



Childhood Cancer

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Childhood Cancer

- **Incidence**
 - **Second leading cause of death in children**
 - **9500 children up to age 15 are diagnosed annually**
 - **1 in every 900 people between the ages of 15 and 45 will be a survivor of childhood cancer**

What is Childhood Cancer?

- **Childhood Cancer is the leading cause of death in children under 18 and is actually a collection of diseases.**
- **Children are diagnosed with many different forms of cancer. There are 12 major types of cancer that can affect the bones, muscle, blood, liver, kidney, brain, or even the eyes.**
- **Common adult cancers (lung, breast, colon, etc.) rarely occur in children or adolescents.**



What is Childhood Cancer?

- **Among the 12 major types, Leukemias (cancer in the blood) and brain tumors account for more than half of all cases.**
- **The median age at diagnosis is six years old.**
- **Some forms of pediatric cancer have a 5 year survival rate of more than 90%, while others have a 5 year survival rate of less than 2%.**

What is Childhood Cancer?

- Every day in America, 46 children are diagnosed with cancer.
- Each year in the U.S. approx. 12,400 children between the ages of birth and 19 years of age are diagnosed with cancer.
- There is no known cause of childhood cancer, and it occurs regularly and randomly across all ethnic groups.
- Some children are even born with cancer.



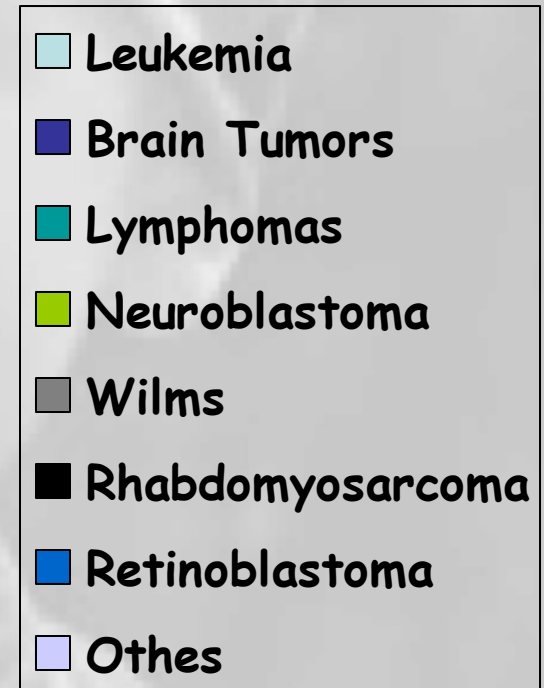
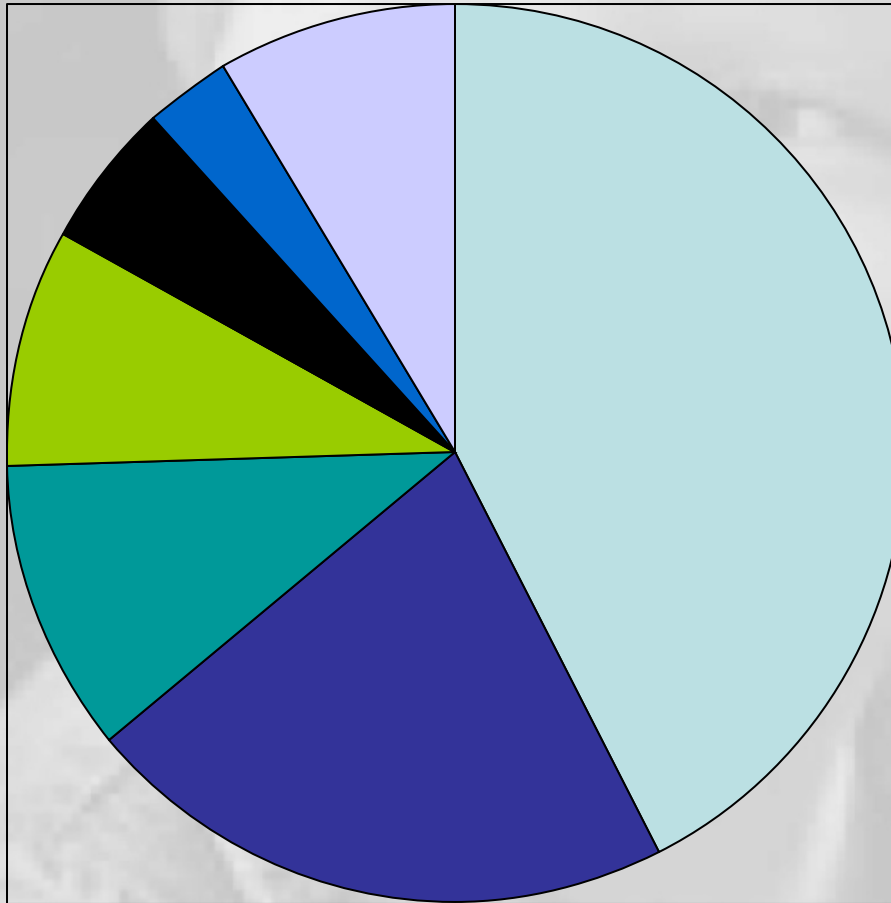
Childhood Cancer

- **Most originate from the mesodermal germ layer**
 - **The mesodermal layer gives rise to connective tissue, bone, cartilage, muscle, blood, blood vessels, gonads, kidneys, and the lymphatic system**

Childhood Cancer

- **Most common childhood cancers are leukemias, sarcomas, and embryonic tumors**
 - **Embryonic tumors**
 - **Originate during uterine life**
 - **Immature embryonic tissue unable to mature or differentiate into fully developed cells**
 - **Diagnosed early in life**

Types and Incidence of Cancers



Childhood Cancer

- **Leukemia**
 - **Most common malignancy in children**
 - **Children with Down syndrome have a 10 to 20 times greater risk for developing**

- **Brain tumors**
 - **Second leading cause of death from childhood cancer.**
 - **Most are cerebellar and brain stem tumors**
- **Lymphomas**
 - **Non-Hodgkins lymphomas—one-third present with a mass in the neck or mediastinal area**
 - **Also have dyspnea, wheezing, abdominal mass or pain and lymphadenopathy**
 - **Hodgkin's disease – arises in single lymph node with painless nodal enlargement, followed by extension to adjacent nodes and into spleen, liver, lungs, bone marrow**



- **Neuroblastoma**

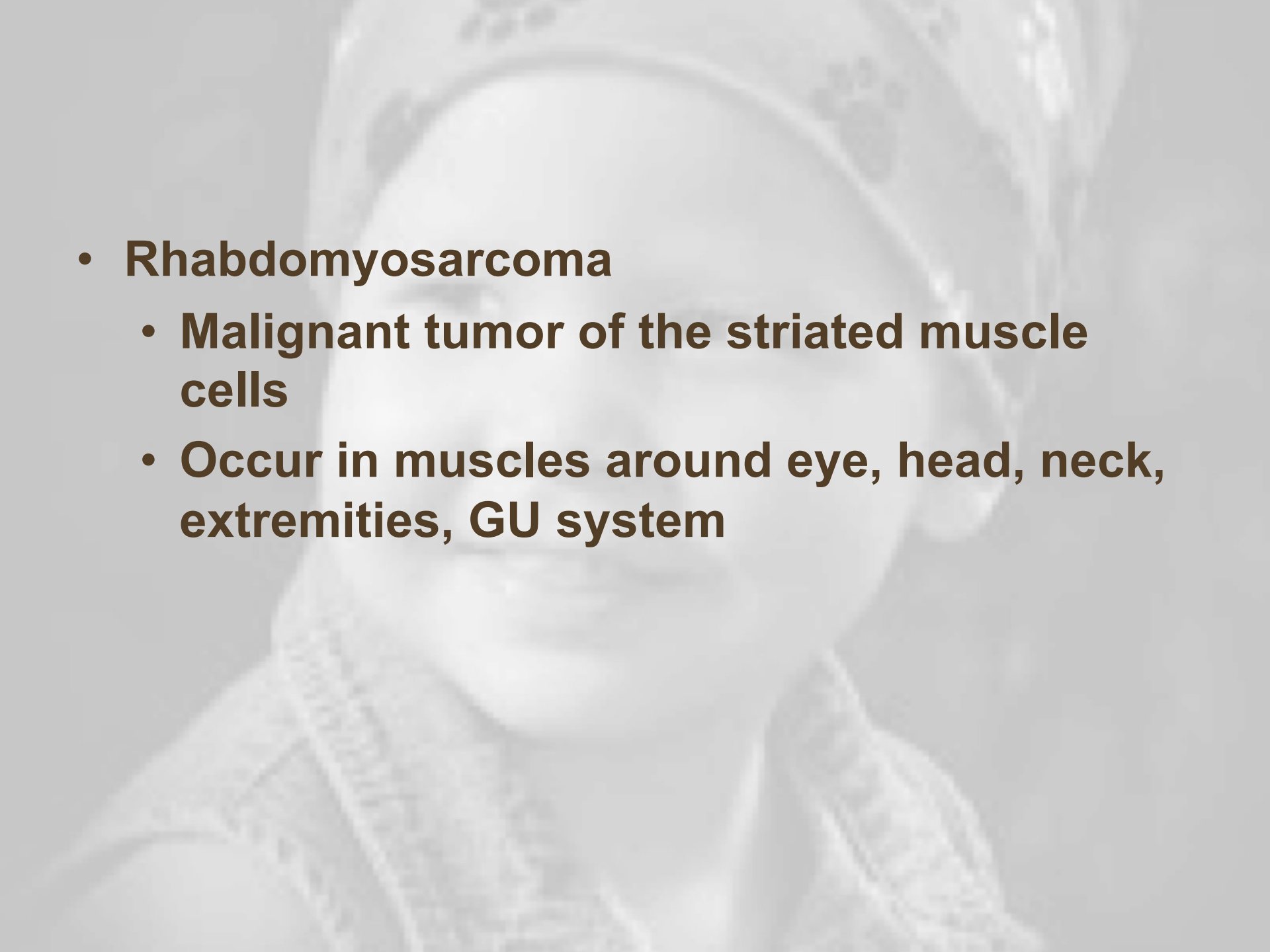
- **Malignant tumor arising from NS ganglion cells outside the cranium**
- **Can arise from anywhere along the sympathetic nervous system chain**
- **Can also occur in retroperitoneal area, pelvis, neck**

- **Wilms Tumor**

- **Solid tumor of kidney**

- **Retinoblastoma**
 - **Intraocular malignancy of the retina of eye**
 - **Usually unilateral**
 - **If bilateral , hereditary**
 - **First sign is white pupil**
- **Others**
 - **Osteogenic sarcoma/ Ewings sarcoma – tumor of bones of the trunk**
 - **Often seen in adolescence growth spurt**
 - **Found in distal femur, proximal tibia**



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- **Rhabdomyosarcoma**
 - **Malignant tumor of the striated muscle cells**
 - **Occur in muscles around eye, head, neck, extremities, GU system**

Theories of Etiology

- **Intrauterine carcinogens**
- **Physical carcinogens**
- **Viruses**
- **Immune defects**
- **Genetics**
 - **Discovered gene for leukemia on chromosome 22**

Warning Signs of Childhood Cancer

C = continual unexplained weight loss

H = headaches with vomiting (early morning)

I = increased swelling of pain in joints

L = lump or mass

D = development of whitish appearance in pupil

R = recurrent or persistent fevers, night sweats

E = excessive bruising or bleeding

N = noticeable paleness or tiredness

Effects of Childhood Cancer

- Many adult cancer patients endure no more than a year of treatment.
- On the other hand, the average length of treatment for children, from initial diagnosis to cure or remission, is three years.
- If the child experiences a relapse, the treatment time could possibly be extended over many years with a potentially lowered prognosis.



The Need for Progress

- **In 80% of cases, a child's cancer diagnosis is delayed until the disease is very advanced and has spread to other parts of the body. As a stark comparison, this only occurs in 20% of adult cancer cases.**
- **Childhood cancers tend to be more aggressive than adult cancers, so this late diagnosis can significantly affect the 5-year survival probability of the child.**

The Need for Progress

- Today's pediatric cancer patients are still being treated with drugs that were developed in the 1950's, 1960's and 1970's.
- Why? Because childhood cancer is rare, often called an 'orphan disease.'
Therefore, drug development for this group of patients is not considered 'cost effective.'



The Need for Progress

- Some forms of pediatric cancer have seen an increase in survival over the past few decades but one in four children will still die.



- If formerly incurable types of cancer are being treated successfully with “old drugs,” imagine what progress could be made with new drugs!

The Need for Progress

- In the past 20 years, the FDA has only approved **ONE** new drug exclusively for pediatric patients.
- In the past 20 years, the prevalence of pediatric cancer has risen by **29%**.



The Battle After Treatment

- Out of every 4 children diagnosed, one will not survive past 5 years and three will have life-long complications due to aggressive treatments for their cancer.
- When treatment stops, an entirely different battle begins...



The Battle After Treatment

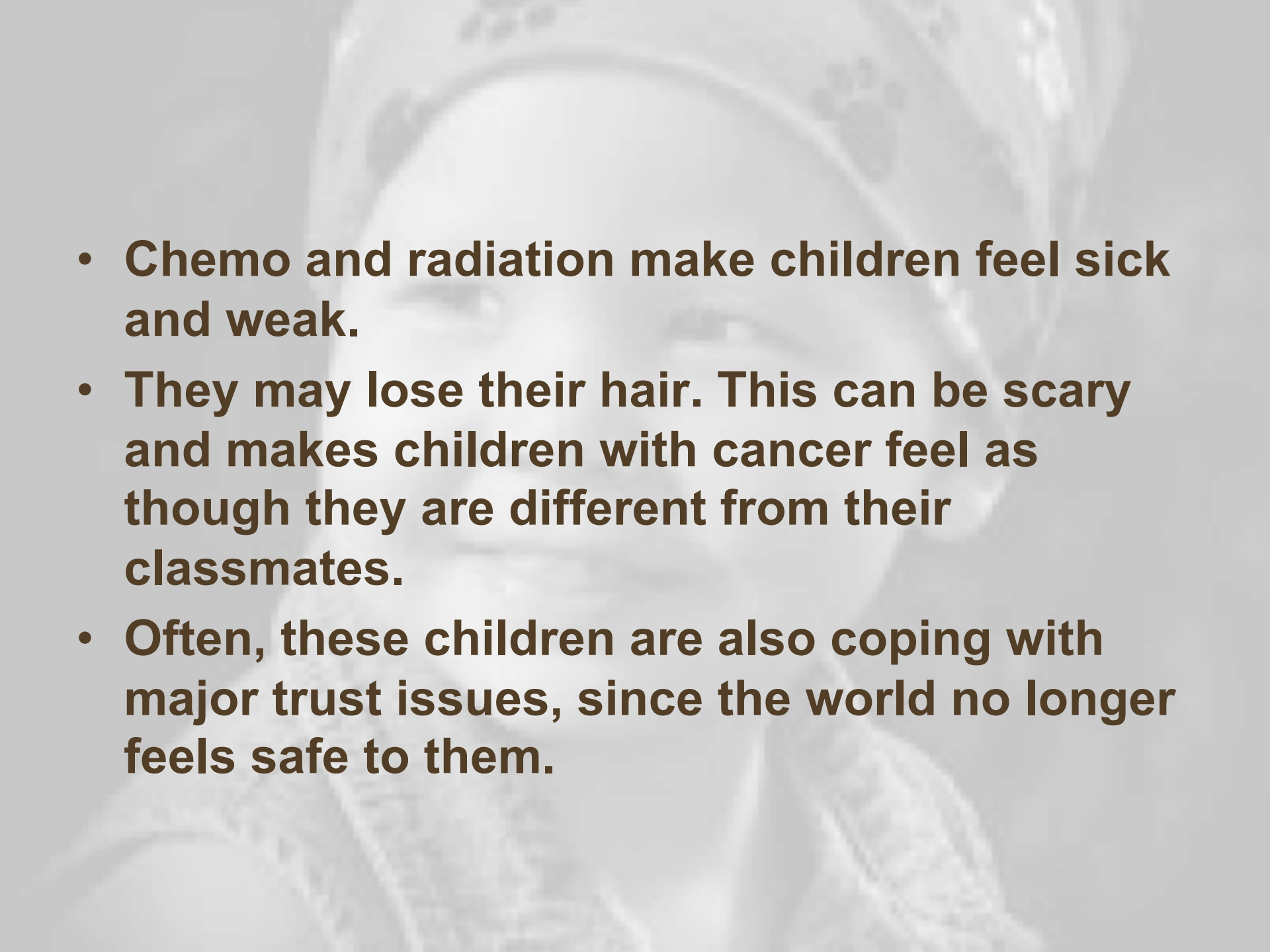
- **Because children's bodies are still developing, toxic therapies damage more than just the cancer cells. Young cancer survivors live the remainder of their lives with the side-effects of their initial treatments.**

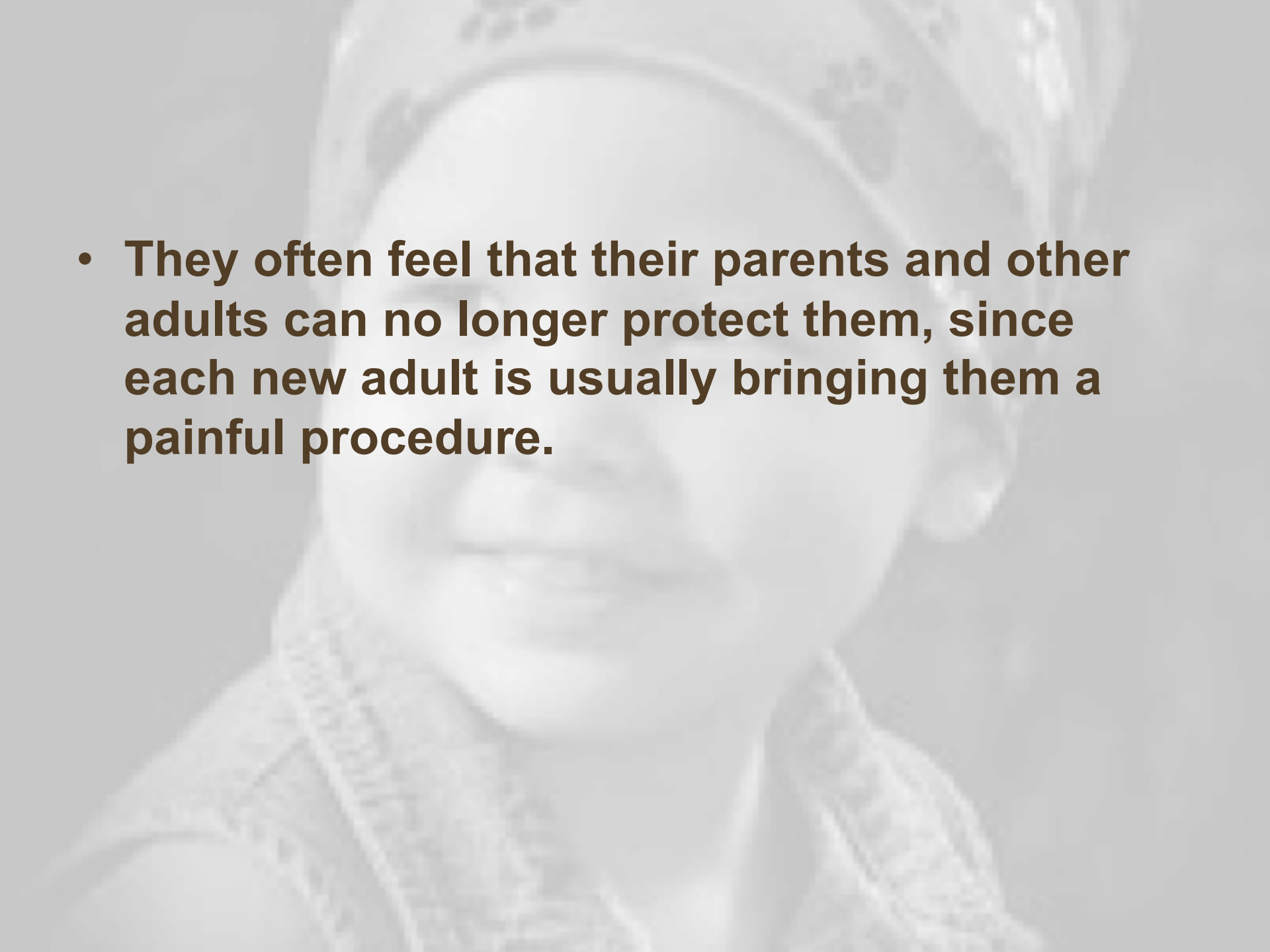
A few of these side effects are:

- **Delayed/ Disrupted cognitive development**
- **Stunted Growth**
- **Damaged speech and/or hearing**
- **Infertility and Endocrine Dysfunction**
- **Learning Disabilities**
- **Physical Handicaps due to nerve damage or amputation**

The Battle After Treatment

- **As many as 2/3rds of survivors have at least one chronic health effect.**
- **25% of survivors have severe or life-threatening effects.**
- **10% will develop a secondary cancer.**
- **Follow-up care is CRUCIAL. However, only 20% of children receive follow-up care. This is in stark contrast to the 90% adults who receive follow-up care.**

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- **Chemo and radiation make children feel sick and weak.**
 - **They may lose their hair. This can be scary and makes children with cancer feel as though they are different from their classmates.**
 - **Often, these children are also coping with major trust issues, since the world no longer feels safe to them.**

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- **They often feel that their parents and other adults can no longer protect them, since each new adult is usually bringing them a painful procedure.**

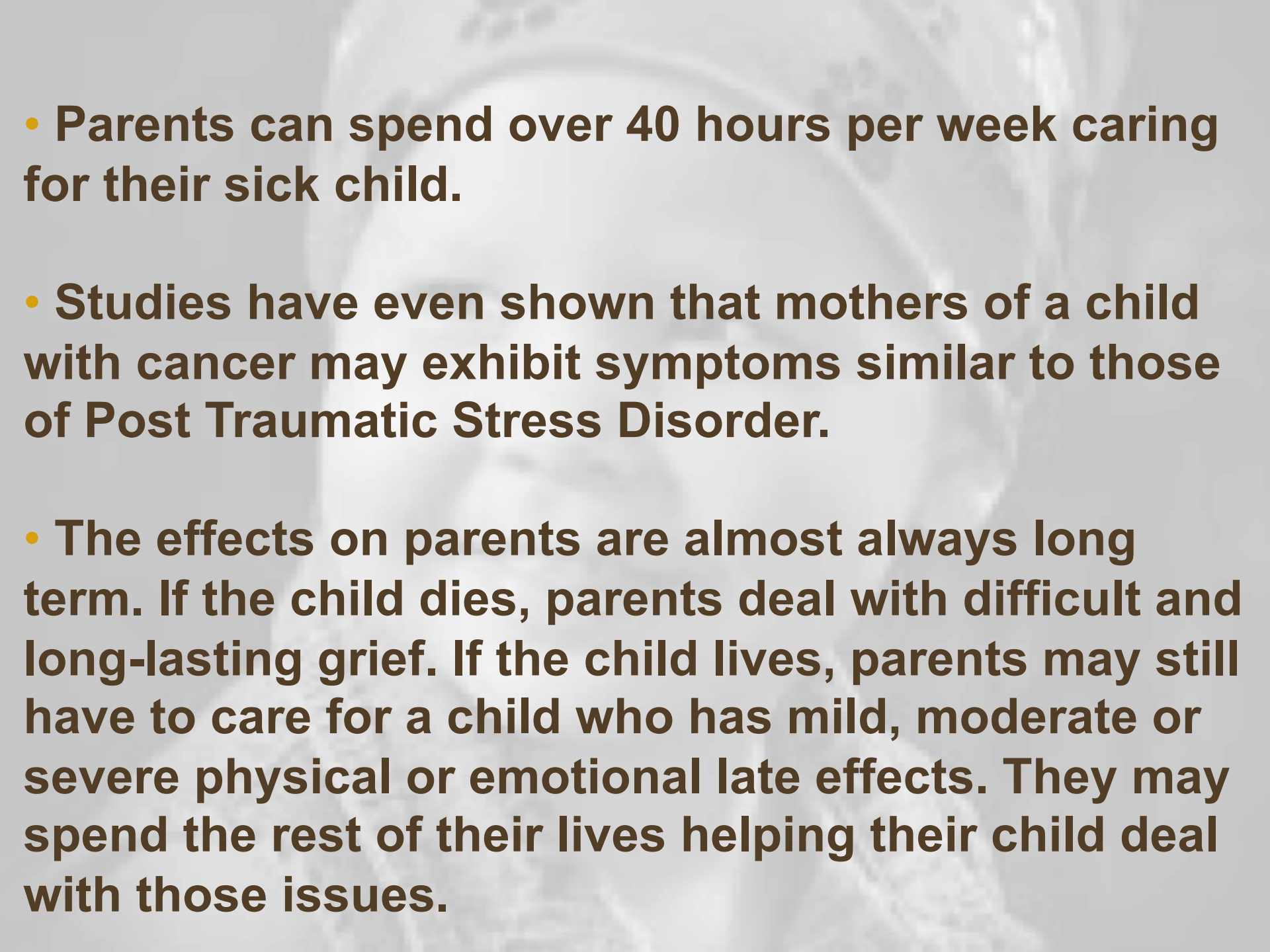
The Child's Entire Family is Affected.

- Because cancer usually strikes children at a young age, their families are often very young as well. There may also be other small children at home to look after.
- Sometimes, one or both parents must stop working in order to care for the sick child.



- **Siblings are often put to the wayside. Some may be constantly shuttled around and may have problems maintaining a normal schedule. They are worried, resentful, and feel abandoned.**
- **These children may develop behavioral problems, anxiety, or depression.**
- **They may also begin to have trouble in school.**
- **Counseling specifically for siblings is often necessary.**



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- **Parents can spend over 40 hours per week caring for their sick child.**
 - **Studies have even shown that mothers of a child with cancer may exhibit symptoms similar to those of Post Traumatic Stress Disorder.**
 - **The effects on parents are almost always long term. If the child dies, parents deal with difficult and long-lasting grief. If the child lives, parents may still have to care for a child who has mild, moderate or severe physical or emotional late effects. They may spend the rest of their lives helping their child deal with those issues.**

Effects of Childhood Cancer

- **Children with cancer can best be helped by doctors who have specialized in treating pediatric cancer patients.**
- **These specialized treatment centers are spread across the country, so families must travel to get the best treatment for their children.**



- **This puts a financial, emotional, and social strain on the parents.**



Diagnostic Tests

- **Biopsy**
- **Blood Tests**
 - **CBC**
 - **Uric Acid**
- **Bone Marrow Aspiration**
- **PET, MRI, CT, ultrasound**



Interventions

- **Radiation therapy**
- **Chemotherapy**
- **Surgery**
- **Bone Marrow and Stem cell transplantation**

Radiation Therapy

**Changes the DNA component of
a cell nucleus**

**The cell cannot replicate which
Inhibits further cell division and growth**

Effects of Radiation Therapy

- **Radiation sickness- anorexia, nausea, vomiting**
 - **Treated with antiemetics (Zofran or Anzimet) Cool cloth to forehead, provide distraction**
- **Fatigue**
 - **Allow for naps and rest periods (coordinate care), encourage parent to cuddle in bed with child, pillow, blankets, favorite toys**
- **Skin reactions**
 - **Erythema, tenderness**

- **Bone marrow suppression**
 - **Anemia, neutropenia thrombocytopenia**
- **Mucositis**
 - **Inflammation of mucus membranes mainly the mouth**
 - **Offer soft foods, and cold foods**
 - **Frequent mouth care. Lidocaine oral to swish in mouth (older child)**
- **Long term**
 - **Depends on part of body receiving radiation**

Chemotherapy

- **There are several categories of antineoplastic drugs used in treating childhood cancers.**
- **Scheduled at set times and days and by different predetermined routes.**
- **May remain in hospital for few days at first, then later report on specific day for therapy.**
- **Children and Parents must be taught about what to do and not to do during therapy.**

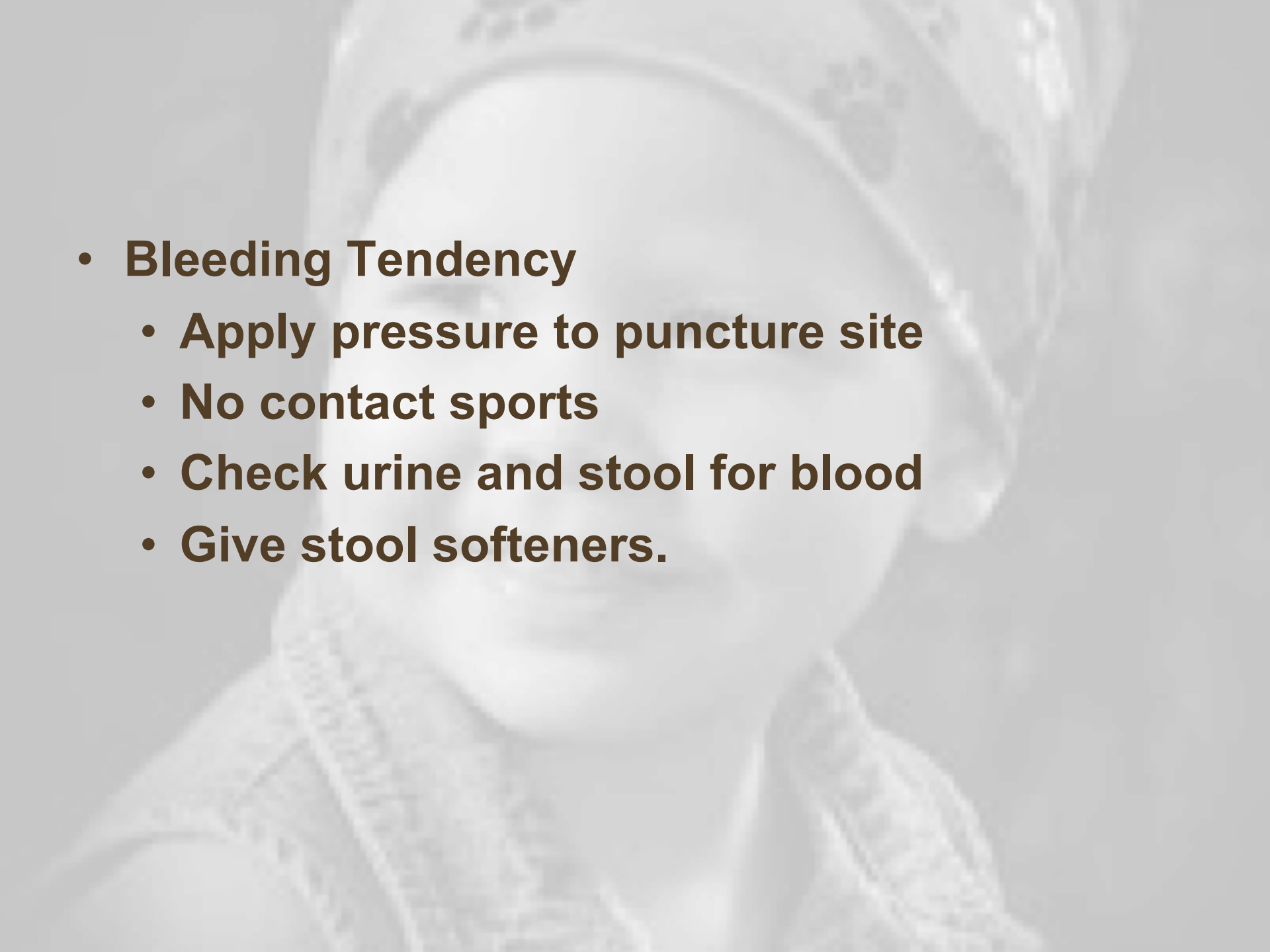
Review of Common Side Effects of Chemotherapy and Radiation

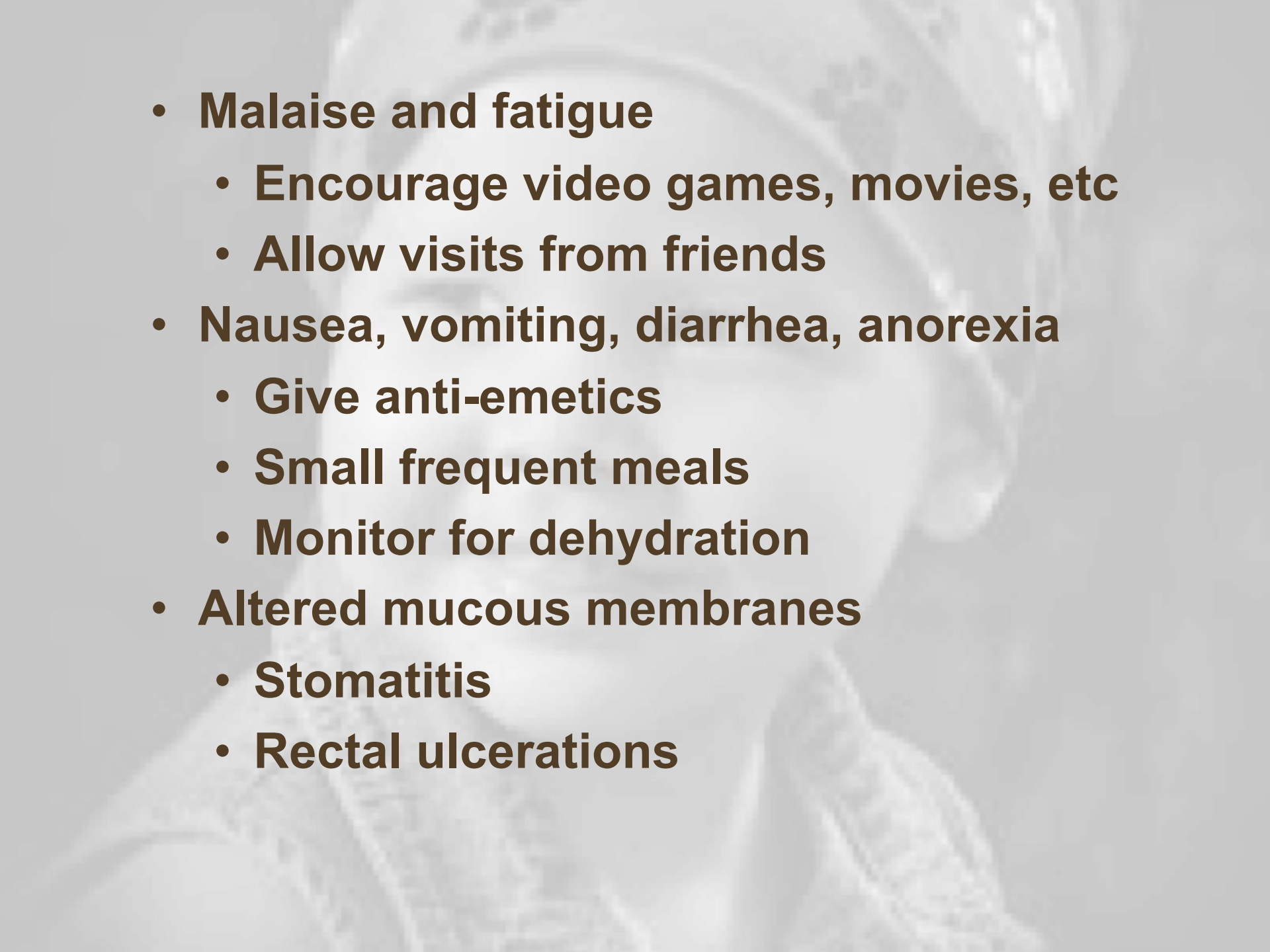
- **Chemotherapy**
 - **Bone marrow suppression**
 - **Alopecia**
 - **Malaise/fatigue**
 - **Nausea**
 - **Vomiting**
 - **Anorexia**
 - **Stomatitis**
- **Radiation side effects**
 - **Skin reactions**
 - **Fatigue**
 - **Bone marrow suppression**
 - **Nausea**
 - **Vomiting**
 - **Anorexia**
 - **Mucositis**

Side Effects and Toxic Reactions to Chemotherapy

- **Bone Marrow Suppression**
 - **Neutropenia, anemia, thrombocytopenia**
 - **Place in reverse isolation, keep anyone exposed to a virus away from patient.**
 - **Monitor temperature**
 - **Should not receive live-virus vaccines**



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- **Bleeding Tendency**
 - **Apply pressure to puncture site**
 - **No contact sports**
 - **Check urine and stool for blood**
 - **Give stool softeners.**

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- **Malaise and fatigue**
 - **Encourage video games, movies, etc**
 - **Allow visits from friends**
 - **Nausea, vomiting, diarrhea, anorexia**
 - **Give anti-emetics**
 - **Small frequent meals**
 - **Monitor for dehydration**
 - **Altered mucous membranes**
 - **Stomatitis**
 - **Rectal ulcerations**

Side effects of chemotherapy

- **Renal involvement**
 - **Uric acid levels rise as a result of breakdown of cells. The renal tubules causing renal failure.**
 - **If kidney affected/damaged- chemo drugs will not be excreted as usual and may limit drugs given.**
- **Body Image changes**
 - **Alopecia**
- **Pain Management**



Etiology

- **Ecogenetics**
- **Genetic factors**
 - **Chromosome abnormalities**
 - **Aneuploidy, amplifications, deletions, translocations, and fragility**
 - **Oncogenes and tumor-suppressor genes**
 - **Fanconi's anemia, Bloom's syndrome**
 - **High recurrence risk**

Etiology

- **Environmental factors**
 - **Prenatal exposure**
 - **Drugs and ionizing radiation**
 - **Nutrition and diet**
 - **Childhood exposure**
 - **Drugs, secondhand smoke, ionizing radiation, viruses**
 - **Anabolic androgenic steroids, cytotoxic agents, immunosuppressive agents, Epstein-Barr virus, and AIDS**

Prognosis

- **5-year survival rate nearly 80%**
- **Children are more responsive and are better able to tolerate treatments**
- **More likely to be enrolled in clinical trials**
- **Residual and long-term effects of treatment**
- **Psychologic sequelae**