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How Is Chemotherapy Used to Treat Cancer?

Chemotherapy refers to the use of any drug to treat any disease. But to most people, the word chemotherapy (or "chemo") means drugs used for cancer treatment. It's important to know that not all medicines and drugs to treat cancer work the same way. It used to be that the only kind of drug that could treat cancer was traditional or standard chemo, but now there are a lot of different kinds of drugs used to treat cancer. While traditional or standard chemotherapy is still the best way to treat many cancers, different kinds of drugs may work better for others.

The information below describes traditional or standard chemotherapy. There are also other drugs that are used to treat cancer in different ways, including [targeted therapy](#)¹, hormone therapy, and [immunotherapy](#)².

Chemo is considered a *systemic* treatment because the drugs travels throughout the body, and can kill cancer cells that have spread (metastasized) to parts of the body far away from the original (primary) tumor. This makes it different from treatments like surgery and radiation. Surgery removes a tumor from a part of the body where cancer has been found, and radiation therapy is aimed at a certain area of the body to kill or damage cancer cells. Treatments like these are called *local* treatments because they affect one part of the body.

Goals of chemotherapy treatment

If your doctor has recommended chemotherapy as an option to treat your cancer, it's important to understand the goals of treatment when making treatment decisions. There are three main goals for chemotherapy (chemo) in cancer treatment:

1. Cure

2. Control
3. Palliation

Cure

If possible, chemo is used to cure cancer, meaning that the cancer is destroyed – it goes away and doesn't come back.

Most doctors don't use the word "cure" except as a possible or intended result of treatment. So, when giving treatment that might have a chance of curing a person's cancer, the doctor may describe it as treatment with *curative intent*.

Although cure may be the goal in these situations, and is the hope of many who have cancer, it doesn't always work out that way. It often takes many years to know if a person's cancer is really cured.

Control

If a cure is not possible, the goal of cancer treatment may be to control the disease. In these cases, chemo is used to shrink tumors and/or stop the cancer from growing and spreading. This can help the person with cancer feel better and live longer.

In many cases, the [cancer doesn't completely go away](#)³, but is controlled and managed as a chronic disease, much like heart disease or diabetes. In other cases, the cancer may go away for a while, but it's likely to come back.

Palliation

Chemo can also be used to ease symptoms caused by the cancer. This is called *palliation*, *palliative chemotherapy*, or treatment with *palliative intent*.

When the cancer is at an [advanced stage](#),⁴ probably cannot be controlled, and has spread, the goal of giving chemo may be to improve the quality of life or help the person feel better. For instance, chemo may be used to help shrink a tumor that's causing pain or pressure so the patient feels better and has less pain.

It's important to know that treatment used to reduce symptoms or improve comfort is called *palliative care*. For example, anti-nausea treatments or pain medicines are palliative, and can be used at all stages of treatment. It can be confusing when chemo is used as a palliative treatment, because it's most often used to try to control the cancer. But when it's used with the goal of comfort, chemo becomes part of a palliative care plan.

Planning chemotherapy treatments

You and your cancer doctor (*oncologist*) will decide what drug or combination of drugs you will get. Your doctor will choose the doses, how the drugs will be given, and how often and how long you'll get treatment. All of these decisions will depend on the type of cancer, where it is, how big it is, if it's spread to other parts of the body, and how it affects your normal body functions and overall health.

Cancer can be treated with a single chemo drug, but often several drugs are used together. They may be given in a certain order or in certain combinations (called combination chemotherapy). Different drugs that work in different ways can work together to kill more cancer cells. This can also help lower the chance that the cancer may become resistant to any one chemo drug.

Sometimes chemo is the only treatment you need. More often, chemo is used with surgery or radiation therapy or both. And it's sometimes used with other drugs, such as targeted therapy, hormone therapy, or immunotherapy. For example, chemo may be used...

- To shrink a tumor before surgery or radiation therapy. Chemo used in this way is called *neoadjuvant* therapy.
- After surgery or radiation therapy to help kill any remaining cancer cells in the body. Chemo used in this way is called *adjuvant* therapy.
- With other types of drugs to help kill cancer cells, such as targeted therapy drugs that act on certain targets of cancer cells or immunotherapy drugs that help the immune system fight cancer.
- With other treatments if cancer comes back or doesn't completely go away.

Determining which chemotherapy drugs to use

In some cases, the best choice of doses and schedules for each chemo drug is clearly known and based on research studies. In other cases, less may be known about the best way to treat certain types and stages of cancer. Or, a patient might have another health condition that makes the doctor think a certain treatment is not the best choice because of side effects or other possible problems. In these cases, different doctors might choose different drug combinations with different schedules.

Factors a cancer care team considers when recommending treatment options include:

- The type and subtype of cancer
- The stage of the cancer (how far it has spread)
- Results of other tests on the tumor, such as biomarkers
- The patient's age
- The patient's overall health and current medications
- Other serious health problems (such as heart, liver, or kidney diseases)
- Types of cancer treatments given in the past

The team takes all these factors into account, along with information from research studies published in medical journals and textbooks describing the outcomes of similar patients treated with chemo.

Determining chemotherapy doses

Most chemotherapy (chemo) drugs are strong medicines that have a fairly narrow range for dose safety and effectiveness. Taking too little of a drug will not treat the cancer well and taking too much may cause life-threatening side effects. For this reason, doctors must calculate chemo doses very carefully.

Depending on the drug(s) to be given, there are different ways to determine chemo doses. Most chemo drugs are measured in milligrams (mg).

The overall dose may be based on a person's **body weight in kilograms** (1 kilogram is 2.2 pounds). For instance, a person weighing 50 kilograms (110 pounds), may be receiving a drug that should be given as 10 milligrams (mg) for each kilogram (kg) of weight, which means the person would get 500 milligrams of the drug (50kg x 10mg per kilogram = 500mg).

Some chemo doses are determined based on **body surface area (BSA)**, which are calculated using height and weight. BSA is expressed in meters squared (m²).

Because children's bodies process drugs differently, dosages for children and adults differ, even after BSA is taken into account. Children may have different levels of sensitivity to the drugs, too.

Besides doses being different for children, dosages of some drugs may also be adjusted for people who:

- Are elderly
- Have poor nutrition

- Are obese
- Have already taken or are currently taking other medicines
- Have already had or are currently getting radiation therapy
- Have low blood cell counts
- Have liver or kidney diseases
- May otherwise be unable to tolerate full doses

Determining a chemotherapy schedule (cycle)

Chemotherapy is commonly given at regular intervals called cycles. A cycle may be a dose of one or more drugs on one or more days, followed by several days or weeks without treatment. This gives normal cells time to recover from drug side effects. Sometimes, doses may be given a certain number of days in a row, or every other day for several days, followed by a period of rest. Some drugs work best when given continuously over a set number of days.

Each drug is given on a schedule that makes the most of its anti-cancer actions and minimizes side effects. If more than one drug is used, the treatment plan will say how often and exactly when each drug should be given. The number of cycles given may be decided before treatment starts, based on the type and stage of cancer. In some cases, the number is flexible, and will take into account how the treatment affects the cancer and the person's overall health.

Changing chemotherapy doses and schedules

In most cases, the most effective doses and schedules of drugs to treat specific cancers have been found by testing them in [clinical trials](#)⁶. It's important, when possible, to get the full course of chemo, the full dose, and keep the cycles on schedule. This gives a person the best chance of getting the maximum benefit from treatment.

There may be times, though, when serious side effects require adjusting the chemo plan (dose and/or schedule) to allow you time to recover. Sometimes, you might be given supportive medicines to help your body recover more quickly. Again, the key is to give enough chemo to kill the cancer cells without causing other serious problems.

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/targeted-therapy.html

2. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/immunotherapy.html
3. www.cancer.org/treatment/survivorship-during-and-after-treatment/when-cancer-doesnt-go-away.html
4. www.cancer.org/treatment/understanding-your-diagnosis/advanced-cancer.html
5. www.cancer.org/treatment/treatments-and-side-effects/palliative-care/supportive-care-guide.html
6. www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html

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