhea based on prior experiences during treatments. If so, mark your calendar so that you aren’t scheduling yourself to be out for a walk or having company when it is most likely to happen.

**FEVER**
Fever, which occurs when the body’s temperature is abnormally high, is the body’s response to infection. Fever can develop in a person who is receiving drug therapy. It can be particularly concerning if it occurs when a person’s white blood count is low. If you recently received chemotherapy and develop a fever, call your doctor immediately. If you know a medication you are taking has fever as a side effect or if you know your white blood count is low, check your temperature if you feel warm or unwell.

Your doctor may recommend over-the-counter medications, such as acetaminophen, to treat the fever related to flu-like syndrome. Avoid non-steroidal anti-inflammatory (NSAID) drugs, as well as aspirin, if you have a bleeding disorder. Discuss all of your options with your doctor before treatment begins to know the best way to manage a fever.

**GRAFT-VS-HOST DISEASE**
Graft-versus-host disease (GvHD) is a common side effect of allogeneic stem cell transplantation that can occur when white blood cells from your donor (the graft) recognize healthy cells in your body (the host) as foreign and attack them. This problem can cause damage to your skin, liver, intestines and many other organs, and can occur a few weeks after the transplant or much later. Symptoms may range from very mild to life threatening and include skin rashes, yellowing skin or eyes (jaundice) and diarrhea.

**FREE WIGS**
Contact the American Cancer Society to ask about free wigs for patients undergoing cancer treatment. It may make the wig eligible for insurance coverage. Using certain phrasing, such as “free wig” may make the wig eligible for insurance coverage. Ask your oncologist for a prescription for a wig. Using certain phrasing, such as “cranial (or skull) prosthesis due to alopecia caused by chemotherapy for cancer” may make the wig eligible for insurance coverage. Contact the American Cancer Society to ask about free wigs for patients undergoing cancer treatment.
GvHD can be treated with steroids or other drugs that suppress your immune system. If you experience any of the following symptoms of GvHD, contact your doctor immediately: dryness of the eyes and mouth, tightening, blistering or burning of the skin, jaundice, fever, sudden weight loss, abdominal pain or bloating.

**MUSCLE AND BONE PAIN**
Diagnostic procedures, treatments and the disease itself may cause different types of pain. Untreated pain, even if it’s minor, can get out of hand quickly and affect your body’s ability to heal. That is why it’s so important to let your health care team know right away if you are in pain. The more you share about how you are feeling, the better your health care team will be able to help you. Although you can’t expect to be entirely free from pain, you can expect them to do everything possible to make sure you’re comfortable.

**NAUSEA AND VOMITING**
Nausea and vomiting are side effects that can cause severe dehydration and interrupt your treatment plan. Talk to your doctor about lowering your medication doses or adding antiemetics (anti-nausea drugs) to help keep you comfortable.

If you experience nausea and vomiting, try eating five to six small meals instead of three large meals, and eat a light meal a few hours before receiving certain treatments. Drink plenty of fluids throughout the day. Identify and avoid foods, drinks or smells that trigger nausea. Sip ginger ale or chamomile tea, or suck on peppermint candies to settle your stomach. It is important for you to contact your doctor if you experience any of the following serious symptoms: more than three episodes of vomiting per hour for at least three hours; blood in vomit; vomit resembling coffee grounds; inability to drink more than eight cups of fluid or ice chips in 24 hours or eat solid food for more than two days; weakness or dizziness; or if you cannot keep your medications down.

**NEUTROPENIA (LOW WHITE BLOOD CELL COUNT)**
Commonly occurring in people with CLL who are treated with conventional chemotherapy, neutropenia is a low number of neutrophils, a type of white blood cell. Neutrophils play an important role in preventing infection throughout the body, so having an abnormally low number of them increases the risk of getting an infection, such as pneumonia, bronchitis, sinusitis or shingles. Neutropenia also makes it more difficult for an infection to resolve. The lower the neutrophil count, the greater the risk for infection. Talk to your doctor about drugs that may help you produce more white blood cells. Wash your hands often, and use hand sanitizer regularly. Avoid sick people and crowded places. Wear gloves when doing chores.

If you experience any of these symptoms, contact your doctor immediately: fever (oral temperature over 100.5°F), OR chills OR sweating; flu-like symptoms (body aches, chills, general fatigue) with or without fever; coughing, shortness of breath or painful breathing; abdominal pain; sore throat or mouth sores; redness, pain or swelling on skin; pus or drainage from any open cut or sore; pain or burning with urination; pain or sores around the anus; or vaginal discharge or itching.

**ORAL MUCOSITIS (MOUTH SORES)**
Mouth sores, also known as oral mucositis, are small cuts or ulcers that can affect the gums, tongue, roof of the mouth or lips. Mouth sores sometimes begin as mild pain or burning, followed by white patches that may become large red lesions. Pain may range from mild to severe, making it difficult to talk, eat or swallow. Taking good care of your teeth and gums is essential to managing mouth sores, and you should brush and floss several times a day. Your doctor may suggest rinsing your mouth with special solutions and may prescribe a medication that coats the lining of your mouth or pain medications that can be applied topically.

To manage mouth sores, keep your mouth and lips moist by using lip balm, sipping water, sucking on ice chips and drinking through a straw. Choose soft, moist foods that are easy to swallow, and consider letting your food cool to room temperature before you eat. It is also a good idea to avoid alcoholic beverages and tobacco products, as well as hot, spicy, citric, greasy, fried, coarse or rough-textured foods.

**SKIN REACTIONS**
Skin reactions can include redness and irritation (similar to sunburn), skin rash or dry, flaky skin. These reactions often cause itchiness and discomfort. Although most reactions are mild to moderate, some can become severe if not treated early. Your doctor may prescribe a mild corticosteroid cream or an antibiotic gel. Severe rashes are usually treated with an oral antibiotic and perhaps an oral corticosteroid. When a rash is severe, the dose of the cancer drug(s) is often reduced or temporarily stopped until it improves.

**THROMBOCYTOPENIA (CAUSING BLEEDING/BRUISING/CLOTTING ISSUES)**
Some treatments for CLL can interfere with the body’s ability to make platelets, which are a type of blood cell. The result is a condition called thrombocytopenia, and it can lead to bleeding and clotting problems as well as easy bruising. Avoid taking Omega 3 supplements, aspirin and other blood thinners while you’re being treated, and talk with your doctor about any other supplements you may be taking.

**ADDITIONAL RESOURCES**
- **American Society of Clinical Oncology:** [www.cancer.net](http://www.cancer.net)
- **Cancer Pain Research Consortium:** [www.cancerpainresearchconsortium.org](http://www.cancerpainresearchconsortium.org)
- **Leukemia & Lymphoma Society:** [www.lls.org](http://www.lls.org)
- **Cancer Pain Research Consortium:** [www.cancerpainresearchconsortium.org](http://www.cancerpainresearchconsortium.org)
- **PearlPoint Cancer Support:** [my.pearlpoint.org](http://my.pearlpoint.org)
- **Managing Side Effects**
- **Side Effects**
When you have a chronic disease, you also typically have a weakened immune system, which puts your body at increased risk of infection. Your doctor will talk with you about the infections that may arise from CLL treatments, side effects and the disease itself to ensure you know what to watch for, how you may be able to prevent an infection and what to do if one occurs. Being an active participant in your own care may help you avoid additional illnesses and enjoy a better quality of life.

One reason your immune system may be weaker is because of a low count of circulating natural protective antibodies. This increases the risk of getting infections of the nose, throat, sinuses and lungs. A blood test can confirm the amount of antibodies in the blood and, if the number is low, a short infusion of intravenous immunoglobulin (IVIG) may be performed periodically. Immunoglobulins are antibodies that fight infection, and IVIG is a treatment that enhances the immune system by raising the amount of protective antibodies in the blood. During IVIG, immunoglobulins from normal, healthy donors are given intravenously (through a vein via a needle or catheter, which is a thin, flexible tube) to raise the amount of immunoglobulins and prevent infections.

Sometimes the drugs you take to treat CLL can increase your risk of getting infections. Be aware of the risk of cytomegalovirus (CMV) and pneumonia. An anti-viral treatment may be prescribed to lower the risk of getting CMV, and antibiotics may be given to treat infections and prevent them from occurring.

CLL and some of its treatments (commonly chemotherapy) may also cause a shortage of normal white blood cells, a condition called neutropenia. This also increases your risk for infections (see Side Effects, page 12). If the levels of normal white blood cells become very low, white blood cell growth factors may be given. These are laboratory-made proteins that are used to increase white blood cell count. One type of growth factor stimulates the growth of neutrophils, which are a type of white blood cell that fights infection. The other stimulates the growth of neutrophils, macrophages (another type of white blood cell that fights infection) and cells that become platelets. Although neutropenia is common, not everyone needs these growth factors. Your doctor may recommend it if you are at risk for developing fever-related neutropenia.

It’s important to continue preventive vaccinations to guard against certain illnesses, but because you have CLL, consult with your health care team first to confirm which vaccines to get and how often to get them. It is recommended that people with CLL receive the influenza vaccine yearly and the vaccine for pneumonia every five years. Vaccines that contain live viruses or bacteria, such as the shingles vaccine, should be avoided.

SAFE FOOD PRACTICES

If your immune system is weakened because of cancer treatments, it can be easy to get an infection from an unclean food environment. Although you can’t control all situations, you and your caregiver can reduce your risk of infection at home by following these four common steps for food safety.

1. Clean. Keep hands and surfaces clean at every step of preparation. Wash hands and surfaces frequently with hot, soapy water before and after handling food. Rinse fruits and veggies thoroughly. Wash countertops, cutting boards, dishes and utensils with hot, soapy water before and after preparing food and in between food items. Keep all other items off of tables or countertops where food is prepared.

2. Separate. Avoid cross contamination. Take extra care when handling raw eggs, meats, poultry and seafood. Keep these foods and their juices away from all other foods. Also keep these items separate from all others in the grocery cart, grocery bags and in the fridge, and have a specific cutting board designated for only these foods.

3. Cook. Food must be cooked thoroughly. Safe minimum food temperatures are:
   - Beef (steaks and roasts): 145°F
   - Fish: 145°F (or until opaque and separates easily)
   - Pork: 145°F
   - Ground meat: 160°F
   - Egg and egg dishes: 160°F
   - Poultry (chicken, turkey, duck, goose): 165°F
   - Casseroles and leftovers: 165°F (no cold spots)

4. Refrigerate. Store food properly. Keep your refrigerator at 40°F or cooler and your freezer at 0°F or below (cold temperatures slow the growth of harmful bacteria). Refrigerate perishables as soon as you bring them home, and defrost food in the refrigerator, under cold running water or using the defrost function in your microwave only. Store leftovers in small, shallow containers for quicker, more efficient cooling, and keep track of stored food so you can discard it if it’s no longer safe to eat.

Additional Resources

- Centers for Disease Control and Prevention: www.cdc.gov
- People at Risk – People with Weakened Immune Systems
- FoodSafety.gov: www.foodsafety.gov
- PearPoint Cancer Support: my.pearpoint.org
- Food Safety During Cancer Treatment

Having an infection when you’re already treating CLL can become serious. Pay close attention to your health so you can catch and treat infections as soon as they start.
Once initial treatment is complete, follow-up care becomes an important next step. There are many things to do to help you continue to monitor your health. Your doctor will put together a plan using specific details about your diagnosis, stage of the cancer, type of treatment received and your overall health, including the side effects and issues related to treatment. Similar to treatment plans, follow-up care plans may vary and change over time as your health care team monitors your health in the months and years following treatment. Your doctor’s plan may include ongoing treatment that could continue indefinitely. Patients can continue to live for a long time without disease-related problems, as long as they continue following their doctor’s plan.

For CLL, your doctor will watch for a potential recurrence or second cancer and manage any side effects associated with your treatment. You may need physical examinations, blood tests and imaging tests along with scheduled cancer screenings.

Recurrent Cancer
When cancer that’s the same type as the original cancer comes back, it’s called recurrent or relapsed cancer. For example, if you are cancer-free after treatment for CLL and, a few years later, you are again diagnosed with CLL, that is recurrent cancer. It can happen weeks, months or years after treatment stops or even while you are on treatment. CLL sometimes comes back because tiny cancer cells occasionally survive treatment and remain in the body undetected. These lingering cells grow and multiply until, eventually, tests can detect them.

Be sure to ask your doctor for more information about your recurrence risk profile, as it is critically important to contact your doctor at the first signs of the return of cancer.

Second Cancer
Like recurrent cancer, a second cancer can develop after you’ve finished treatment for the first cancer. However, unlike recurrent cancer, a second cancer is a different or new type of cancer diagnosis. People with CLL have a greater risk of developing a second cancer of the colon, breast, lung or skin. Your doctor will ask you to do a monthly self-examination of your skin for potential skin cancer. Tell your doctor if you notice any symptoms, such as skin problems or new moles.

Chemotherapy treatment for CLL may cause a different type of leukemia to develop several years later. This new leukemia is not a recurrence but is called therapy-related myeloid leukemia.

The risk for developing a second cancer is small, but it’s still important to talk to your doctor about what to look for and what you can do to help minimize your risk.

Long-term and Late Effects
When treatment ends, some people are able to readjust to a new way of life and, for the most part, don’t experience any major health issues related to their experience with the disease. Others, however, experience side effects of treatment that last beyond the end of their therapy regimen. These are known as long-term effects.

The side effects of treatment that may appear weeks, months or even years after treatment ends are called late effects. They are notoriously hard to predict. Some late effects may simply go away over time, and others may be permanent. They vary from person to person and often depend on the type of treatment and the length of time it was given, as well as the individual’s age, gender and overall health.

Ask your doctor or other members of your health care team about possible late effects you may experience based on the types of cancer treatments you had. Although you aren’t able to prevent late effects, you can take certain steps to improve your health and lifestyle that will prepare you to better handle any health issues you may experience in the years to come.

Like almost all side effects, most long-term and late effects can be treated more easily the earlier they’re detected. That’s why it’s so important to stay in contact with your doctor to communicate any new health concerns.

Physical and Emotional Health
Perhaps as important as sticking to your follow-up care schedule is staying healthy and active. It’s important to maintain good nutrition, be as active as you can, get enough rest and be emotionally healthy. Taking these actions can help you feel better both physically and psychologically, allowing you to better cope with the day-to-day challenges of living with CLL.

Participating in physical activities or regular exercise can help you feel better overall. Although it may not seem to make sense, physical exercise is actually the best treatment for fatigue. Studies have shown that people with cancer who exercise regularly feel less tired and have more energy. Weight-bearing activities, such as walking, can help strengthen bones, which is important if you have bone metastasis. Think about what type of physical activity you enjoy most, and engage in it daily, or as often as you can tolerate. Try to modify your favorite form of exercise if you experience any pain or discomfort, rather than discontinue it.

Sleep disturbances are common among people with cancer. One reason is that fatigue related to cancer and its treatment leads people to take frequent naps during the day, which then makes it difficult to sleep at night. You can still set aside time in your day to rest or take naps, but limit them to 20 to 30 minutes each, and avoid napping in the late afternoon or early evening. Your doctor may review the medications you are taking and change them if drug interactions or side effects are contributing to your sleep problems. Your doctor may also recommend a medication to help you sleep.

Living with a chronic type of cancer can often feel like being on an emotional rollercoaster. Allow yourself to express your emotions freely. Finding ways to reduce and manage stress will strengthen your coping abilities. Some possibilities are journaling, meditation, guided imagery, muscle relaxation and yoga. Ordinary “escapes,” such as reading, television and games, can help you relax. You must also be alert to depression and seek help if you’re experiencing a depressed mood and a loss of interest or pleasure in normal activities. Maintaining relationships and participating in support groups – either in-person or online – can go a long way toward helping you stay emotionally healthy.

Additional Resources
- American Cancer Society: www.cancer.org
  Supportive Care for Chronic Lymphocytic Leukemia
- American Society of Clinical Oncology: www.cancer.net
  CLL Follow-up Care
- Leukemia Society: www.lls.org
  Supportive Care
- National Cancer Institute: www.cancer.gov
  Follow-up Medical Care
Dr. Larry Saltzman paid close attention to his health and, in so doing, was able to alert his doctor early on that something was amiss. After receiving a chronic lymphocytic leukemia diagnosis, he immediately surrounded himself with physicians and resources that put him on the forefront of treatment. Now retired from his family practice, Dr. Saltzman is an Executive Research Director with the Leukemia & Lymphoma Society (LLS), spends time with his family, and is actively involved in helping others who are facing cancer.

As a family physician, I know the importance of annual checkups, and I’ve gotten them for decades. As a doctor, I also received copies of my blood work. When I noticed my white cell count was higher than normal after my October 2009 checkup, I paid close attention to my body and discovered bumps, which turned out to be swollen lymph nodes. I finally voiced my concern with my physician two months later. On January 8, 2010, at age 56, I learned I had chronic lymphocytic leukemia (CLL) and small lymphocytic lymphoma.

My wife and I live in Sacramento. I sought a second opinion at a leading cancer facility nearby and began seeing a lymphoma specialist there. Even though results from genetic testing indicated I would eventually need treatment, it was very early in my diagnosis, so she suggested “watching and waiting.” For my wife and me, that felt more like “waiting and worrying.” At this point, we hadn’t yet shared our news. Our daughter was getting married in May, and our son was getting married in October. I was afraid telling them their dad had cancer would put a damper on the upcoming festivities. I’d lost my sister to breast cancer three years before, and I didn’t want to tell my parents I had cancer, too. We sought counseling and ended up sharing the news with everyone.

After 18 months, my blood tests indicated I would need treatment. I was referred to a local oncologist and, in July 2013, began six months of chemotherapy. There were two standard types of CLL treatment. Mine consisted of two drugs that had kinder, gentler side effects than the other option. Being in family practice, I was constantly exposed to germs. Because the treatment would make my immune system vulnerable, my oncologist recommended that I retire, if possible. I stepped away from my practice the week I began chemotherapy. That was difficult because, over my career, I’d delivered babies, performed surgeries and seen patients, and I loved it.

I was monitored by my specialist and oncologist on a regular basis and after just 11 months, I relapsed. That was quicker than we expected. I was interested in clinical trials, so I transferred my specialty care to a CLL physician who was intimately aware of clinical trials regarding my condition. By June 2014, I was showing fluid symptoms of cancer, such as night sweats. As a doctor, I’d told patients they might have night sweats but, until I experienced them myself, I realized I had no idea what I was really talking about.

I happened to be in New York City for a work meeting at LLS’ main office, and the chief science officer noticed I was ill. He referred me to a specialist who suggested a clinical trial that would require me to stay in NYC for many months or a single pill that was FDA-approved that I could take back home in California. I chose the pill and home care, and started treatment in June 2015. My counts improved and the bumps went down, but six weeks into treatment, I had significant diarrhea and water retention in my legs. The situation became serious when a bowel obstruction made me very ill. I had surgery to remove the right side of my colon and the end of my small intestine. Because my doctors didn’t know if the pill had caused my issues, they didn’t know what to do for me next.

I consulted with a few specialists I’d met through LLS, and they all recommended a trial that sounded perfect, except that none were accepting new patients. Finally, new slots opened up in January 2016 and I began the trial, which consisted of a new type of oral therapy. After two or three months, my lymph nodes went down. By June, six months later, they were huge. Because the trial was limited to just one medication and I obviously needed additional treatment, I had to leave the trial.

My next option was a CAR T-cell clinical trial. We found one that was open, but I was actually disqualified for it because one of the rules was that I had to have already taken a certain chemotherapy drug. Unfortunately, I had taken the other option (the one with the kinder, gentler side effects) when I first started chemotherapy. The third option was a trial back East, and I was accepted. We planned the trip to have my T-cells harvested in July but, just prior to my travel, I developed shingles, so they rescheduled me for September 2016.

While we waited, my doctor suggested a new combination of two drugs. Within two weeks, my bumps had gone down. After weeks of follow-up testing, my CLL was essentially controlled. We didn’t know how long this would maintain, so I kept my harvesting appointment in September. I still hadn’t needed to have my T-cells reinfused. They can stay frozen for two years, just in case I need them.

CLL is called chronic because it’s not curable. It ebbs and flows, and that’s a challenge. The worry never goes away, but many parts of my experience have made this difficult course more bearable. I’ve found valuable support resources through LLS. As a marathon runner, I became involved with LLS’s Team-in-Training in 2012, and I’ve raised hundreds of thousands of dollars as my spouse and I have participated in the Boston Marathon and other events. My friends and family have been incredibly supportive, and I enjoy doing what I can to give back to an organization that has been so valuable to me.
ASSISTANCE & SUPPORT RESOURCES

CAREGIVERS & SUPPORT

4th Angel Patient & Caregiver Mentoring Program ........................................ www.4thangel.org
Advocacy Connector ................................................................................. www.advocacyconnector.com
CancerCare ............................................................................................... www.cancercare.org
CANCER101 ................................................................................................ www.cancer101.org
Cancer Action ............................................................................................ www.canceractiontc.org
CancerHopeNetwork ................................................................................ www.canceropennetwork.org
Cancer Support Community ...................................................................... www.cancersupportcommunity.org
Cancer Support Hotline ............................................................................. 888-793-9355
CaregiverActionNetwork ......................................................................... www.caregiveraction.org
CaringBridge .............................................................................................. www.caringbridge.org
FamilyCaregiverAlliance ........................................................................... www.caregiverhelp.org
FightingChance ........................................................................................ www.fightingchance.org
Friend for Life Cancer Support Network .................................................. www.friend4life.org
TheGatheringPlace .................................................................................. www.touchedbycancer.org
TheHopeLightFoundation ........................................................................ www.hopelightproject.com
ImmermanAngels ...................................................................................... www.immermanangels.org
LIVESTRONGFoundation ........................................................................ www.livestrong.org
LivingWellCancerResourceCenter .............................................................. www.livingwellrc.org
MyLifeLine.org .......................................................................................... www.mylifeline.org
PearlPointCancerSupport ........................................................................ mypearlpoint.org
StrikeOutCancer ......................................................................................... www.strikeoutcancer.com
StrongholdMinistry ................................................................................... www.stronghold.org
SupportGroups ........................................................................................ www.supportgroups.com
TriageCancer ............................................................................................. www.triagecancer.org
TurningPoint .............................................................................................. www.turningpointtc.org
Wonders& Worries ................................................................................... www.wondersandworries.org

CHRONIC LYMPHOCYTIC LEUKEMIA

Be the Match ............................................................................................... www.beathemat.org
Blood & Marrow Transplant Information Network .................................. www.bmtinfonet.org
CLL Advocates Network (CLLAN) .............................................................. www.clladvocates.net
CLL Society ............................................................................................... www.cllsociety.org
FocusOnCLL .............................................................................................. www.focussocl.com
Leukemia & Lymphoma Society ................................................................. www.lls.org
TheMaxFoundation ................................................................................... www.themaxfoundation.org
NationalBoneMarrowTransplantLink ......................................................... www.nbmtlink.org

CLINICAL TRIALS

ACCESS ........................................................................................................ cantria.com/access
AccruaNet ..................................................................................................... www.accuratenet.cancer.gov
ACT (About Clinical Trials) .......................................................................... www.learnaboutclinicaltrials.org
Center for Information and Study on Clinical Research Participation .......... www.searchclinicaltrials.org
CenterWatch ............................................................................................... www.centerwatch.com
ClinicalTrials.gov ...................................................................................... www.clinicaltrials.gov
Coalition of Cancer Cooperative Groups ................................................. www.cccg.org
MolecularMatch ........................................................................................ www.molecularmatch.com
MyClinicalTrial Locator ........................................................................... myclinicaltriallocators.com
NationalCancerInstitute ............................................................................ www.cancer.gov
NCI Contact Center (Cancer Information Service) ...................................... 800-422-6237
TrialCheck .................................................................................................... www.trialcheck.org

FINANCIAL ASSISTANCE

AdvocacyConnector ...................................................................................... www.advocacyconnector.com
BenefitCheckUp ........................................................................................ www.benefitcheckup.com
BringingHopeHome .................................................................................. www.bringinghopehome.com
CancerCare ............................................................................................... www.cancercare.org
CancerFinancialAssistanceCoalition ......................................................... www.cancerfac.org
TheCHAINFundInc .................................................................................... www.thechainfund.com
HealthWellFoundation ............................................................................ www.healthwellfoundation.org
HopeLodge ................................................................................................. www.cancer.org/treatment/supportprogramsservices/hopeodge
Medicare.gov ............................................................................................ www.medicare.gov
PartnershipforPrescriptionAssistance ..................................................... www.ppa.org
PatientAccessNetworkFoundation .......................................................... www.panfoundation.org
PatientAdvocateFoundation .................................................................... www.patientadvocate.org
PatientServices, Inc .................................................................................. www.patientadvicent.org
SocialSecurityAdministration .................................................................... www.ssa.gov

FINANCIAL ASSISTANCE

SocialSecurityDisabilityResourceCenter ................................................... www.ssdrc.com
StateHealthInsuranceAssistancePrograms ................................................ www.shipatc.org

PAIN MANAGEMENT

AmericanChronicPainAssociation ............................................................... www.theapa.org
CancerPainResearchConsortium ............................................................... www.cancerpainresearchconsortium.org
LIVESTRONGFoundation ........................................................................ www.livestrong.org
TheResourceCenteroftheAllianceofStatePainInitiatives ......................... www.trc.wisc.edu
U.S.PainFoundation .................................................................................... www.uspainfoundation.org

PRESCRIPTION EXPENSES

TheBoneMarrowFoundation ...................................................................... www.bonemarrow.org, 800-365-1336
CancerCareCo-PaymentAssistanceFoundation ....................................... www.cancercarecopay.org, 866-552-6729
CancerFinancialAssistanceCoalition ......................................................... www.cancerfac.org
TheCHAINFundInc .................................................................................... www.thechainfund.com, 203-691-5905
FoundationforHealthCoverageEducation ................................................ www.coverageforall.org
GoodDays .................................................................................................. www.mygooddays.org, 972-806-7141
HealthWellFoundation ............................................................................. www.healthwellfoundation.org, 800-675-8416
Leukemia & LymphomaSociety ................................................................. www.lls.org, 800-955-4572
NationalOrganizationforRareDisorders .................................................. www.rarediseases.org, 203-744-1010
NeedyMed .................................................................................................. www.needymeds.org, 800-503-8897
PartnershipforPrescriptionAssistance ...................................................... www/ppra.org
PatientAccessNetworkFoundation .......................................................... www.panfoundation.org, 866-316-7263
PatientAdvocateFoundationCo-PayRelief ................................................ www.copays.org, 866-512-3861
PatientServices, Inc .................................................................................... www.patientservicesinc.org, 800-366-7741
ReAssist ..................................................................................................... www.reassist.org
ReHope ....................................................................................................... www.rehope.org, 877-267-0517
RoOutreach ................................................................................................ www.rooutreach.org, 888-796-1234
TogetherRxAccess ..................................................................................... www.togetheraccess.com, 800-444-4106

REIMBURSEMENT & PATIENT ASSISTANCE PROGRAMS

AmgenAssist ................................................. www.amgenassist360.com,patient, 888-427-7478
AstellasPharmaSupportSolutions ............................................................... www.astellaspharmasupportsolutions.com, 800-477-6472
AstraZenecaPrescriptionSavingsProgram(AZ&ME) .................................. www.aazmdreap.org, 800-292-6363
BendekaCURE ............................................................................................ bendeka.com/support/access, 888-587-3268
EisaiReimbursementResources ................................................................. www.eisaiaccessmanagement.com
GazzyaAccessSolutions ........................................................................... www.gazzyaaccess.com, 866-423-2377
GenentechAccessSolutions ....................................................................... www.genetech-access.com,patient, 866-423-2377
GenzymePatientSupportServices .............................................................. www.genzyme.com/patients/patient-support-services,
                                                                                   800-745-4447
GileadPatientAccess .................................................................................... www.gilead.com/responsibility/us-patient-access
HelisinnCares .............................................................................................. helsinnreimbursement.com/patient/access-resources,
                                                                                   844-357-4688, select prompt 2
JanssenCarePath ......................................................................................... www.janssencarespath.com, 877-227-3728
JanssenPrescriptionAssistance ................................................................. www.janssenprescriptionassistance.com
Johnston&JohnsonPatientAssistanceFoundation, Inc ................................ www.jjfoundation.org, 800-652-6227
LeukineDirectReimbursementSupportLine ............................................ www.leukine.com/patient/reimbursement,
                                                                                   888-479-5385
MerckAccessProgram ............................................................................... www.merckaccessprogram.com, 855-257-3932
MerckHelps ............................................................................................... www.merckhelps.com, 800-727-5400
NeulastaFIRSTSTEPCo-PayProgram ....................................................... www.neulastacost.org, 888-657-8371
NeupogenFIRSTSTEP .............................................................................. www.amgenaccess360.com/patient/neupogen-cost-assistance,
                                                                                   888-657-8371
NovartisPatientAssistanceNow ................................................................. www.patientassistancecno.org, 800-245-5356
PatientRxSolutions ..................................................................................... www.patientrxsolutions.com, 800-676-5884
PfizerRxPathways ....................................................................................... www.pfizerrxpathways.com, 844-989-7284
RituxanHYCELAPatientAssistancePrograms ........................................... www.genentech-access.com/patient/trusts/rituxanychela.html, 888-423-2377
RituxanPatientAssistancePrograms ......................................................... www.rituxan.com/hem/patient/rituxan-patient-assistance,
                                                                                   888-249-4918
SanousoPatientAssistance ........................................................................... www.sanouso.com/patient/access/index.html,
                                                                                   800-726-2876
SandooOneSource ..................................................................................... www.sandooone.com, 844-726-3691
SandozPatientConnection ......................................................................... www.sandozconnection.com, 800-847-4817
TakedaPatientAssistance .......................................................................... www.takeda.us/patient/access/
patient_assistance_program.aspx, 800-830-9159
TevaCaresFoundationPatientAssistancePrograms .................................... www.tevacares.org, 877-237-4881
TevaOncologyCoreReimbursementAssistance&Support ................................ www.tevacares.com, 888-587-3283
TogetherwithTESARO .............................................................................. www.togethertwtherasor.com, 844-283-7276
VenclextaBioUncologyCo-payCard ............................................................ www.copayassistance.com/,venclexta/co-paycard,
                                                                                   855-692-6729
ZanoxPatientSupportServices ................................................................. www.zanox.com/patient/access/index, 844-276-3831
ZydeliqAccessConnect .............................................................................. www.zydeliqaccessconnect.com, 844-622-2377

PatientResource.com