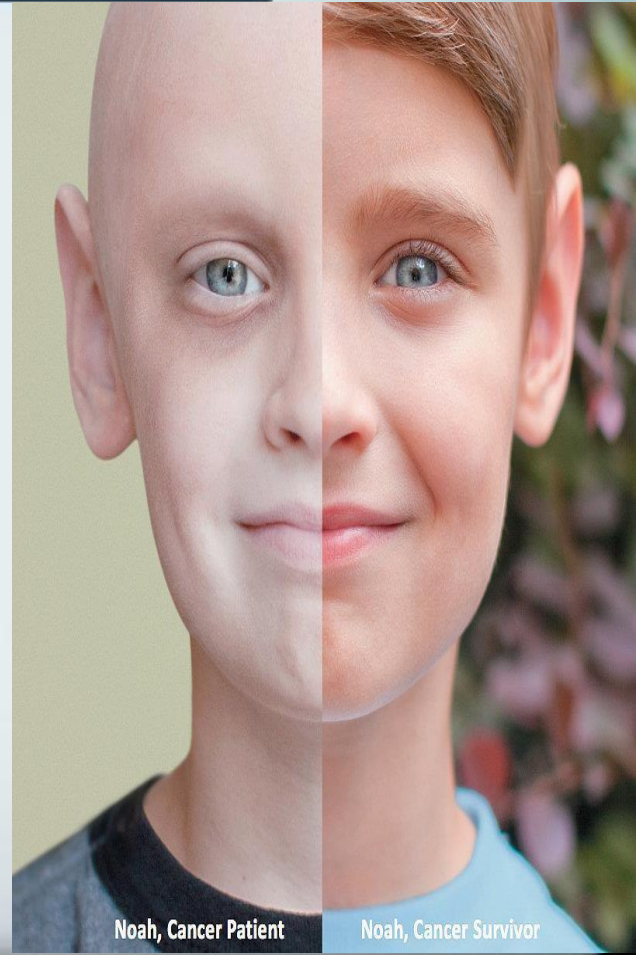
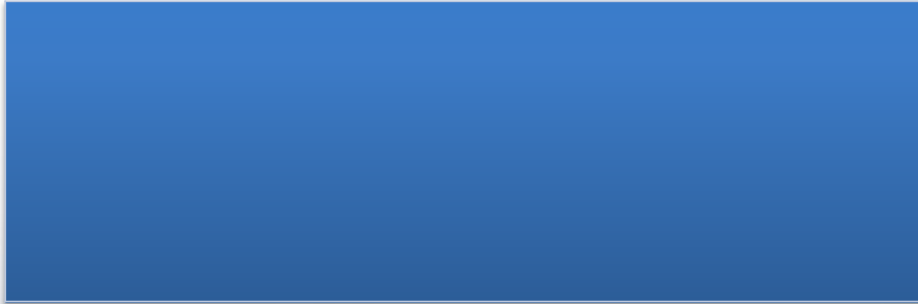


NURSING CARE OF A CHILD WITH NEOPLASTIC DISORDER



Noah, Cancer Patient

Noah, Cancer Survivor

Context

Incidence of childhood cancer

General characteristics of childhood cancer

Etiology and pathophysiology of childhood cancer

Treatment methods of childhood cancer

Emergencies in Pediatric Oncology and Care

Symptom Management

Types of cancers in children

CHILDHOOD CANCER

- Childhood cancers are a chronic problem and their incidence has become an increasingly important health problem all over the world.
- Cancer accounts for the most deaths from disease in children older than 1 year of age.

(ACS, 2021; WHO, 2021)

Epidemiology

- Childhood cancers constitute approximately 1-4% of all cancers (WHO, 2019).

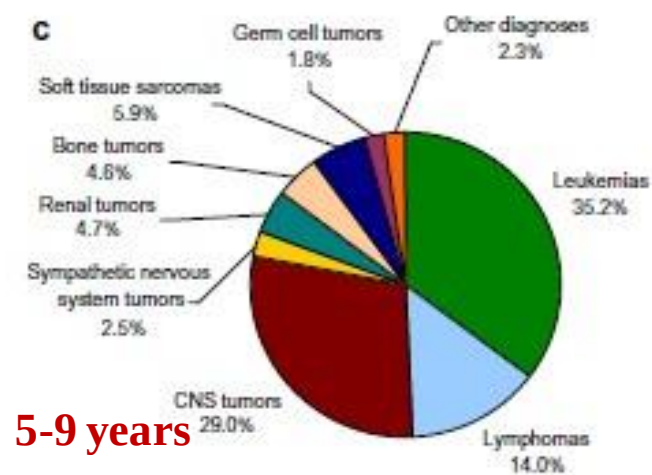
Childhood Cancers

International Classification of Childhood Cancer (ICCC, 2019)*

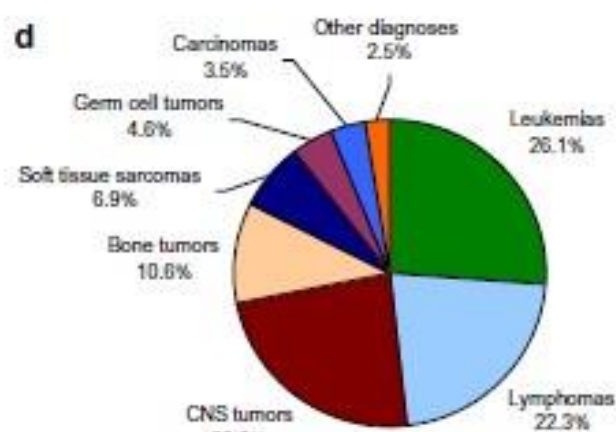
1. Leukemias, myeloproliferative diseases, and myelodysplastic diseases
2. Lymphomas and reticuloendothelial neoplasms
3. CNS and miscellaneous intracranial and intraspinal neoplasms
4. Neuroblastoma and other peripheral nervous cell tumors
5. Retinoblastoma
6. Renal tumors
7. Hepatic tumors
8. Malignant bone tumors
9. Soft tissue and other extraosseous sarcomas
10. Germ cell tumors, trophoblastic tumors, and neoplasms of gonads
11. Epithelial neoplasms and malignant melanomas
12. Other and unspecified malignant neoplasms

International Classification of Childhood Cancer, ICCC Recode ICD-O-3/WHO, 2019

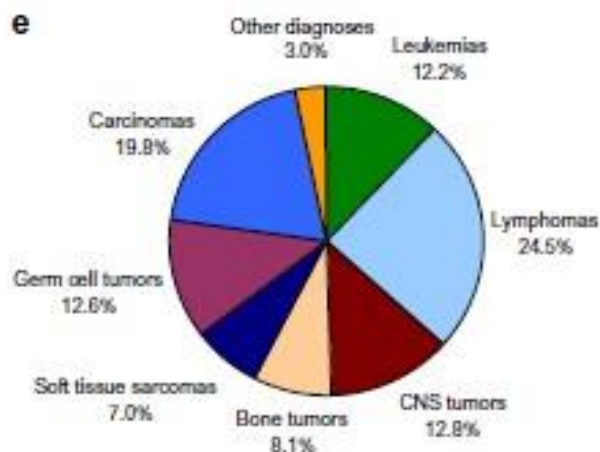
Most common cancer types in world



5-9 years



10-14 years



15-19 years

Etiology

- Idiopathic causes of most cancers
 - Chemical carcinogens and drugs
 - Radiation exposure
 - Viruses
 - Genetic and hereditary conditions with oncogenes
- allow unregulated genetic activity and **tumor growth**
(Wilms' tumor)

Names of Benign and Malignant Tumors

Tissue	Benign Tumors	Malignant Tumors
Connective Tissue		
Bone	Osteoma	Osteosarcoma
Cartilage	Chondroma	Chondrosarcoma
Endothelium and Mesothelium		
Blood vessels	Hemangioma	Hemangiosarcoma
Muscle		
Striated muscle	Rhabdomyoma	Rhabdomyosarcoma
Epithelial Tissues		
Glandular epithelium	Adenoma	Adenocarcinoma

**TREATMENT OF
CHILDHOOD CANCER**

Treatments

- Surgery
- Radiotherapy
- Chemotherapy
- Biotherapy
- Hematopoietic Stem Cell Transplantation

RADIOTHERAPY

- *The use of ionizing radiation for treatment purposes.*
- *The goal is to provide control of local tumors.*

✓ Radiation affects not only cancer cells but also any rapidly growing cells with which they are in contact.

RADIOTHERAPY

Short-term side effects

- Desquamation
- Alopecia
- Nausea
- Vomiting
- Mucositis
- Headache
- Fatigue

RADIOTHERAPY

Long-Term Side Effects

Bones

Hormones

Nervous system

Lungs

Heart

Liver

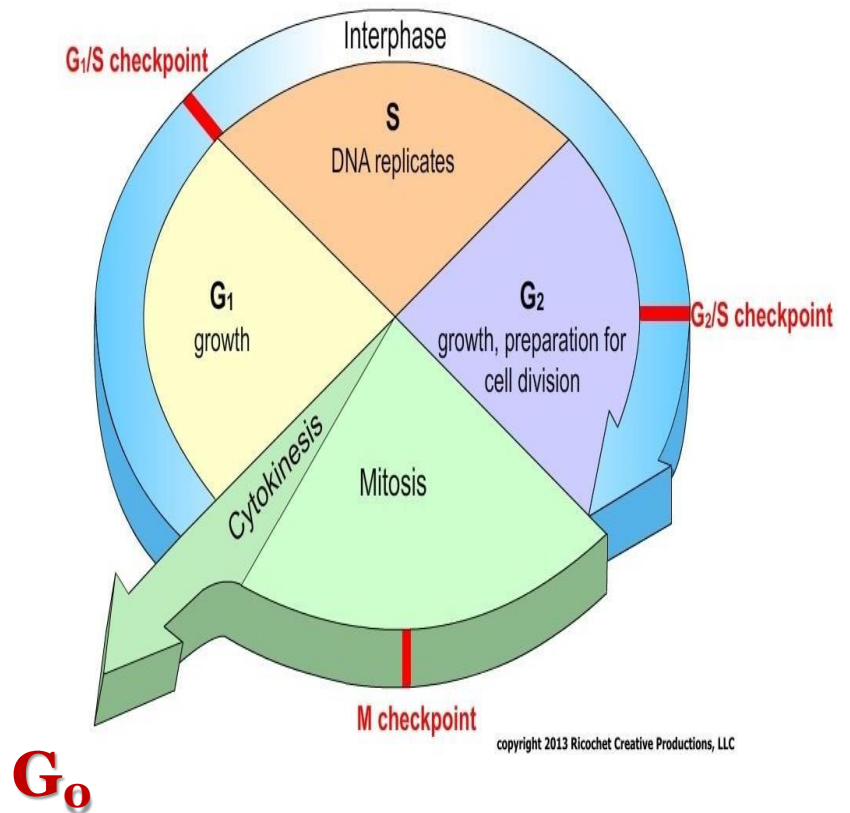
Kidney and bladder

CHEMOTHERAPY

- Stop cell division or
- Causes cell death

CELL CYCLE

- ❑ **G₀ phase:** the resting phase
- ❑ **G₁ phase:** preparation for dividing
- ❑ **S phase:** DNA replicates
- ❑ **G₂ phase:** just before the cell splits into two cells
- ❑ **M phase:** mitosis



Alkylating agents
G1 and S phases.

Antimetabolites
S phase specific effect

Alcaloids
M phase

Antitumor antibiotics
Inhibits DNA synthesis (S)

Other Drugs
Steroids, Enzymes (Asparaginase)

Protocol!

Chemotherapeutic Agents

Chemotherapy drugs are divided into classes that have an effect on different portions of the cell cycle.

Lumbar Puncture



Intrathecal chemotherapy

To prevent metastasis to CNS, chemotherapy is given directly to the cerebrospinal fluid (CSF)

EXTRAVASATION!!!

- ✓ Stop the infussion,
- ✓ Notify the team,
- ✓ Remove the set of IV solution from the port but leave the port in place,
- ✓ Aspirate the residual drug inside the injector,
- ✓ Give antidote,
- ✓ Elevate the affected area,
- ✓ Apply cold or warm according to drug,

BIO THERAPY (IMMUNOTHERAPY)

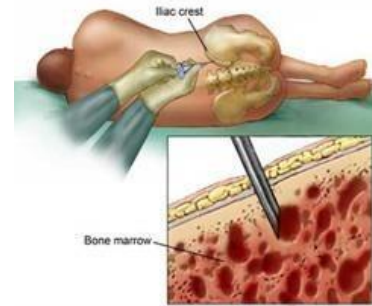
It is the treatment using biologically active agents with the ability to affect the biological response.

Tumor necrosis factor (protein cytokine) Increases effectiveness of immune cells, stops cancer cells from dividing, damages tumor blood vessels, Used in a variety of cancer protocols	May cause fever, chills, rigors, nausea, vomiting.
Colony-stimulating factors: darbepoetin alfa, epoetin alfa Stimulate production of red blood cells (epoetin) or granulocytes Used to counteract myelosuppressive effects of chemotherapy	Administer SQ or IV. Filgrastim, sargramostim: may cause bone pain. Sargramostim may cause hypotension and a first-dose reaction.
Cancer Vaccine	Human papilloma virus (HPV)
Interferons: α , γ Alter cancer cell proliferation (α), stimulate macrophage production to fight bacteria and fungus (γ) Indicated in a variety of cancer Protocols	May cause fl u-like symptoms. Maintain adequate hydratiON

Hematopoietic Stem Cell Transplantation (HSCT)

- The goal of hematopoietic stem cell transplantation is to replace diseased or damaged hematopoietic stem cells with healthy ones.

- Bone marrow
 - Peripheral blood
 - Umbilical cord
- } stem cells could be taken.



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- *Autologous Transplantation*
- *Allogenic Transplantation*
- *Isogenic Transplantation*

Complementary therapies

- Acupuncture
- Aromatherapy
- Massage
- Listening to music
- Energy therapies
- Mind-body therapies
- Exercise

**PEDIATRIC
ONCOLOGICAL
EMERGENCIES**

Tumor Lysis Syndrome

This is a syndrome that develops when many cancer cells pass away quickly, releasing their contents into the blood.

Urine, potassium, and phosphorus levels rise more quickly than the kidneys can eliminate them when cancer cells decompose rapidly in the body.

Problems; Pain, arrhythmia, muscle cramps, tetany, lethargy, nausea, vomiting, oliguria, pruritus, changes in consciousness

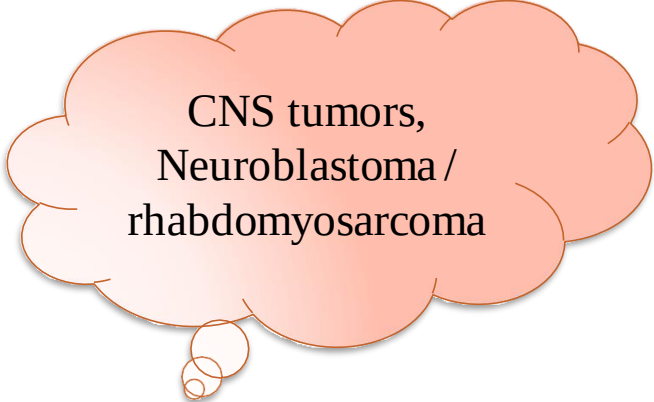
- Preventive measures, early diagnosis and early intervention
- Serum electrolyte levels, urine pH
- Monitor intake and output
- Provide hydration (3000 cc and more/m²)
- 24-48 hours before for prophylaxis (Allopurinol, NaHCO₃)

Spinal Cord Pressure



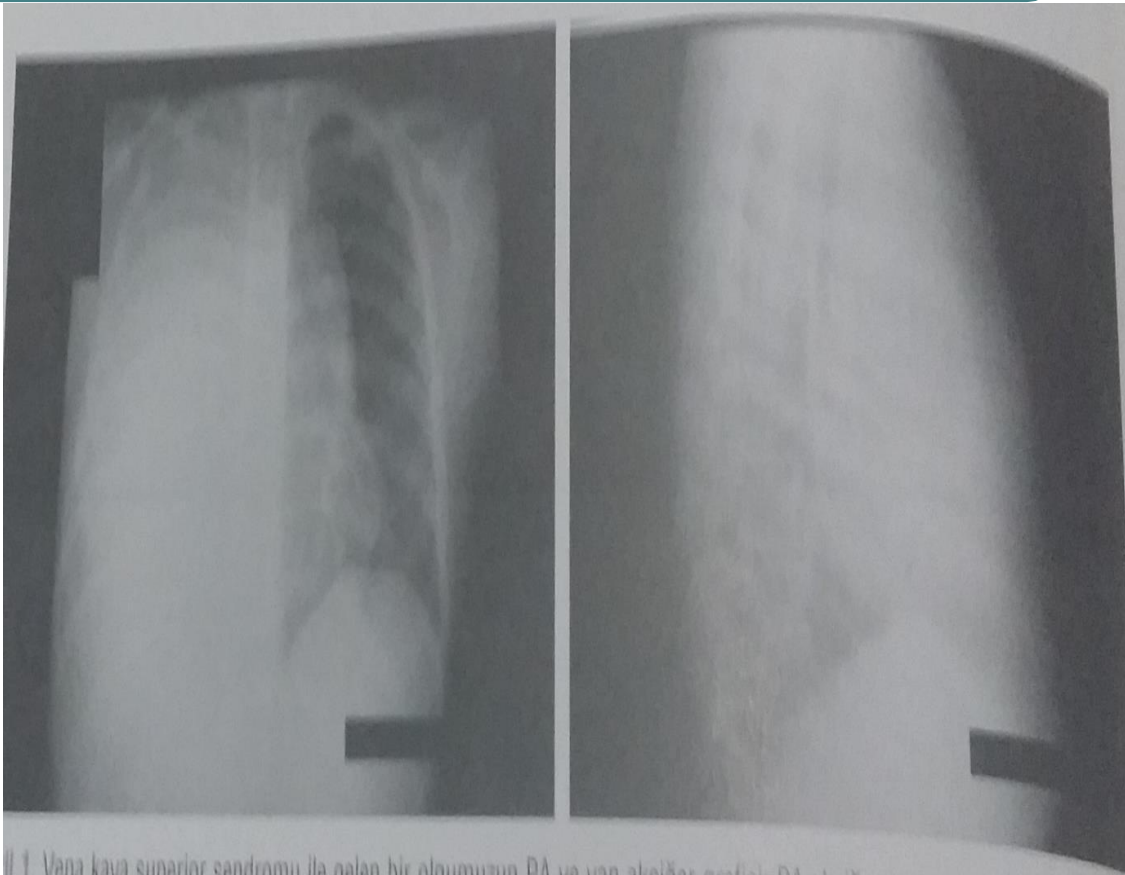
Spinal Cord Pressure

- It occurs in 2-5% of children with cancer.
- Clinical findings vary according to the level of the mass.
 - Back pain,
 - Progressive weakness,
 - Paralysis,
 - Sensory disorder,
 - Bowel-bladder function Loss,
 - Shortness of breath



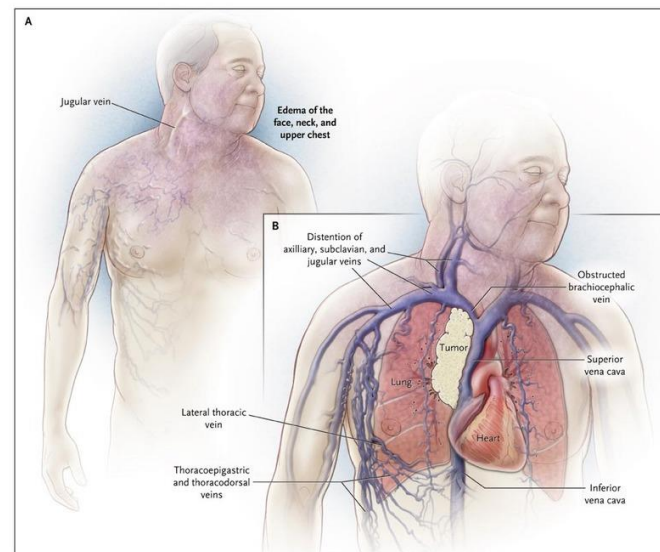
CNS tumors,
Neuroblastoma /
rhabdomyosarcoma

Vena Cava Superior Syndrome



Vena Cava Superior Syndrome

- Due to mass at the mediastinal space, a constriction in the vena cava superior prevents the blood flow.
- Neck, arm and face edema, dyspnea, cough, orthopnea position



***SIDE EFFECTS AND
SYMPTOM MANAGEMENT
IN PEDIATRIC
ONCOLOGY***

MYELOSUPPRESSION
!!!!



INFECTION



BLEEDING

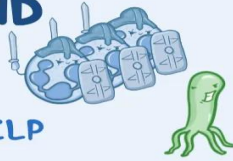


ANEMIA

INFECTION RELATED TO NEUTROPENIA

BACKGROUND

- ↓ CONCENTRATION of NEUTROPHILS in the BLOOD
- NEUTROPHILS = WBC that HELP FIGHT INFECTION



MASCC RISK INDEX

CHARACTERISTIC	WEIGHT
Burden of febrile neutropenia with no or mild symptoms	5
No hypotension (systolic BP >90mm Hg)	5
No chronic obstructive pulmonary disease	4
Solid tumor or hematological malignancy with no previous fungal infection	4
No dehydration requiring parenteral fluids	3
Burden of febrile neutropenia with moderate symptoms	3
Outpatient status	3
Age >60 years	2

Source: <https://www.mascc.org/mascc-fn-risk-index-score>

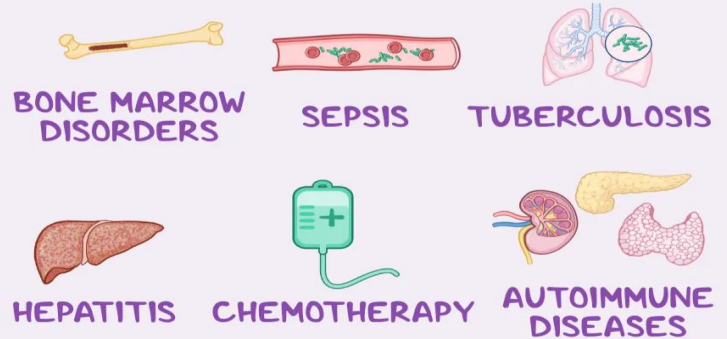


FEVER ($\geq 101^{\circ}\text{F}$)

MUCOSITIS of GASTROINTESTINAL TRACT

ABDOMINAL PAIN

CAUSES



Febrile neutropenia

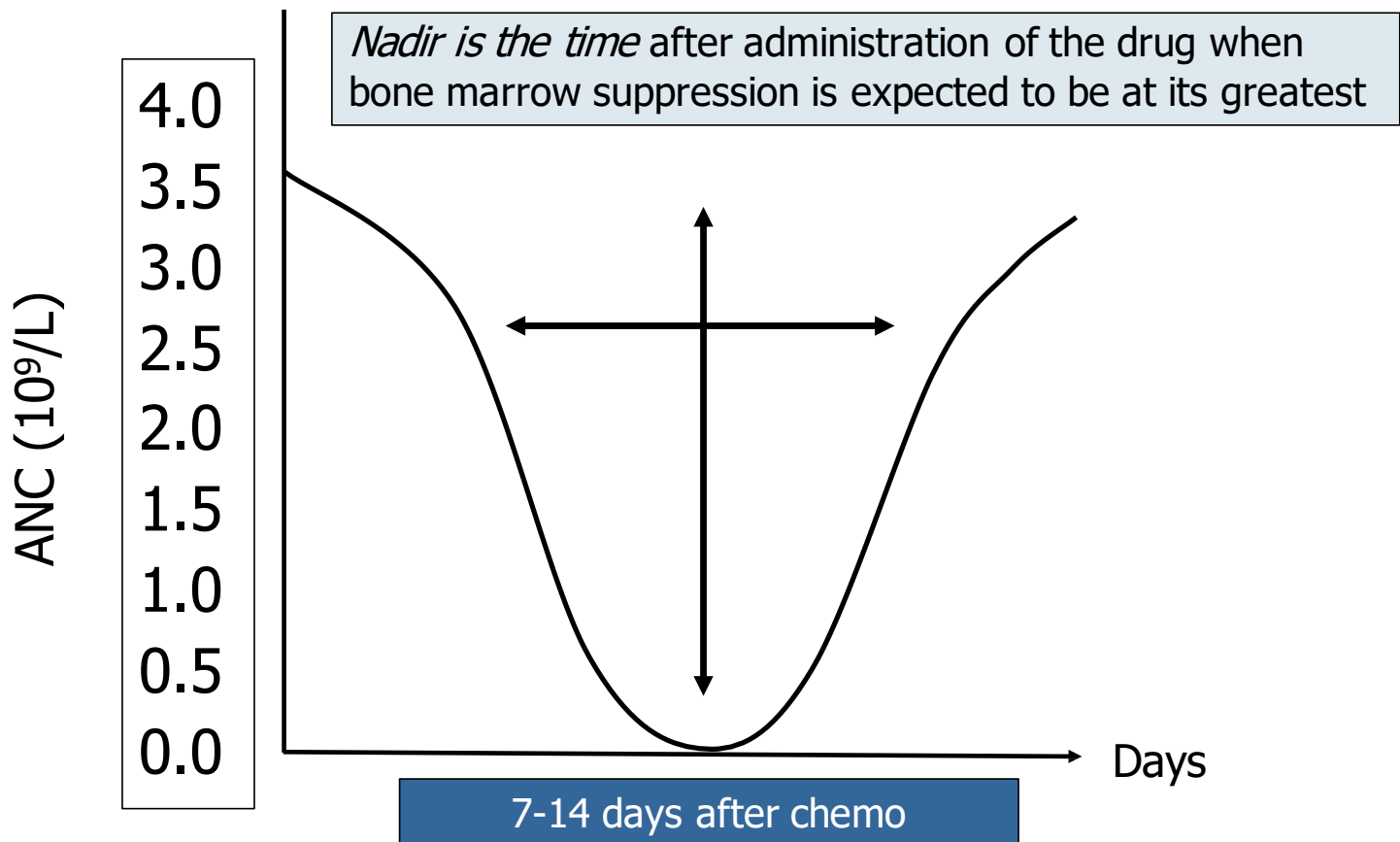
more than 38.3 C fever,

Serious infection

General malaise

Risk of convulsion

Nadir Period (The neutrophil count is expected to be at its lowest - neutropenia)



Nursing Care

- Private room
- Avoid rectal suppositories, enemas, or examinations
- Restrict visitors with fever, cough, or other signs/ symptoms of infection.
- Do not permit raw fruits or vegetables or fresh flowers or live plants in the room.
- Place a mask on the child when he or she is being transported outside of the room.

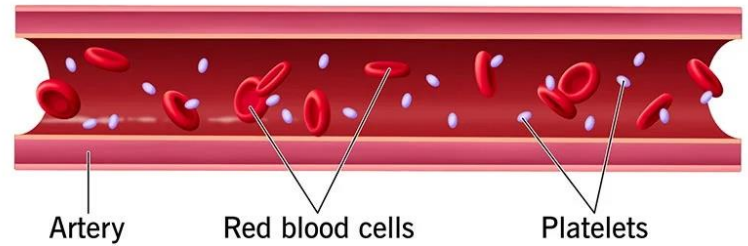
Bleeding due to Thrombocytopenia

low platelet count

Thrombocytopenia

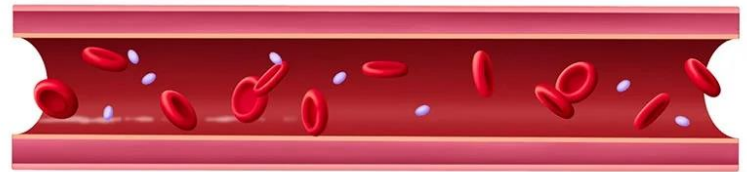
Normal platelet count

150,000 - 450,000



Thrombocytopenia

< 140,000



Nursing Care in Thrombocytopenia

- Provide the safety
- Continue skin care
- Provide oral care (soft toothbrush, dental floss, etc.)
- Inform the child and the parent about signs and symptoms of bleeding
- Monitor the child for bleeding (petechiae, ecchymosis, hematemesis, hematuria, etc.)
- Follow the platelet and other coagulation tests
- Monitor the vital signs (filiform pulse, hypotension)
- Prevent constipation, laxatives
- Thrombocyte infusion (10,000 / mm³)
- NSAID use in pain control (as irin)

Anemia

TABLE 2. Classification of anemia by degree of severity

Degree of Severity	Hemoglobin level
Normal hemoglobin level	>11g/dl
Mild Anemia	9-11g/dl
Moderate	7-9g/dl
Severe	4-7g/dl
Very severe	<4g/dl

Hypoxia!!!

- ✚ Nutritional support
- ✚ Iron treatment
- ✚ Erythrocyte transfusion
- ✚ Erythropoiesis-inducing treatments

Fatigue

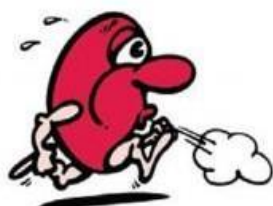
FATIGUE SCALE

Select the number that best describes how you feel today.



NO
FATIGUE

0



MILD
FATIGUE

1 2 3



MODERATE
FATIGUE

4 5 6



EXTREME
FATIGUE

7 8 9



THE WORST
FATIGUE

10

Mucositis

Stomatitis; Oral mucosa mucositis

Esophagitis; Mucositis in the esophagus

Enteritis; Mucositis in the small intestine

Mucositis Incidence

- Chemo 40-80%
- HSCT (hematopoietic stem cell transplant) 80%
- Radiotherapy to neck and head ~ 100%

NCI Oral Toxicity Scale



a. Grade 1: erythema of the mucosa



b. Grade 2: patchy ulcerations or pseudomembranes



c. Grade 3: confluent ulcerations or pseudomembranes; bleeding with minor trauma



d. Grade 4: tissue necrosis, significant spontaneous bleeding, life-threatening consequences

Grade 0	No change
Grade 1	Soreness/erythema
Grade 2	Erythema, ulcers, can eat solid food
Grade 3	Ulcer, requires liquid diet only
Grade 4	Severe ulceration, necrosis, need parenteral or enteral support

FIGURE 2. EXAMPLES OF GRADES OF MUCOSITIS BASED ON NATIONAL CANCER INSTITUTE CRITERIA
Note. Photos courtesy of Mark Schubert, MSD. Reprinted with permission.

Providing oral and dental hygiene

- ✓ Mouth and teeth are assessed daily,
- ✓ Appropriate oral care protocol is administered,
- ✓ The patient's complete blood count is followed,
- ✓ Nutritional support is provided;
 - ✓ Not irritating foods (hot, spice, orange, lemon, etc.) and solid (bagels, apples, etc.)
 - ✓ Enteral or parenteral feeding is started with physician's order,
- ✓ Appropriate antibiotics will be started if necessary
- ✓ Pain control should be done

Oral Care Protocol

Grade 0 ; Routine care

Grade 1	}	Every 2 hours while awake, after meals,
Grade 2		Every 6 hours during night, adequate hydration
Grade 3	}	Every 2 hours while awake, after meals,
Grade 4		Every 4 hours during night, adequate hydration

parenteral/enteral nutritional support

- Oral care with sodium bicarbonate,
- Local anesthetics (alcohol-free),
- Chlorhexidine gluconate for prevention,
- Prophylactic antibiotics and antifungals

If platelets <50.000mm³ and neutrophil < 1000

DO NOT USE toothbrush and dental floss

Lemon glycerinated sponges,

hydrogen peroxide,

magnesium hydroxide are NOT USED.

Other Symptoms

- Diarrhea,
- Constipation,
- Anorexia,
- Taste change



Chemotherapy often causes alopecia.

Nursing Diagnosis

- **Ineffective respiratory pattern** due to pressure on the airway of the tumor located in the head and neck region
- **Ineffective peripheral tissue perfusion** due to deterioration of blood flow
- **Imbalance of nutrition: less than requirement** due to insufficient intake of nutrients
- **Fluid volume deficiency** due to antineoplastic treatment
- **Activity intolerance** due to general fatigue
- **Acute pain** due to chemotherapy and disease process
- **Risk of infection** due to changes in the immune system
- **Risk of bleeding** due to thrombocytopenia
- **Ineffective family coping** due to cancer diagnosis and treatment process
- **Altered in family processes** due to cancer diagnosis and treatment process



LEUKEMIA

Leukemia

Childhood leukemia is the most common pediatric malignancy and accounts for approximately 30% of childhood cancers below 15 years of age.

Prognose

- The higher the WBC count at diagnosis, the worse the prognosis.
- When a child experiences a relapse, the prognosis becomes poorer.
- Most children will achieve initial remission if appropriate treatment is given. The overall cure rate of ALL is over 80%

Clinical Manifestations

- Fever,
 - Bleeding, petechiae,
 - Fatigue,
 - Anorexia,
 - Greater joint or bone pain
 - Growth in the liver and spleen
 - Changes in lymph nodes (lymphadenopathy).
- CNS Infiltration**
 - Headache,
 - Vomiting,
 - Papillary edema and cranial nerve paralysis

LYMPHOMAS

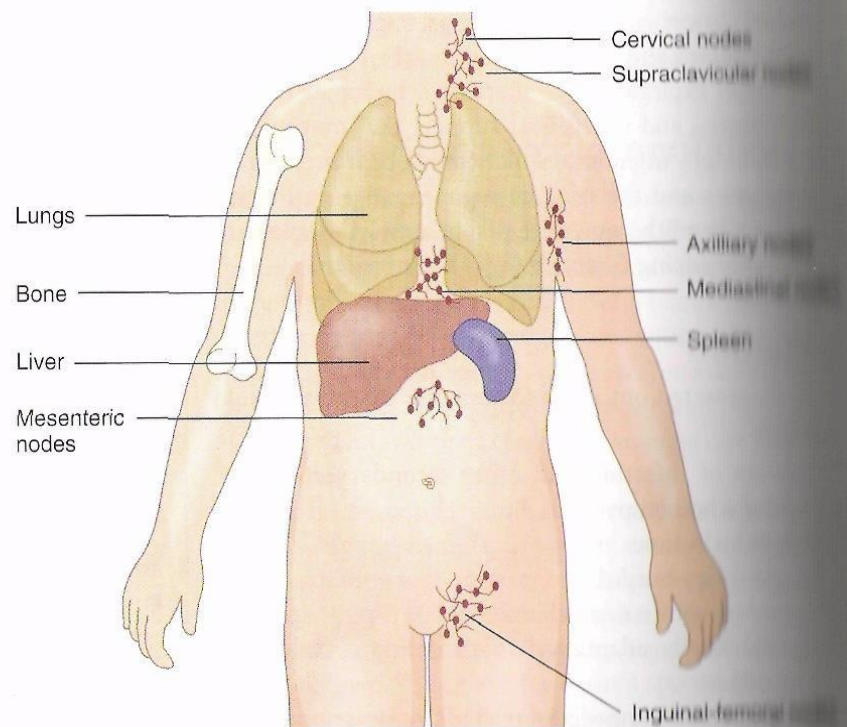
Lymphomas

- Hodgkin lymphoma (HL) (40-45%)
- Non-Hodgkin lymphoma (NHL) (55-60%)

Hodgkin disease tends to affect lymph nodes located closer to the body's surface, whereas NHL tends to affect lymph nodes located more deeply inside the body.

Hodgkin Disease

FIGURE 29-15 ■ Lymph nodes and organs affected in Hodgkin disease in children.



HODG

➤ Malign



Etiology

- Genetic predisposition (siblings, parents)
- Epstein-Barr virus

Clinical Manifestations

- Generally painless lymphadenopathy
- 80% cervical
- Mediastinal lymphatic growth, respiratory distress
- Unexplained subfebrile fever, night sweats,
- Weight loss up to 10% of body weight over the last 6 months

Diagnosis

- Classification
- Biopsy of nodes,
- Chest radiography, Computed tomography (CT) scan,
Magnetic resonance imaging (MRI)

Staging of Hodgkin Disease

STAGE	CLINICAL FINDING
I	One group of lymph nodes is affected.
II	Two or more groups on the same side of the diaphragm are affected.
III	Groups of lymph nodes at different sides are affected.
IV	Metastasis to organs such as the liver, bone, or lungs
A or B suffix	A—Absence of systemic symptoms at diagnosis B—Systemic symptoms present at diagnosis (fever, night sweats, weight loss)

Treatment

- ❖ Chemotherapy and radiotherapy

Prognosis

Children with Hodgkin disease have a 75% 20-year survival rate

NON-HODGKIN LYMPHOMA (NHL)

1. Lymphoblastic lymphoma (30-40%)
2. Burkitt's lymphoma (40-50%)
3. Large cell lymphoma (15%)

Peak at 7-10 years, under 2 years is rare.

a cancer of immature lymphocytes, cells of the immune system

rare but highly aggressive (fast-growing)

B-cell non-Hodgkin lymphoma (NHL)

a type of non-Hodgkin lymphoma. It's a cancer in the lymphatic system

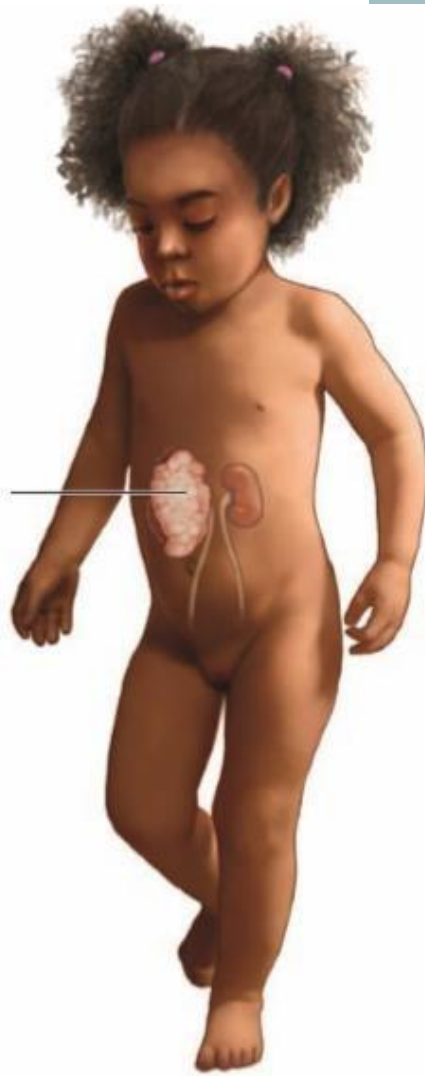
ALERT

Cough, dyspnea, orthopnea, facial edema, or venous engorgement may indicate mediastinal disease in the child with NHL. This is an emergency requiring rapid treatment.

WILMS TUMOR

- Peak incidence occurs between the ages of 2 and 3 years
- It usually affects only one kidney.
- Wilms tumor demonstrates rapid growth and is usually large at diagnosis.

Right kidney with
Wilms' tumor



Wilms Tumor

➡ The overall survival rate is about 90%

Clinical Manifestations

- Abdominal pain, constipation, vomiting, anorexia, weight loss, or difficulty breathing.
- Hemihypertrophy of the spine, genitourinary anomalies, absence of the iris
- Hypertension occurs in 25% of children with Wilms tumor

TAKE NOTE!

Avoid palpating the abdomen after the initial assessment preoperatively. Wilms tumor is highly vascular and soft, so excessive handling of the tumor may result in tumor seeding and metastasis.

Staging

Stage I	Unilateral, limited to kidney, completely resectable
Stage II	Unilateral, tumor extends beyond kidney but is completely resectable
Stage III	Unilateral, tumor has spread outside of kidney, located in abdominal cavity only, not fully removed
Stage IV	Unilateral with metastasis in liver, lung, bone, or brain
Stage V	Bilateral kidney involvement

BRAIN TUMORS

- Brain tumors are the most common form of solid tumor and the second most common type of cancer in children.

TREATMENT

- Surgery
- Radiotherapy
- Chemo

Take Note!

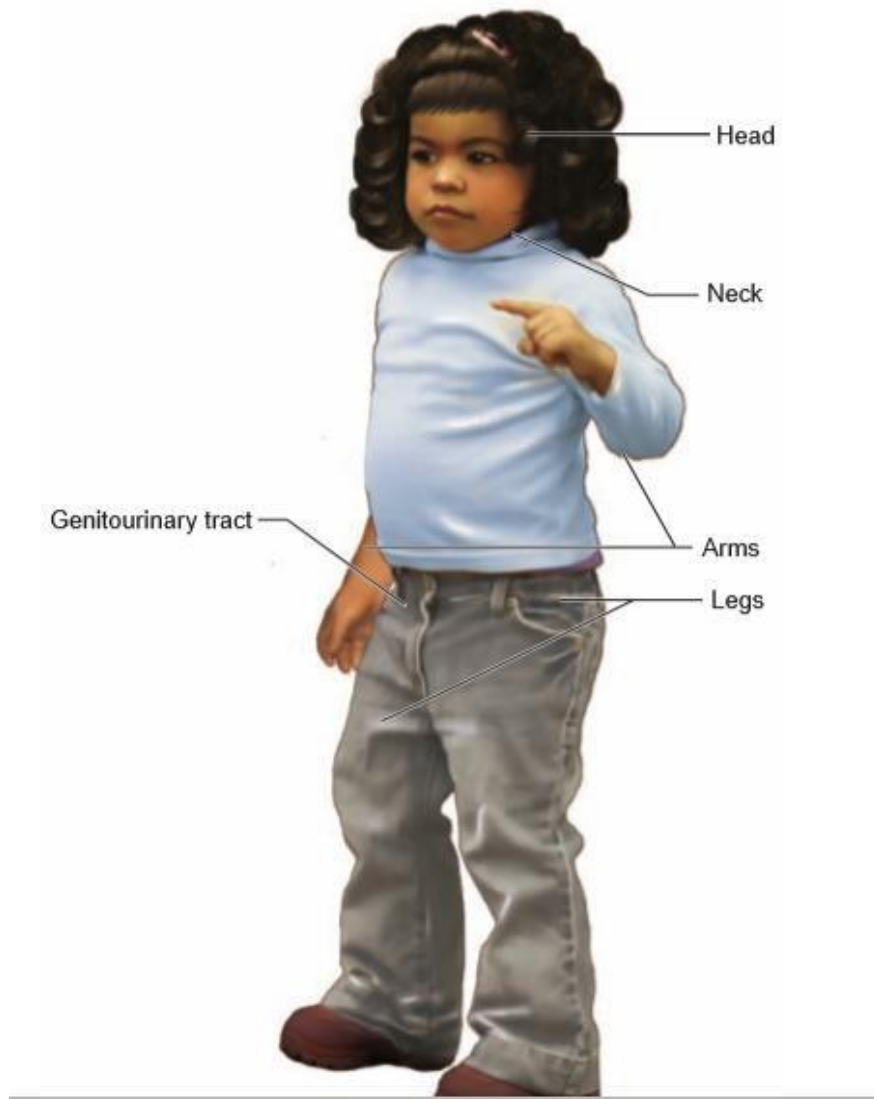
Observe preoperative vital signs, intracranial pressure, changes in vital signs, bradycardia, irregular pulse, and changes in body temperature.

Position the child on the unaffected side with the head of the bed flat or at the level prescribed by the neurosurgeon.

RHABDOMYOSARCOMA

- Rhabdomyosarcoma is a soft tissue tumor that usually arises from the embryonic mesenchymal cells
- Lungs are the most common site for metastasis.

Most common locations



Rhabdomyosarcoma

- Complications of rhabdomyosarcoma include metastasis to lung, bone, or bone marrow and direct extension into the CNS, resulting in brain stem compromise or cranial nerve palsy.
- Surgical removal of the primary tumor is generally performed.

Take Note!

- Primary tumors arising in the neck region may compress the child's airway. Assess work of breathing and lung sounds.

RETINOBLASTOMA

- Retinoblastoma is a congenital, highly malignant tumor that arises from embryonic retinal cells.
- It accounts for 5% of cases of blindness in children.
- It could be autosomal dominant mode (40%).
- Complications include spread to the brain and the opposite eye, as well as metastasis to lymph nodes, bone, bone marrow, and liver.



Parents are often the first to notice the “cat’s eye reflex” to the child’s affected pupil.

Take Note!

- Educate parents about protecting vision in the remaining eye: routine eye check-ups, protection from accidental injury, use of safety goggles during sports, and prompt treatment of eye infections.
- Generally, children with one eye should not participate in contact sports.



BONE TUMORS

OSTEOSARCOMA

- The most common bone cancer in children
- The most common location is distal femur
- More in adolescence



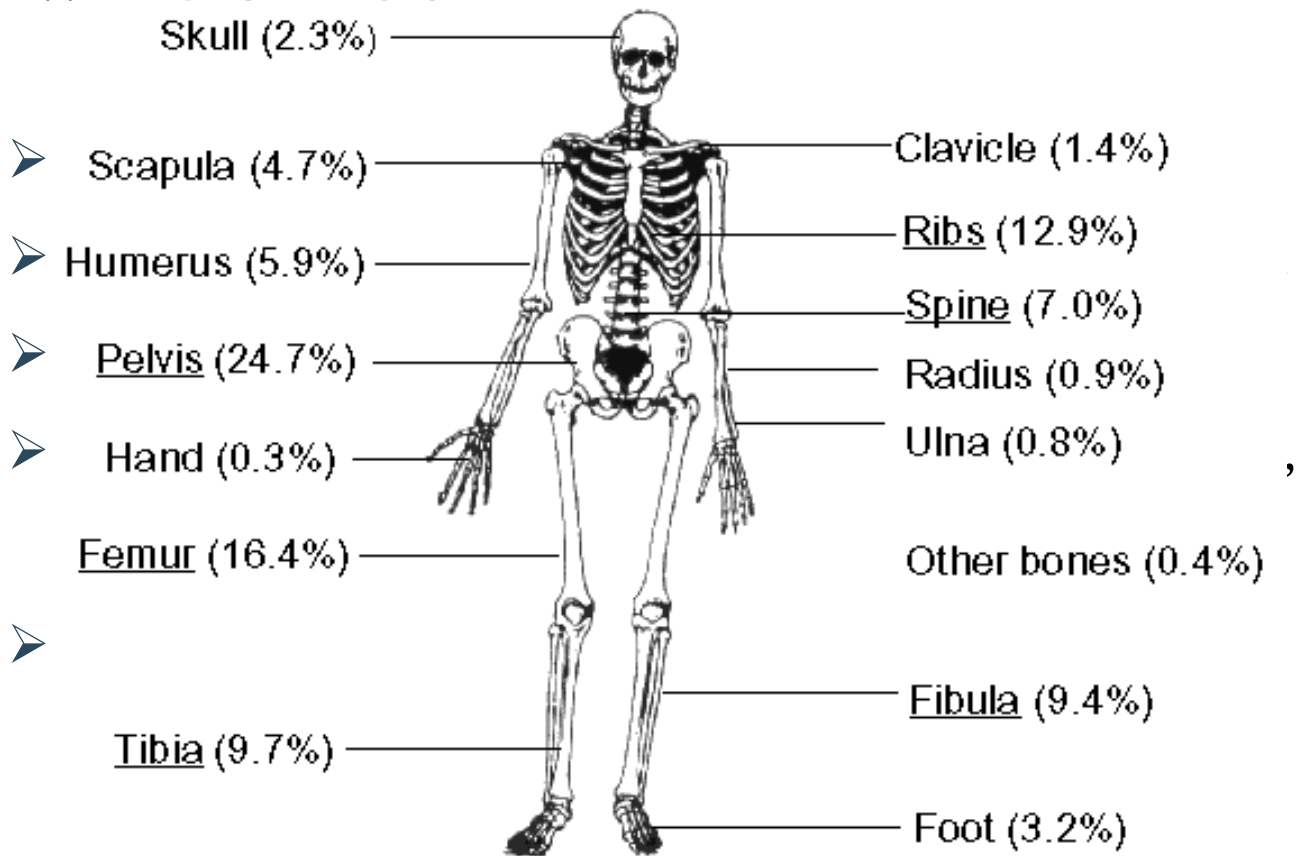
Symptoms

- Bone pain
- Growing aches
- Increase in pain after the activity
- Restriction of movement

Treatment

- Surgery (amputation)
- Chemo (high dose)
- Radiotherapy

EWING SARCOMA





- Phantom pain, devices, emotional support (body-image)

MONITORING SURVIVORS

PALIATIVE CARE

FAMILY CARE AFTER DEATH



Noah, Cancer Patient

Noah, Cancer Survivor

THANK YOU

