



WWJMRD 2020; 6(12): 1-5
www.wwjmr.com
International Journal
Peer Reviewed Journal
Refereed Journal
Indexed Journal
Impact Factor MJIF: 4.25
E-ISSN: 2454-6615

Diksha Sharma
M.Sc. in Medical Surgical
Nursing (Oncology), Lecturer,
Netaji Subash College of
Nursing, Palampur. H.P,
India.

Nursing Consideration: Safe handling of Chemotherapeutic Drugs

Diksha Sharma

Abstract

Cancers have been known to mankind since ancient times. Hippocrates used the terms 'carcinomas' and carcinoma to describe non-ulcer forming and ulcer-forming tumours. Cancer begins when cells in a part of the body start to grow out of control. Cancer can start almost anywhere in the human body, which is made up of trillions of cells. People receive variety of combination in order to get rid of cancer. The types of treatment receive by the client will depend on the type of cancer and how advanced it is. These activities involve opening, transferring, connecting, and disconnecting, which are activities that may cause spray, splash and drip and as a result people became contaminated. The risk to health care professional from handling a hazardous drug stems from its inherent toxicity and the extent to which workers are exposed to drugs. Health care professionals who handle the chemotherapy are advised to be well informed of the potential health hazard, familiar with safe handling and disposal of agents, utilize appropriate protective equipment and adhere to available written policies and guidelines.

Evolution of the Safe Handling of Hazardous Chemotherapy Drugs:

Flack and colleagues in 1977 described the presence of chemotherapy in the urine of nurses caring of patient who had received chemotherapy. The discovery that merely handling chemotherapy drugs became important in re-evaluation of safety in health care environments. In 2004 National Institute for Occupational Safety and Health (NIOSH) observed skin rashes, infertility, miscarriage, birth defect and leukemia or other cancer may be associated with or near hazardous drugs. Over the years the Oncology Nursing Society (ONS), United States Pharmacopeial Convention (USP) and American Society of Clinical Oncology have developed guidelines that identify healthcare workers who are risk for exposure to hazardous drugs and methods for reducing those risk⁽¹⁾

Keywords: Cancer, Chemotherapy, Hazardous drugs, cytotoxic drugs

1. Introduction

Chemotherapy is a type of cancer treatment that uses drugs to kill cancer cells or it is an aggressive form of chemical drug therapy meant to destroy rapidly growing cells in the body. Different kinds of chemotherapy or chemo drugs are used to treat cancer – either alone or in combination with other drugs or treatments. These drugs are very different in their chemical composition, how they are prescribed and given, how useful they are in treating certain types of cancer, and the side effects they might have. It's important to know that not all medicines and drugs to treat cancer work the same way⁽²⁾

Chemotherapy is designed to kill cancer cells, but it may also harm normal cells in the body. These medicines can sometimes be absorbed through the skin or breathed in through the lungs. Family members can also be exposed to chemotherapy if the drugs come into contact with foods or everyday surfaces in the home. It is important for family members and caregivers to handle chemotherapy carefully and take steps to reduce exposure. Women who are pregnant or breastfeeding should avoid all contact with these drugs. All chemotherapy drugs that are brought into the home should be thought of as a possible hazard⁽³⁾

Nurses play a crucial role in safe medication administration. Knowledge is the corner stone in provision of safe nursing care practices especially in the field of cancer nursing care since deficit in nurses' knowledge may inversely affect safety of both patient and nurses. Medication errors harm at least 1.5 million patient and 7000 deaths every year in hospital as

Correspondence:

Diksha Sharma
M.Sc. in Medical Surgical
Nursing (Oncology), Lecturer,
Netaji Subash College of
Nursing, Palampur. H.P,
India.

per Medicare 2006 report. Reduction in the error remains the main stay of all healthcare professional to improve the patient safety. These errors can result from inadequate communication, slips or lapses, lack of checking procedures, lack of vigilance, calculating errors and suboptimal workplace & medication packaging design and inadequate documentation⁽⁴⁾

Chemotherapy drugs are considered to be hazardous to people who handle them or come into contact with them. For patients, this means the drugs are strong enough to damage or kill cancer cells. But this also means the drugs can be a concern for others who might be exposed to them. This is why there are safety rules and recommendations for people who handle chemo drugs. Nurses who had poor knowledge were emphasized they are in need for high level of knowledge and hands on training. It is very important to improve nurses' knowledge to help in reduction of medication errors and provide safe medication administration. It's important to know that not all medicines and drugs to treat cancer work the same way or have the same safety precautions. Chemotherapy medication administration safety is a challenge facing among all health care professional. Medication errors prevention is an important goal of nurses, pharmacists and physician in all treatment places especially in oncology. Reduction of medication error remain the mainstay of all health care professional to improve patient safety and to minimise the errors it is very important to look for the various contributing factors.^(2,4)

Chemotherapy Drug Classification:

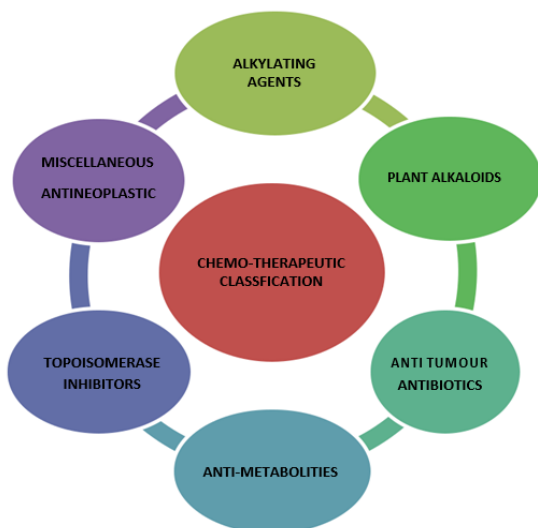


Fig 1: Various types of Chemo Therapeutic Classification of drugs

Alkylating Agents:

Alkylating agents keep the cell from reproducing damaging its DNA. These drugs work in all phases of the cell cycle and are used to treat many different cancers, including cancers of the lung, breast, and ovary as well as leukemia, lymphoma, Hodgkin disease, multiple myeloma, and sarcoma.

Because these drugs damage DNA, they can affect the cells of the bone marrow which make new blood cells. In rare cases, this can lead to leukemia. The risk of leukemia from

alkylating agents is “dose-dependent,” meaning that the risk is small with lower doses, but goes up as the total amount of the drug used gets higher. The risk of leukemia after getting alkylating agents is highest about 5 to 10 years after treatment.

Various alkylating agents are:

- Altretamine
- Bendamustine
- Busulfan
- Carboplatin
- Carmustine
- Chlorambucil
- Cisplatin
- Cyclophosphamide
- Dacarbazine
- Ifosfamide
- Lomustine
- Mechlorethamine
- Melphalan
- Oxaliplatin
- Temozolomide
- Thiotepa
- Trabectedin

Plant Alkaloids

Plant alkaloids are chemotherapy treatment derived made from the certain types of plants. Mitotic inhibitors are also called plant alkaloids. They are compounds derived from natural products, such as plants. They work by stopping cells from dividing to form new cells, but can damage cells in all phases by keeping enzymes from making proteins needed for cell reproduction.

Examples of mitotic inhibitors include the taxanes and vinca alkaloids.

- Taxanes include:
 - Cabazitaxel
 - Docetaxel
 - Nab-paclitaxel o Paclitaxel
- Vinca alkaloids include:
 - Vinblastine
 - Vincristine
 - Vincristine liposomal
 - Vinorelbine

The plant alkaloids are cell cycle specific as this attack the cell during various phase of cell cycle.

Anti-tumor antibiotics

These drugs are not like the antibiotics used to treat infections. They work by changing the DNA inside cancer cells to keep them from growing and multiplying act during multiplying phase of the cell cycle and are considered cell cycle specific. Varieties of anti-tumour drugs are:

- Anthracyclines: Doxorubicin (Adriamycin), Daunorubicin, Mitoxantrone
- Taxanes: Paclitaxel and Docetaxel
- Podophyllotoxin: Etoposide and Teniposide
- Camptothecan analogs: Irinotecan and Topotecan

Antimetabolites

Antimetabolites interfere with DNA and RNA by acting as a substitute for the normal building blocks of RNA and

DNA. When this happens, the DNA cannot make copies of itself, and a cell cannot reproduce. They are commonly used to treat leukemias, cancers of the breast, ovary, and the intestinal tract, as well as other types of cancer.

Examples of antimetabolites include:

- Azacitidine
- 5-fluorouracil (5-FU)
- 6-mercaptopurine (6-MP)
- Capecitabine (Xeloda)
- Cladribine
- Clofarabine
- Cytarabine (Ara-C)
- Decitabine
- Floxuridine
- Fludarabine
- Gemcitabine (Gemzar)
- Hydroxyurea
- Methotrexate
- Nelarabine
- Pemetrexed (Alimta)
- Pentostatin
- Pralatrexate
- Thioguanine
- Trifluridine/tipiracil combination

Topoisomerase inhibitors

Topoisomerase inhibitors are types of chemotherapy drugs that interfere with the action of topoisomerase enzymes (topoisomerase I&II). During the process of chemo treatments, topoisomerase enzymes control the manipulation of the structure of DNA necessary for replication:

Topoisomerase I inhibitors (also called camptothecins) include:

- Irinotecan
- Irinotecan liposomal
- Topotecan

Topoisomerase II inhibitors (also called epipodophyllotoxins) include:

- Etoposide (VP-16)
- Mitoxantrone (also acts as an anti-tumor antibiotic)
- Teniposide

Miscellaneous Antineoplastics

Some chemotherapy drugs act in slightly different ways and do not fit well into any of the other categories. Here are some examples:

- All-trans-retinoic acid
- Arsenic trioxide
- Asparaginase
- Eribulin
- Hydroxyurea
- Ixabepilone
- Mitotane
- Omacetaxine
- Pegaspargase
- Procarbazine
- Romidepsin
- Vorinostat

Goals:

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 tumours 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, 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.⁽⁵⁾

Precautions by Cancer Care Team

Chemotherapy is the strong medicine, so it is safest for people without cancer to avoid direct contact with drugs. People may notice special clothing and protective equipment being worn by the nurses and other members of cancer care team. Pharmacists and nurses who prepare chemo drugs use a special type of pharmacy that must meet certain regulations. Nurses and others who administered chemo helps and take care of you afterwards wear protective clothing, such as 2 pairs of special gloves and a gown, and sometimes goggles or a face shield. If patient is getting IV chemo, there might be a disposable pad under the infusion tubing to protect the surface of the bed or chair.

Precautions by Client When Taking Chemo Orally

Oral chemo, or chemo when taken by mouth and swallow, is usually taken at home. These drugs are as strong as other forms of chemo, and many are considered hazardous. There are usually special precautions for storing and handling oral chemo drugs. Client might be told to be careful not to let others come into contact with it or body fluids while taking it and for a time after taking it. Sometimes you need to wear gloves when touching the pills or capsules. Some drugs have to be kept in the bottle or box they came in. And some drugs and the packages they come in need to be disposed of in a certain way. Some might have to be taken back to the drug store to be thrown away safely. If clients are taking an oral chemo drug, discuss with cancer care team about any special precautions needed at home.

Special Consideration Taken During 48 To 72 Hours After Chemo:

It generally takes about 48 to 72 hours for the body to break down and/or get rid of most chemo drugs. But it's important to know that each chemo drug is excreted or passed through the body a bit differently. Talk to doctor or nurse about how the chemo client's are getting is passed and what body fluids may be affected by chemo. Some drugs take longer to leave your body.

Most of the drug waste comes out through body fluids, such as urine, stool, tears, sweat, and vomit. The drug waste is also in your blood, and may be in other body fluids such as fluids from semen and the vagina. When chemo drugs or their waste are outside your body, they can harm or irritate skin. Other people and pets could be exposed to the drug waste for a few days if they come into contact with any of body fluids.

Here are things client can do to help keep the family, visitors, and pets safe during this time:

- If possible, have children use a different toilet than the one you use.
- Flush the toilet twice after you use it. Put the lid down before flushing to avoid splashing. If possible, you may want to use a separate toilet during this time. If this is not possible, wear gloves to clean the toilet seat after each use.
- Both men and women should sit on the toilet to use it. This cuts down on splashing.
- Keep the toilet lid down when you're not using it to keep pets from drinking the water.
- Always wash your hands with warm water and soap after using the toilet. Dry your hands with paper towels and throw them away.
- If you vomit into the toilet, clean off all splashes and flush twice. If you vomit into a bucket or basin, carefully empty it into the toilet without splashing the contents and flush twice. Wash out the bucket with hot, soapy water and rinse it; empty the wash and rinse water into the toilet, then flush. Dry the bucket with paper towels and throw them away.
- Caregivers should wear 2 pairs of throw-away gloves if they need to touch any of your body fluids. They should always wash their hands with warm water and soap afterward even if they had gloves on.
- If a caregiver does come in contact with any of your body fluids, they should wash the area very well with warm water and soap. It's not likely to cause any harm, but try to avoid this. At your next visit, let your doctor know this happened. Being exposed often may lead to problems, and extra care should be taken to avoid this.
- Any clothes or sheets that have body fluids on them should be washed in your washing machine – not by hand. Wash them in warm water with regular laundry detergent. Do not wash them with other clothes. If they can't be washed right away, seal them in a plastic bag.
- If using throw-away adult diapers, underwear, or sanitary pads, seal them in 2 plastic bags and throw them away with your regular trash.⁽⁶⁾

Proper Handling of Chemotherapy Drugs

- **Direct contact with chemotherapy drugs** (HDs), either by handling, reconstituting, or administering, represents an exposure risk.

- **The recommended location** for chemotherapy preparation and administration is a quiet, low-traffic room that is dedicated to chemotherapy purposes, free from distractions, and easy to clean.
- **Many HDs have also been found to have drug residue** on the outside of drug containers, which creates another opportunity for exposure of individuals who receive drugs and perform inventory control procedures.
- **Personal protective equipment (PPE) should be used** to protect personnel from exposure during handling of HDs. PPE includes gloves, gowns, goggles for eye protection, a full face shield for head protection, and respiratory barrier protection.
- **Regular exam gloves are not recommended** for use as standard protocol for handling chemotherapeutic agents. However, as an expedient, wearing two pairs of powder-free nitrile or latex gloves can be used as a last resort. Vinyl gloves do not provide protection against chemotherapy. Ideally, gloves should be powder free and rated for chemotherapy use by the American Society for Testing and Materials (ASTM). When administering, managing, and disposing of HDs, two pairs of ASTM-tested chemotherapy gloves should be worn with the inner glove under the gown cuff and the outer glove over the cuff. If a glove becomes contaminated or if there is a breach in the glove, it should be removed and discarded promptly, while carefully avoiding contamination of the handler's skin or nearby surfaces.
- **Disposable gowns** made of polyethylene-coated polypropylene or other laminate materials offer the best protection.
- **Eye, face, and respiratory protection is mandatory** when working with HDs outside of a clean room or isolator cabinet, or whenever there is a probability of splashing or uncontrolled aerosolization of HDs. A full face mask is a suitable alternative to goggles, although it does not form a seal or fully protect the eyes. A NIOSH N95 respirator mask is suitable for most situations, with the exception of large spills that cannot be contained by a commercially available spill kit.
- **PPE should be removed in the following order:** chemotherapy gown (touching the outside of the gown, then rolling the outside inward to contain HD trace contamination), goggles and face shields (touching only the outside without making contact with the face), then chemotherapy gloves (touching the outside of the gloves away from the exposed skin while attempting to roll the glove outside-in).
- **Closed system transfer devices (CSTDs) are another type of PPE that can be used** for any cytotoxic chemotherapy agent (although not necessarily for all HDs) during preparation and administration. Traditional needle and syringe techniques for mixing HDs create the potential for droplet or aerosol contamination. CSTDs prevent mechanical transfer of external contaminants and prevent harmful aerosols that are created by mixing HDs from escaping and exposing personnel. CSTDs are commercially available from a number of companies.
- **Male and female employees** who are immune compromised or attempting to conceive and women

who are pregnant or breastfeeding should avoid working with chemotherapy agents.

- **Employees or pet owners** who will be exposed to the patient's waste (urine, faeces, vomit, blood) within 72 hr of chemotherapy administration (sometimes longer for some drugs) should wear proper PPE.
- **Chemotherapy pills (tablets and capsules) are best handled within a biological safety cabinet (BSC)** if available. If no BSC is available, a ventilated area or a respirator should be used to avoid inhalation of HD particles or aerosols.
- **Separate pill counters should be used for chemotherapy pills.** Counters labelled for chemotherapy use will help avoid inadvertent use with conventional medications. The counters should be stored either within the BSC (not to be removed) or in a sealed container (e.g., a plastic box with a secure lid) dedicated to that pill counter and any other items that may come in contact with HD pills.⁽⁷⁾

Barriers to Safe Handling

Obstacle facing safe chemotherapy is multiple and interrelated. Most of the nurses working in oncology department expressed they are in need for high level of knowledge about the safe chemotherapy preparation and administration. The most important obstacle related to nurses was knowledge level, attitude and anxiety. It was also reported in 2011 that half of the nurses reported that lack of safety guidelines and training programme their workplace considered obstacle facing safe chemotherapy administration. It was also recorded that interruption during drugs preparation and administration and environmental factors such as loud noise, poor lighting and untidy working area contribute to unsafe preparation and administration of chemotherapy.⁽⁴⁾

Conclusion:

Safe chemotherapy administration is the corner stone in nursing care of cancer patient. Chemotherapy must continue to be included in the establishment of safe practice, policies and procedures. The risk for exposure to hazardous drugs in health care professional begins with the arrival of dangerous agents to their institutions and end with proper disposal. Education about the hazardous material is critical for everyone, but providing safe handling education and spill management tool is especially important for patients and families. Enforcement of policy, reinforcement of education and monitoring for compliance can demonstrate to workers that their safety and practice is important and expected. Preparation, administration and disposal of intravenous chemotherapy agents pose the highest risk for accidental exposure to hazardous drugs. These activities involve a high frequency of handling including accessing vials, preparing bags and syringes, handling and accessing IV sets and tubing and discarding excess material into waste replacement. It is important for the people who are handling with chemotherapy drugs should be provided with personal protective equipment (PPE) to protect themselves from various hazardous exposure.

References

1. TON The oncology nurse APNPA From: <http://www.theoncologynurse.com/>

2. BrianKrans (2017) Chemotherapy
3. From:<https://www.healthline.com/health/chemotherapy>.
4. St. Jude Children Research Hospital <https://together.stjude.org/en-us/diagnosis-treatment/medication-management/safe-handling-chemotherapy.html>
5. Nagwa ragab, Maha Shokier(2017) obstacles and facilitators facing administration of chemotherapy by oncology nurses. From: www.ijnd.info
6. <https://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/chemotherapy/chemotherapy-safety.html>
7. From: American Cancer Society (2019) www.cancer.org
8. [https://www.aaha.org/aaha-guidelines/oncology-configuration/implementation-toolkit/safe-handling-of-chemotherapy-drugs/#:~:text=Chemotherapy%20pills%20\(tablets%20and%20capsules,be%20used%20for%20chemotherapy%20pills](https://www.aaha.org/aaha-guidelines/oncology-configuration/implementation-toolkit/safe-handling-of-chemotherapy-drugs/#:~:text=Chemotherapy%20pills%20(tablets%20and%20capsules,be%20used%20for%20chemotherapy%20pills).