Nursing Management of Children Receiving Chemotherapy: A Review Article

Gehan Elsayed Mohammed[1], Eman Mahmoud Aboelela[2], Rasha Abd El-Lateef Abd El-Aziz Ramdan[3], Amal Mohamed EL-Dakhakhny[4]

1 Clinical Instructor, Technical Institute of Nursing, Zagazig University, Egypt. g.elsayed022@nursing.zu.edu.eg
2 Lecturer of Pediatric Nursing, Faculty of Nursing, Zagazig University, Egypt. EMAboelaa@nursing.zu.edu.eg
3 Lecturer of Pediatric Nursing, Faculty of Nursing, Zagazig University, Egypt. RAAbdelazyz@nursing.zu.edu.eg
4 Professor of Pediatric Nursing, Faculty of Nursing, Zagazig University, Egypt.

Corresponding author: Gehan Elsayed Mohammed
Conflict of interest: None declared.
Funding: No funding sources

Abstract

The care of children with cancer is a specialized and holistic aspect of pediatric nursing, requiring a combination of knowledge, compassion, and family-centered care. Pediatric cancer encompasses various malignancies, including leukemias, brain tumors, lymphomas, and sarcomas, each presenting unique challenges for diagnosis, treatment, and care. Managing these conditions demands a multidisciplinary approach that addresses the physical, emotional, and psychosocial needs of the child and their family. Nurses play a pivotal role in the management of childhood cancer. They are responsible for administering treatments, such as chemotherapy and radiation therapy, managing symptoms, and preventing complications like infections. Beyond clinical care, nurses provide emotional support, educate families about the disease and its management, and advocate for the child's needs to ensure a high quality of life during and after treatment.

Keywords: Nursing Management, Children Receiving Chemotherapy

Tob Regul Sci. ™ 2023 ;9(1): 8893-8909
DOI : doi.org/10.18001/TRS.9.1.634

Introduction

Childhood Cancer

Cancer is a general term used to describe a disturbance of cellular growth and refers to a group of diseases and not a single disease entity. Because cancer is a cellular disease, can arise from any body tissue, with manifestations that result from failure to control the proliferation and maturation of cells (***Warnakulasuriya et al., 2021).***

Incidence of childhood cancer

American Cancer Society (2022) reported that cancer remains the second leading cause of death in children under 20 years of age, after accidents. Recent research by ***Soliman et al. (2021)*** documented that total cancer rates in Egypt will increase three times by 2050 and childhood cancer will increase 1.2 times. Egypt **National Cancer registry program (2015**) documented that 31.9% of children under the age of 15 years have cancer. The survival rates and trends in survival of the largest available cohort of children with cancer aged 0–18 years from Egypt between 2007 and 2017, treated at Children's Cancer Hospital Egypt, represented 40–50% of all childhood cancers across Egypt **(*Behiry et al., 2023).***

Causes of cancer

Cancer is a complex genetic disease that is caused primarily by environmental factors. More significantly, a globalization of unhealthy lifestyles, particularly cigarette smoking and the adoption of many features of the modern Western, diet (high fat, low fiber content) increase cancer incidence **(Veach, et al., 2013).** Furthermore, causes of cancer may be infectious agents, chemicals including alcohol, and physical agents such as ionizing radiation and viral **(Motilall, 2015).**

Treatment of cancer

Treatment of childhood cancer is based on the type and stage of cancer. Types of treatment used for childhood cancer include surgery, chemotherapy, radiation, hormone therapy, stem cell transplantation, and immunotherapy. Often, multiple treatment are indicated **(Klika et al,2018).**

1. Surgery

Surgery is often used to remove solid tumors in childhood cancers. It aims to excise the cancerous tissue while preserving as much healthy tissue as possible. This treatment is commonly employed for localized cancers, such as neuroblastoma or Wilms' tumor. Advances in surgical techniques, including minimally invasive procedures, have improved outcomes and reduced recovery times ***(Green & Carter, 2021).***

2. Chemotherapy

Chemotherapy involves the use of drugs to destroy cancer cells or stop their growth. It is particularly effective for cancers like leukemia and lymphoma. Chemotherapy can be administered orally, intravenously, or intrathecally, depending on the type and stage of cancer. While highly effective, it often causes side effects such as nausea, fatigue, and hair loss. **(*Erdmann et al., 2021).***

3. Radiation Therapy

Radiation therapy uses high-energy beams, such as X-rays, to kill cancer cells. It is commonly used for brain tumors and other solid tumors. Advances in precision techniques, like proton therapy, allow targeting of cancer cells while sparing healthy tissues. Side effects depend on the location treated and may include fatigue or skin irritation ***(Brown & White, 2019).***

4. Immunotherapy

Immunotherapy boosts the body's immune system to fight cancer. This includes treatments like monoclonal antibodies, immune checkpoint inhibitors, and Chimeric Antigen Receptors T-cell therapy (CAR T-cell therapy). Immunotherapy is increasingly used for refractory or relapsed cancers and has shown promise in improving survival rates with fewer side effects compared to traditional therapies ***(Johnson & Lee, 2022).***

5. Stem Cell Transplant

Stem cell transplants, also known as bone marrow transplants, are used to replace damaged bone marrow with healthy cells. This procedure is often performed after high-dose chemotherapy or radiation therapy. It is particularly beneficial for leukemia and other blood cancers. The procedure involves either autologous (patient's own) or allogeneic (donor) stem cells and requires careful monitoring for complications like graft-versus-host disease ***(Taylor & Smith, 2021).***

Chemotherapy

Chemotherapy (or "chemo") refers to drugs that destroy cancer cells by interfering with growth. Especially effective for cancers that are spread throughout the body, such as leukemia and lymphoma. Though chemotherapy can be the sole treatment, it's often given in combination with other treatments, like surgery and radiation therapy. Patients may receive chemotherapy before surgery (called neoadjuvant chemotherapy) to shrink the tumor and make the surgery less invasive. Also received after surgery (adjuvant chemotherapy) to kill any cancer cells that couldn't be removed during the procedure ***(Aljamali, & Mizhir, 2021).***

Chemotherapy refers to drugs used to kill cancer cells or prevent them from multiplying and passing along DNA mutations. Chemotherapy is also used to shrink tumors that are causing pain and discomfort, may be used to help make other treatments more effective. Also used to help kill cancer

cells that threaten to spread through the bloodstream, called metastatic or secondary cancer (***Current, 2020)***.

Types of chemotherapy.

Four main types *of chemotherapy* ***(Neoadjuvant chemotherapy):*** is given to shrink a tumor's size before surgery or radiation therapy. **(*Adjuvant chemotherapy):*** is given after surgery or radiation therapy to destroy any remaining cancer cells and prevent cancer from coming back. ***(Curative chemotherapy):*** is given instead of surgery or radiation to eliminate all the cancerous cells in a body. **(*Palliative chemotherapy):*** is given to relieve symptoms or prolong a patient's life, but eventually the cancer will be fatal. There can be several types of palliative chemotherapy for a patient (***Wustefeld-Janssens et al., 2021)***.

Methods of chemotherapy administration

Doses of chemotherapy are delivered in cycles, separated by periods of rest and recovery. Sometimes, multiple cycles, over several weeks or even months, are necessary. Like other drugs, chemotherapy comes in many forms. Often, given as pills or injections (***Kjeldsted et al., 2023)***.

Importantly, the use of drugs (whether chemotherapy, hormonal therapy or targeted therapy) constitutes *systemic therapy* for cancer in that are introduced into the blood stream and are therefore in principle able to address cancer at any anatomic location in the body. Systemic therapy is often used in conjunction with other modalities that constitute *local therapy* (i.e., treatments whose efficacy is confined to the anatomic area where they are applied) for cancer such as radiation therapy, surgery or hyperthermia therapy (***Kong et al., 2023)***.

Oral chemotherapy can be given orally as a pill, capsule, or liquid. Intravenous (IV): Chemotherapy can be administered into a vein intravenously, through a catheter inserted in a vein, a port surgically installed in the chest, or an internal or external pump. Injection: Chemotherapy drugs can be given via a shot (in the arm, leg, or hip). Intrathecal: Chemotherapy is injected between the brain and spinal tissues. Intraperitoneal (IP): Chemotherapy can be injected into the area of the body where the vital organs (stomach, intestines, liver) are located, also known as the peritoneal cavity(***Wasserman et al., 2021)***.

Intra-arterial (IA), sometimes chemotherapy is injected into an artery that feeds blood to the tumor. Topical, chemotherapy creams can be rubbed into the skin. A medical oncologist will decide the most effective method, considering the kind of cancer, location and stage. (***Anand et al., 2022)***.

Side effects of chemotherapy

To a large extent, chemotherapy can be thought of as a way to damage or stress cells, which may then lead to cell death if apoptosis is initiated. Because of the effect on immune cells (especially lymphocytes), chemotherapy drugs often find use in a host of diseases that result from harmful over

activity of the immune system against self (so-called autoimmunity), include rheumatoid arthritis, systemic lupus erythematosus, multiple sclerosis, vasculitis and many others(***Sun et al., 2021)***.

Traditional chemotherapeutic agents are cytotoxic by means of interfering with cell division (mitosis) but cancer cells vary widely in susceptibility to these agents. Though the goal of chemotherapy is to destroy fast-growing cancer cells, ends up killing some fast-growing normal cells, too, include cells in the hair, bloodstream, mouth, and digestive tract which explains why chemotherapy patients often have hair loss, low blood counts (anemia), mouth sores and nausea, among other ailments. Also normal for children undergoing chemotherapy for cancer to feel very tired and even to have cognitive challenges during treatment. Fortunately, effects tend to go away once chemotherapy is over (***Li et al., 2023)***.

Chemotherapeutic techniques have a range of side effects that depend on the type of medications used. The most common medications affect mainly the fast-dividing cells of the body, such as blood cells and the cells lining the mouth, stomach, and intestines. Chemotherapy-related toxicities can occur acutely after administration, within hours or days, or chronically, from weeks to years. Immunosuppression and myelosuppression, virtually all chemotherapeutic regimens can cause depression of the immune system, often by paralyzing the bone marrow and leading to a decrease of white blood cells, red blood cells, and platelets **(*Kaur et al., 2022)***.

Nursing Management of Children Receiving Chemotherapy

Nurses play a key role in administering chemotherapy safely and helping patients manage uncomfortable side effects. Patient and family education begins before chemotherapy is initiated and continues during and after the treatment is completed. To ensure adherence and prevention of complications, continuous reinforcement of accurate information and appropriate nursing care can help ensure the success of the therapy.

Nurses are the health care professionals who most frequently come into contact with patients and families **(Landier et al., 2023)**. children with cancer and their family have various needs including, physical, psychological, social, financial ,information need, spiritual or religious issues, family relationships, emotional concerns, practical issues or other everyday life issues **(Kiernan et al., 2010; McHaro et al., 2022).**

Oncology nurses are often responsible for the administration of chemotherapy drugs to the child. They must be educated on safe handling, cytotoxic spills and management of allergic reactions. Nurses may be responsible for following the medical oncologists prescriptions, ensuring the correct drug dose is administered to the correct patient via the correct route **(Antúnez-Blancat,2024).**

. Children with cancer often suffer many physical effects as a result of the disease and its treatment. The nurse must be diligent when assessing for these effects and should involve the parents as a reliable source for reporting the child's physical symptoms.**(Lalithabai, et al,2024).**

chemotherapy can induce a spectrum of side effects, including nausea, vomiting, dyspepsia, ovarian failure, oral ulcers, oral mucositis, hyperuricemia, neuropathy, cardiomyopathy, hemorrhagic cystitis, and renal failure Reduced renal drug clearance and renal dysfunction of various severity can occur as a side effect of administrating anti-cancer medications **(Aldiss S, Hollis R, Phillips B, et al. 2023).**

Primary Care Needs of Children with Cancer

Growth and development

Cancer treatment can have profound effects on the growth and development of pediatric patients. Different models of psychosocial development and behavioral treatment approaches aid children receiving medical treatment. Providing education, anticipatory guidance, and individualized support to child and their families is a psychosocial standard **(Brand S,2017).** Child`s growth should be observed on a standardized growth curve. Growth rates should be checked every 1 to 3 months during therapy and for first year after therapy, then measurements should be taken every 6 months until linear growth is completed **(Breen et al., 2009).**

Immunization

Protection against vaccine preventable diseases (VPD) is not sufficient at the time of cancer diagnosis and during the first year after the end of oncologic treatment, despite a good immune reconstitution already observed between 3 and 4 months after the end of treatment in most children. Children lose their vaccine-induced protection and are particularly vulnerable to vaccine-preventable diseases after chemotherapy. However, revaccination guidelines are heterogeneous, and there is often a lack of revaccination post-treatment**(Cetin et al , 2024).**

Immunization for vaccine preventable diseases (VPD) is important in children with cancer as it can reduce non cancer related morbidity/mortality and contribute favorably to the overall outcome in these children. Many developed countries have formulated guidelines for vaccinating children with cancer during their treatment as well as after the completion of treatment, in line with their national immunization schedules **(Arora RS, 2016).**

Dental care and management

Good personal hygiene of the child including dental care is important. As chemotherapy places the child at risk for stomatitis and dental caries, so routine dental care during and after therapy is very important. Daily brushing with a soft- bristled brush and daily fluoride rinses are recommended **(Özyılkan D., 2024).**

Safety

Safety issues for the child with a malignant disease involve balancing normal participation in daily activities. For the safety of all children, chemotherapeutic agents must be stored securely out of reach. Through hand washing should follow handling of any chemotherapeutic agents. If circumstances

make those impossible, gloves should be worn to avoid direct contact with medication **(Bakry,& Waly 2024).**

Promote Activity

The nurse should encourage activity or ambulation per physician`s orders, observe child for symptoms of activity intolerance such as pallor, nausea, light headache, if the child was on bed rest, perform range of motion exercise and frequent position change, as well as referring the child to physical therapy to increase skeletal muscle strength. These activities build the child`s self-esteem, and enhance coping skills **(Malysse et al., 2021).** Home based exercise help parents to participate with cancer patients. Exercise programs should be individualized according to the child`s diagnosis, condition and treatment **(O'Brien & Sali, 2017).**

Managing chemotherapy side effects

1- Nausea and vomiting

Nausea and vomiting are common side effects of cancer treatments, including chemotherapy and radiation therapy,. Nausea and vomiting from chemotherapy may begin a few minutes to a few hours after treatment begins or be delayed and occur a day or more after treatment usually last 24 to 48 hours, but some people may feel sick for up to 7 days after treatment. but anti-nausea medications such as drugs that block serotonin, a chemical in the brain that can trigger nausea and vomiting: ondansetron (Zofran), granisetron (Kytril), dolasetron (Anzemet), palonosetron (Aloxi) often prevent or relieve nausea and vomiting before they start or become a problem(***Mustapha et al., 2021).***

Nurse should advice the child to drink plenty of fluids .and water or clear liquids will help prevent dehydration, eat foods that are easy digested(e.g. cold foods such as popsicles, pudding, yogurt, and gelatin. Try bland, starchy foods such as toast, rice, plain pasta, crackers, and pretzels. Foods and beverages with ginger, such as ginger tea, may also ease nausea and vomiting.. Practice relaxation techniques. Deep breathing, guided imagery, hypnosis, massages, listening to music, and meditating can all help reduce nausea and vomiting in people with cancer**(*Wu*,2024)**

2- Mucosal Ulceration

Stomatitis often occurs with administration of chemotherapy drugs. The nurse should give the child a soft or light diet as chewing was painful, mashed potatoes and pudding rather than hard ones. The nurse should provide non acidic foods, such as gelatin instead of orange juice, which than a brush or having the child rinse the mouth with half-strength hydrogen peroxide and water **(Elsehrawy et al, 2024).**

3- Management of Anorexia and Weight loss

Loss of appetite is a major problem for parents, as it was the one area they feel responsible for, when loss of appetite and weight persist, the nurse should investigate the family situation to determine if any factors (e.g., conditioned aversion to food, environmental stress related to eating, controlling behavior, anger) might be contributing to the problem. Nasogastric tube feeding or total parentall nutrition may be implemented for significant nutritional problems **(Flank et al., 2016)**.

4- Pain management

Pain is a common symptom of cancer diagnosis and rises in prevalence throughout and beyond cancer treatment. Pain is frequently reported during cancer disease, and it still remains poorly controlled in 40% of patients. Recent developments in oncology have helped to better control pain **(Mestdagh, et al 2023)** .

Pain management in children with cancer is a challenging issue that leaves unpleasant memories associated with tissue damage in children's experiences. As an intellectual phenomenon, children cannot express their affliction through verbal communication. This issue adversely affects their physical and physiological conditions, including insomnia, anorexia, fear, anxiety, helplessness, and refusal to continue the care process **(Khoubila,et al 2022).**

The nurse should discuss with the child and parent`s techniques that may help to reduce pain. Administration of acetaminophen was useful for mild pain and the nurse should administer medication. Using non pharmacologic measures such as play therapy, games, TV watching, guided breathing, imagery, and hypnosis appropriate to district the child attention from pain **(Davis, 2017)** . Massage, positioning, or heat may be used to relieve pain in particular area. Also, the parent`s presence during procedures as support person might help in pain management techniques, such as singing, counting, telling stories, and blowing bubbles **(Jacob, 2017).**

5- Management of Alopecia

Alopecia or hair loss was a common side effect of cancer treatment, the nurse should tell children and their parents about it and that the hair re-grows into 3 to 6 months might be of a different color and texture. The nurse or parent might cut the child`s hair into a shorter style might help to reduce distress when the hair begin to fall out. The nurse could advise the child to wear head cover such as colorful hats and scarves, during cold climates and during exposure to the sun, and the scalp hygiene was important, the scalp should be washed like any other body part **(Hockenberry et al. 2017).**

6- Provide Psycho-social support

The child undergoing treatment for cancer needs support appropriate to his or her developmental stage and cognitive level. Younger children need support during painful procedures and separation from parents. Older children also need intervention strategies to assist in working through feelings

related to treatments. Adolescents and children gain strength from participating in usual routines such as school as much as possible **(Breen et al., 2009)**. The nurse should educate school personnel about the special needs which were created by hospitalization, side effects as well as long term squeal of chemotherapy **(Choi et al., 2014)**.

Reducing Fear and Anxiety

Reducing Fear and Anxiety and Providing Emotional Support, Fear and anxiety are common emotional responses experienced by patients with cancer and families, stemming from uncertainty, treatment-related concerns, and the impact of the disease on daily life. Family patterns may be influenced by these fears and anxieties, leading to changes in communication, roles, and relationships within the family unit. Review previous experience with cancer. Clarifies perceptions; assists in the identification of fear(s) and misconceptions based on diagnosis and experience with cancer. Identify the stage and degree of grief and so are currently experiencing. The choice of interventions is dictated by the stage of grief, and coping behaviors (anger, withdrawal, denial) ***(van Hof et al., 2023)***.

Note ineffective coping (poor social interactions, helplessness, giving up everyday functions, and usual sources of gratification). Identifies individual problems and provides support for the patient and so in using effective coping skills. Be alert to signs of denial and depression (withdrawal, anger, inappropriate remarks). Feelings of guilt, spiritual distress, physical symptoms, or lack of cure may cause to become withdrawn and believe that suicide is a viable alternative. Encourage to share thoughts and feelings. Provides an opportunity to examine realistic fears and misconceptions about the diagnosis ***(Wang et al., 2022)***.

Permit expressions of anger, fear, and despair without confrontation. Give information that feelings are normal and are to be appropriately expressed. Acceptance of feelings allows to begin to deal with the situation. Explain the recommended treatment, purpose, and potential side effects. Help prepare for treatments. Explain procedures, providing opportunities for questions and honest answers. Stay with the child during anxiety-producing procedures and consultations (***Decadt et al., 2021)***.

Provide reliable and consistent information and support. Allows for better interpersonal interaction and reduction of anxiety and fear. Include indicated or desires when major decisions are to be made. Provides a support system and allows to be involved appropriately. Note components of family, presence of extended family, and others (friends and neighbors). Identify patterns of communication in the family and patterns of interaction between family members. Provides information about the effectiveness of communication and identifying problems that may interfere with the family's ability to assist the child and adjust positively to the diagnosis and treatment of cancer (***Yabroff et al., 2020)***.

Education for children with cancer and their families:

The pediatric nurse should instruct children and their family about importance of treatment plane, follow up visits when to seek medical help, personal self-care and hygiene. The pediatric nurse should also educate child and his family about complications that may results from these complications include: Increased bruising, bleeding or petechiae, pallor, or increased levels of fatigue, earache, sore throat, nuchal rigidity, blisters, rashes, ulcers, red, irritated skin on the child's buttocks ,abdominal pain, difficulty or pain with eating, drinking, or swallowing, and constipation or diarrhea. For children with central venous catheters Pus, redness, or swelling at the site, breakage of the catheter, do not give the child aspirin**. Kline. (2008).**

Maintain positive body image and self-esteem

The diagnosis and treatment process of cancer can lead to feelings of self-doubt, insecurity, and reduced confidence, which can be compounded by changes in physical appearance, functional abilities, and social relationships. Feelings can significantly impact well-being and ability to cope with the challenges of illness, making crucial for nurses to address and support the patient's self-esteem ***(Halkett et al., 2023).***

Acknowledge and accept the expression of feelings of frustration, dependency, anger, grief, and hostility. Note withdrawn behavior and use of denial. Acceptance of feelings as a normal response to what has occurred facilitates resolution. Denial may be prolonged and be an adaptive mechanism because the child is not ready to cope with personal problems. On the other hand, denial of the feelings impedes the development of a trusting, therapeutic relationship (***Tort-Nasarre et al., 2021).***

Support verbalization of positive or negative feelings about the actual or perceived loss, is worthwhile to encourage to separate feelings about changes in body structure or function from feelings about self-worth. Expression of feelings can enhance the coping strategies. Verbalization of feelings with a trusted individual may help come to terms with unresolved issues **(Yamani Ardakani et al., 2020).**

The nurse should acknowledge child`s feelings of anger over body changes and illness. Also, introduced idea of wig before hair loss and encourage child to select a similar wig to child`s own hair style and color to foster later adjustment to hair loss **(Choi et al., 2014)**. The nurse should encourage the child to choose a comfortable, fashionable clothing to disguise weight or scars. In addition to, encourage the child to spend time with his peers **(Santone et al., 2015).**

After perceiving body image change, in order to maintain a sense of self-completeness/wholeness and to reduce damage, children and adolescents with cancer will use skills to conceal their illness, test other people's responses, and adopt strategies to cope with social withdrawal **(Lee et al., 2012)** .

Exhibit positive caring in routine activities. Positive remarks by the nurse may encourage the child to develop more positive responses to the changes in body. Work with self-concept, avoiding

moral judgments regarding efforts or progress. Positive reinforcement encourages the child to continue efforts and strive for improvement. Be realistic and positive during treatments, in health teaching, and in setting goals within limitations, enhances trust and rapport between the child and the nurse. Provide information at the level of acceptance and in small segments to allow easier assimilation. Discuss the expectations and anticipated body changes, then assist in identifying realistic goals ***(Vaartio-Rajalin et al., 2021).***

Initiating health teachings, provide information on how to promote a positive body image. Teach about topics for developing self-concept and self-esteem, such as accepting that healthy bodies come in a wide range of shapes and sizes. Fashion magazines and social media portray an ideal body that is unrealistic and unhealthy for most people, therefore, should avoid them if make feel bad, keep a list of things like about body and refer to it when feeling down. Then, provide with practice in accepting positive comments about appearance and coach responses as needed (***Molassiotis et al., 2021).***

Nursing intervention in cases of low self-esteem begins right from admission or first contact with the client/patient. The nurse can assist client/patient to regain positive self-esteem by conveying a feeling of acceptance and respect, employing a non-judgmental approach in handling the values and beliefs of the client/patient, encouraging independence, rewarding progress, allowing the client/patient to do as much self-care as possible, and tailoring specific nursing actions towards the root cause of the altered self-concept **(McGruder, 2012)**. But if patients‟ self-esteem is so low that they fail to care for themselves, the nurse assumes total responsibility for meeting those other needs while taking steps to increase self-esteem **(National Open University of Nigeria, 2010)**.

The feeling of being unloved, unworthy, and incompetent is often expressed with low self-esteem. Often presents self-unable to manage the current situation. The nurse should encourage the child to express if is able to associate changes to a specific event in life. The child may be knowledgeable of up-to-date situations that negatively change self-concept **(Tuominen et al., 2019).**

Evaluate the extent to which the child feels loved and respected by others. Lack of recognition of achievements or rejection by others may contribute to feelings of unworthiness. Care and support by others will be essential in developing the self-esteem. Assess how competent feel about ability to perform and carry out own and others' expectations. The child may have developed the ability to carry out personal responsibilities despite low self-esteem, may be a positive indicator of potential for successful improvement of self-esteem (***Pham et al., 2020).***

Act as a role model or significant others in healthy expression of feelings or concerns. Assume responsibility for own thoughts and actions by using "I think" language in conversations. Children may want an example of positive measures to display feelings. Self-awareness enables the nurse to show authentic behavior .Present an environment favorable to the expression of feelings: Spend time with the child; set aside enough time so that the encounter is calm and deliberate. Having enough time for

the child conveys the nurse's interest in and acceptance of the child feelings. A trusting relationship is an important factor in building self-esteem (***Drury et al., 2023)***.

Provide privacy. Private discussions need to take place in a setting where is free to express feelings without being overheard ·Apply active listening and open-ended questions, permit to verbalize interests, concerns, worries, and thoughts without interruption, will convey a sense of respect for the patient's abilities and strengths in addition to recognizing problems and concerns ·Consider the "normal" impact of change on self-esteem. Reassure such modifications often occur in a variety of emotional or behavioral responses (***Wang et al., 2019)***.

Support attempts to secure autonomy, reality, positive self-esteem, a sense of capability, and problem-solving. The child needs continuous positive feedback and support to manage behaviors to promote self-esteem, will benefit from feedback that provides a realistic appraisal of development and strengthens the effective change made by the child ·Give anticipatory direction to reduce anxiety and fear if interference in self-esteem is an expected part of the process of adjustment to changes in health status (***Ferrua et al., 2021)***.

Promote role enhancement and satisfaction. Sometimes the difficulty with self-concept centers on the inability to fulfill one's usual or desired role. Help distinguish between ideal and actual role performance. Then discuss boundaries, expectations, and management defined by lifestyle and family networks. Facilitate communication between family members regarding sharing of responsibilities to accommodate role changes of the ill person (***Cheng et al., 2022)***.

Discuss how the diagnosis and treatment are affecting the activities. Aids in defining concerns to begin the problem-solving process. Review anticipated side effects associated with a particular treatment, including possible effects on sense of attractiveness and desirability (alopecia, disfiguring surgery). Tell that not all side effects occur, and others may be minimized or controlled. Anticipatory guidance can help begin the process of adaptation to a new state and prepare for some side effects ***(Semenenko et al., 2023)***.

Nurse may help in refer to support groups, clergy, and family therapy as indicated. May need additional assistance to resolve problems of disorganization that may accompany a diagnosis of potentially terminal illness (cancer). Moreover, ensures better quality of life, physical and emotional well-being of children, and providing evidenced-based data that can be developed to design programs and theoretical background to enhance self-esteem and research in the field of pediatric oncology nursing **(Aquil et al., 2021).**

References:

1. Aldiss S, Hollis R, Phillips B, et al. Research priorities for children's cancer: a James Lind alliance priority setting partnership in the UK. BMJ Open. 2023 [cited 2023 Dec 20];13(open in a new window)(12(open in a new window)):e077387. doi: 10.1136/bmjopen-2023-077387

2. Aljamali, N. M., & Mizhir, A. H. (2021). Review on Types of Cancerous Tumors and Pharmaceutical Methods of Treatment and Diagnosis. Research & Review: Drugs and Drugs Development 3(2), 1-10

3. American Cancer Society (2022). Cancer facts and figures. Atlanta: American Cancer Society. American Cancer Society, Inc., Surveillance and Health Equity Science, available at Cancer Facts & Figures 2022 | American Cancer Society

4. Anand, U., Dey, A., Chandel, A. K. S., Sanyal, R., Mishra, A., Pandey, D. K., & de la Lastra, J. M. P. (2022). Cancer chemotherapy and beyond: Current status, drug candidates, associated risks and progress in targeted therapeutics. Genes & Diseases. 10(4), Pages 1367-1401

5. Antúnez-Blancat A, Gago-Valiente FJ, García-Iglesias JJ, Merino-Navarro D. The Role of Nursing in the Management of Chemotherapy Extravasation: A Systematic Review Regarding Public Health. Healthcare (Basel). 2024 Jul 22;12(14):1456. doi: 10.3390/healthcare12141456. PMID: 39057599; PMCID: PMC11276807.

6. Aquil, A., El Kherchi, O., El Azmaoui, N., Mouallif, M., Guerroumi, M., Chokri, A., & Elgot, A. (2021). Body image dissatisfaction and lower self-esteem as major predictors of poor sleep quality in gynecological cancer patients after surgery: cross-sectional study. BMC Women's Health, 21(1), 229.

7. Arora RS, Prabha S, Moulik NR, Bagai P. A survey of immunization practices in children with cancer in India. Pediatric Hematol Oncol J. 2016;1:2-5.

8. Bakry, H., Waly, E. Effectiveness of Health Education on Safety Measures for Family Caregivers of Cancer Patients Receiving Cytotoxic Drugs. Zagazig University Medical Journal, 2024; 30(1.2): 121-128. doi: 10.21608/zumj.2022.113216.2447

9. Behiry, F. M., Darwish, M. M., Hassan, E. A. F., & Mahmoud, M. H. (2023). Self-esteem of acute leukemic children undergoing chemotherapy. Egyptian Nursing Journal, 20(1), 68.

10. Breen M, Coombes L and Bradbourne C (2009): Supportive care for children and young peapole during cancer treatment. Community practice journal:82(9):28-31.

11. Brown, P., & White, L. (2019). Advances in radiation therapy for pediatric oncology. Radiology Today, 18(5), 45-51.

12. Brown, T., & Miller, P. (2022). Early signs and symptoms of pediatric cancers. Pediatric Health Journal, 15(3), 123-130.

13. Cetin, Melissa MS*; Gumy-Pause, Fabienne MD†,‡; Gualtieri, Renato MD§; Posfay-Barbe, Klara M. MD, MS‖; Blanchard-Rohner, Geraldine MD, PhD, DPhil¶. Vaccine Immunity in Children After Hematologic Cancer Treatment: A Retrospective Single-center Study. Journal of Pediatric Hematology/Oncology 46(1):p e51-e59, January 2024. | DOI: 10.1097/MPH.0000000000002774

14. Choi EK, Kim IR, CHANG O, Kang D, Nam SL, LeeJE, lee SK, Im YH, Park YH, Yang JH and Cho J (2014): Impact of chemotherapy – induced alopecia distress on body image, psychosocial well-being, and depression in breast cancer patients. Pycho-Oncology journal;(23):1103-1110.

15. Current, J. R. (2020). How Can We Stop Cancer?. The Review: A Journal of Undergraduate Student Research, 21(1), 5.

16. Davis KF(2017): Dying and Death in oncology chapter of Pediatric Cancer and End-of-life in: Berk L(eds) . Dying in Oncology. Springer, Cham. Springer International Publishing Switzerland,USA Pp:147-169.

17. Davis KF(2017):Dying and Death in Oncology chapter of Pediatric Cancer and Ened-of-life In: Berk I.(eds). Dying and Death in Oncology Springer, Chem. Springer Publishing Switzerland,USA Pp:147-169.

18. Decadt, I., Laenen, A., Celus, J., Geyskens, S., Vansteenlandt, H., & Coolbrandt, A. (2021). Caregiver distress and quality of life in primary caregivers of oncology patients in active treatment and follow-up. European Journal of Cancer Care, 30(3), e13399.

19. Drury, A., Sulosaari, V., Sharp, L., Ullgren, H., de Munter, J., & Oldenmenger, W. (2023). The future of cancer nursing in Europe: Addressing professional issues in education, research, policy and practice. European Journal of Oncology Nursing, 63(1),102271. https://doi.org/10.1016/j.ejon.2023.102271.

20. Elsehrawy, M. G., Ibrahim, N. M., Eltahry, S. I., & Elgazzar, S. E. (2024). Impact of Educational Guidelines on Oral Mucositis Severity and Quality of Life in Oncology Patients Receiving Chemotherapy: A Quasi-Experimental Study. Asian Pacific journal of cancer prevention : APJCP, 25(7), 2427–2438. https://doi.org/10.31557/APJCP.2024.25.7.2427

21. Erdmann, F., Frederiksen, L. E., Bonaventure, A., Mader, L., Hasle, H., Robison, L. L., & Winther, J. F. (2021). Childhood cancer: survival, treatment modalities, late effects and improvements over time. Cancer epidemiology, 71(Part B), 101733. https://doi.org/10.1016/j.canep.2020.101733

22. Erdmann, F., Frederiksen, L. E., Bonaventure, A., Mader, L., Hasle, H., Robison, L. L., & Winther, J. F. (2021). Childhood cancer: survival, treatment modalities, late effects and improvements over time. Cancer epidemiology, 71, 101733.

23. Ferrua, M., Mathivon, D., Duflot-Boukobza, A., Abbas, M., Charles, C., Barrais, A., & Scotté, F. (2021). Nurse navigators' telemonitoring for cancer patients with COVID-19: a French case study. Supportive Care in Cancer, 29, 4485-4492. https://doi.org/10.1007/s00520-020-05968-y

24. Green, A., & Carter, M. (2021). Surgical innovations in pediatric cancer care. Journal of Pediatric Surgery, 56(3), 567-574.

25. Halkett, G. K., Lobb, E. A., Phillips, J. L., McDougall, E., Clarke, J., Campbell, R., & Care-IS Project Team Newton Jade Emery Laura Gilbert Marie Atwood Robyn Miller Lisa Agar Meera Moorin Rachael Shaw Therese Bulsara Max. (2023). Carer preparedness improved by providing a supportive educational intervention for carers of patients with high-grade glioma: RCT results. Journal of Neuro-Oncology, 161(3), 501-513.

26. Hockenberry MJ, Wilson D and Rodgers CC (2017): Wong's Essential of Pediatric Nursing. 10th ed. Canada, Elsever;P;825.

27. Johnson, K., & Lee, R. (2022). Immunotherapy breakthroughs in childhood cancer. Pediatric Oncology Reports, 10(2), 234-240.

28. Kaur, S., Mayanglambam, P., Bajwan, D., & Thakur, N. (2022). Chemotherapy and its adverse effects-A systematic review. International Journal of Nursing Education and Research, 10(4), 399-402.

29. Khoubila, N., Bendari, M., Benmiloud, S., ElHoudzi, J., Maani, K., Elmouden, L., ... & Hessissen, L. (2020). Pain management in children with cancer: National surveys of practices and perceptions in Morocco. Open Access Macedonian Journal of Medical Sciences, 8(B), 723-730.

30. Kiernan, G., Meyler, E., Guerin, S., (2010). Psychosocial issues and care in pediatric oncology:medical and nursing professionals' perceptions. Cancer Nurs. 33, E12–E20

31. Kjeldsted, E., Ammitzbøll, G., Jørgensen, L. B., Lodin, A., Bojesen, R. D., Ceballos, S. G., & Dalton, S. O. (2023). Neo-train: study protocol and feasibility results for a two-arm randomized controlled trial investigating the effect of supervised exercise during neoadjuvant chemotherapy on tumour response in patients with breast cancer. BMC cancer, 23(1), 777.

32. Klika R, Tamburini A, Galanti G and Mascherini G(2018): The Role of Exercise in Pediatric and Adolescent Cancer: A Review of Assessment and Suggestions for Clinical Implementation. Journal of Functional Morphology and Kinesiology;3(7):1-9.

33. Kong, X., Qi, Y., Wang, X., Jiang, R., Wang, J., Fang, Y., & Hwang, K. C. (2023). Nanoparticle drug delivery systems and their applications as targeted therapies for triple negative breast cancer. Progress in Materials Science, Volume 134(2023), 101070, ISSN 0079-6425, https://doi.org/10.1016/j.pmatsci.2023.101070.

34. Kyle T (2008): Essential of pediatric nursing 6th ed. Lippincott Williams & Wilkins co, Philadelphia . Pp :161,163,1623,968.

35. Lalithabai, Diana, BahaAldeen Tahar Mahmood, and Heba Jamal Salamah. "Safe Handling of Oral Chemotherapeutic Agents Among Nurses in Oncology Units." The Journal of Medicine, Law & Public Health 4.2 (2024): 371-384.

36. Landier, W., York, J.M., Wadhwa, A., Adams, K., Henneberg, H.M., Madan-Swain, A., Benton, B., Slater, V., Zupanec, S., Miller, J., Tomlinson, K., Richman, J.S., Bhatia, S., (2023). A structured discharge education intervention for parents of newly diagnosed pediatric oncology patients. J. Pediatric Hematol./Oncol. Nurs. 40, 145–157.

37. Lee, S., & Ziegler, E. (2022). Body Image Disturbance in Female Adolescents Using Online Learning Platforms: A Concept Analysis. Nurse Practitioner Open Journal, 2(1).

38. Li, C., Ure, C., Zheng, W., Zheng, C., Liu, J., Zhou, C., & Wu, Y. (2023). Listening to voices from multiple sources: A qualitative text analysis of the emotional experiences of women living with breast cancer in China. Frontiers in Public Health, 11, 1114139.

39. Malysse, Catherine & Romero-Galisteo, Rita-Pilar & Merchán-Baeza, Josan & Durán-Millán, J. & González Sánchez, Manuel & Galán-Mercant, Alejandro. (2021). Physical Activity Promotion Programmes in Childhood Cancer Patients and Their Impact on Fatigue and Pain: A Systematic Review. Children. 8. 1119. 10.3390/children8121119.

40. McHaro, S.K., Bally, J., Spurr, S., (2022). Nursing presence in pediatric oncology: a scoping review. J. Pediatr. Oncol. Nurs. 39 (2), 99–113.

41. Mestdagh, F., Steyaert, A., & Lavand'homme, P. (2023). Cancer Pain Management: A Narrative Review of Current Concepts, Strategies, and Techniques. Current oncology (Toronto, Ont.), 30(7), 6838–6858. https://doi.org/10.3390/curroncol30070500

42. Motill R (2015): Understanding cancer : Causes, Spread, and Control measures. Available at : http:google.come/books?isbn-1514400154. Accessed on (February 2, 2017)at 5:15pm.

43. Mustapha, A., Ismail, A., Abdullahi S.U., Hassan, O.N., Ugwunnaji, P.I. and Berinyu, E.B. (2021). Cancer Chemotherapy; A review update of the mechanisms of action, prospects and associated problems. BIOMED Natural and Applied Science. 01(01), 001–019

44. Özyılkan D . Oral and Dental Health in Pediatric Oncology Patients. Cyprus J Med Sci. 2024 Oct;9(5):297-301. doi:10.4274/cjms.2024.2024-24.

45. Pham, Q., Hearn, J., Gao, B., Brown, I., Hamilton, R. J., Berlin, A., ... & Feifer, A. (2020). Virtual care models for cancer survivorship. NPJ digital medicine, 3(1), 113.

46. Semenenko, E., Banerjee, S., Olver, I., & Ashinze, P. (2023). Review of psychological interventions in patients with cancer. Supportive Care in Cancer, 31(4), 210.

47. Smith, R., & Johnson, L. (2023). Pediatric oncology: Advances in diagnosis and treatment. New York: Medical Press.

48. Sun, Y., Liu, Y., Ma, X., & Hu, H. (2021). The influence of cell cycle regulation on chemotherapy. International journal of molecular sciences, 22(13), 6923.

49. Taylor, D., & Smith, L. (2021). Stem cell transplantation for pediatric cancers: An overview. Bone Marrow Transplantation Journal, 30(4), 123-129.

50. Tort-Nasarre, G., Pollina Pocallet, M., & Artigues-Barberà, E. (2021). The meaning and factors that influence the concept of body image: Systematic review and meta-ethnography from the perspectives of adolescents. International Journal of Environmental Research and Public Health, 18(3), 1140.

51. Tuominen, L., Stolt, M., Meretoja, R., & Leino-Kilpi, H. (2019). Effectiveness of nursing interventions among patients with cancer: an overview of systematic reviews. Journal of clinical nursing, 28(13-14), 2401-2419.

52. Vaartio-Rajalin, H., Santamäki-Fischer, R., Jokisalo, P., & Fagerström, L. (2021). Art making and expressive art therapy in adult health and nursing care: A scoping review. International journal of nursing sciences, 8(1), 102-119.

53. van Hof, K. S., Hoesseini, A., Verdonck-de Leeuw, I. M., Jansen, F., Leemans, C. R., Takes, R. P., ... & Offerman, M. P. (2023). Self-efficacy and coping style in relation to psychological distress and quality of life in informal caregivers of patients with head and neck cancer: a longitudinal study. Supportive Care in Cancer, 31(2), 104.

54. Wang, J., Coyte, P. C., Shao, D., Zhen, X., Zhao, N., Sun, C., & Sun, X. (2022). The Relationship between the Unmet Needs of Chinese Family Caregivers and the Quality of Life of Childhood Cancer Patients Undergoing Inpatient Treatment: A Mediation Model through Caregiver Depression. International Journal of Environmental Research and Public Health, 19(16), 10193.

55. Wang, J., Yan, C., & Fu, A. (2019). A randomized clinical trial of comprehensive education and care program compared to basic care for reducing anxiety and depression and improving quality of life and survival in patients with hepatocellular carcinoma who underwent surgery. Medicine, 98(44).

56. Warnakulasuriya, S., Kujan, O., Aguirre-Urizar, J. M., Bagan, J. V., González-Moles, M. Á., Kerr, A. R., & Johnson, N. W. (2021). Oral potentially malignant disorders: A consensus report from an international seminar on nomenclature and classification, convened by the WHO Collaborating Centre for Oral Cancer. Oral diseases, 27(8), 1862-1880.

57. Wasserman, S., Davis, A., Stek, C., Chirehwa, M., Botha, S., Daroowala, R., & Wilkinson, R. J. (2021). Plasma pharmacokinetics of high-dose oral versus intravenous rifampicin in patients with tuberculous meningitis: a randomized controlled trial. Antimicrobial agents and chemotherapy, 65(8), 1110-1128.

58. Wu, Z., Fu, X., Jing, H., Huang, W., Li, X., Xiao, C., ... & You, F. (2024). Herbal medicine for the prevention of chemotherapy-induced nausea and vomiting in patients with advanced colorectal cancer: A prospective randomized controlled trial. Journal of Ethnopharmacology, 325, 117853

59. Wustefeld-Janssens, B., Smith, L., & Wilson-Robles, H. (2021). Neoadjuvant chemotherapy and radiation therapy in veterinary cancer treatment: a review. Journal of Small Animal Practice, 62(4), 237-243.

60. Yabroff, K. R., Bradley, C., & Shih, Y. C. T. (2020). Understanding financial hardship among cancer survivors in the United States: strategies for prevention and mitigation. Journal of Clinical Oncology, 38(4), 292.

61. Yamani Ardakani, B., Tirgari, B., & Roudi Rashtabadi, O. (2020). Body image and its relationship with coping strategies: The views of Iranian breast cancer women following surgery. European Journal of Cancer Care, 29(1), e13191.