

B-Cell Lymphoma (80%)

- B-Cells help make antibodies, which are proteins that attach to and help destroy antigens
- Lymphomas are caused when a mutation arises during the B-cell life cycle
- Various different lymphomas can occur during several different stages of the cycle
 - Follicular lymphoma, which is a type of B-cell lymphoma is caused by a gene translocation which results in an over expressed gene called BCL-2, which blocks apoptosis.

T-Cell Lymphoma (15%)

- The T-cells are born from stem cells, similar to that of B-cells, but mature in the thymus.
- They help the immune system work in a coordinated fashion.
 - These types of lymphomas are categorized by how the cell is affected
 - Anaplastic Large cell Lymphoma, t-cell lymphoma caused by a gene translocation on chromosome 5

Mechanisms of lymphomagenesis

- Genetic alterations
- Infection
- Antigen stimulation
- Immunosuppression

Epidemiology of lymphoma

- males > females
- incidence
 - NHL increasing
 - Hodgkin lymphoma stable
- in NHL: 3rd most frequently diagnosed cancer in males and 4th in females
- in HL: 5th most frequently diagnosed cancer in males and 10th in females

DISTRIBUTION OF 20 MOST COMMON MALIGNANCIES 1975 - 2005 (TOTAL CASES = 57,255)

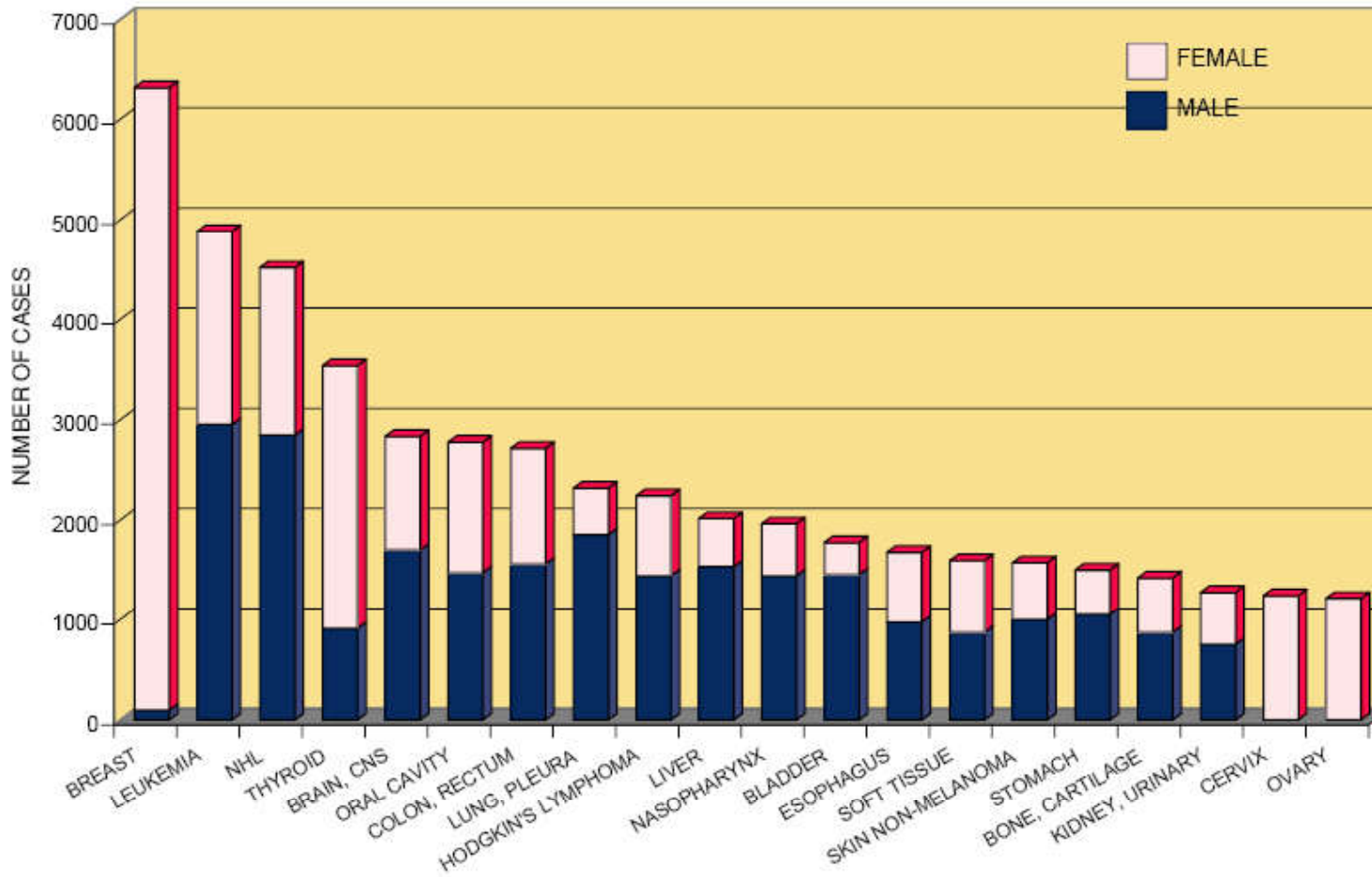
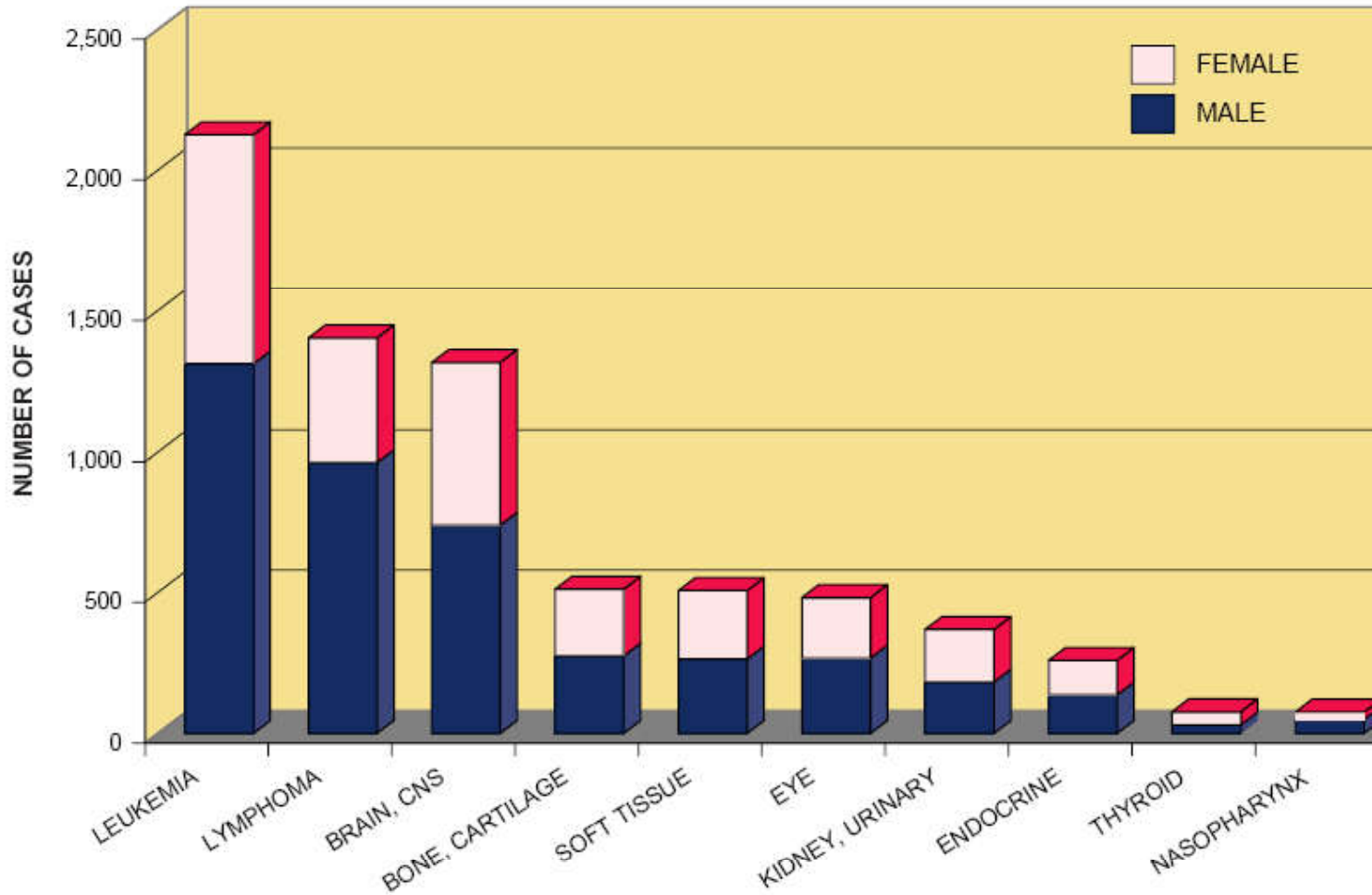


FIGURE 6

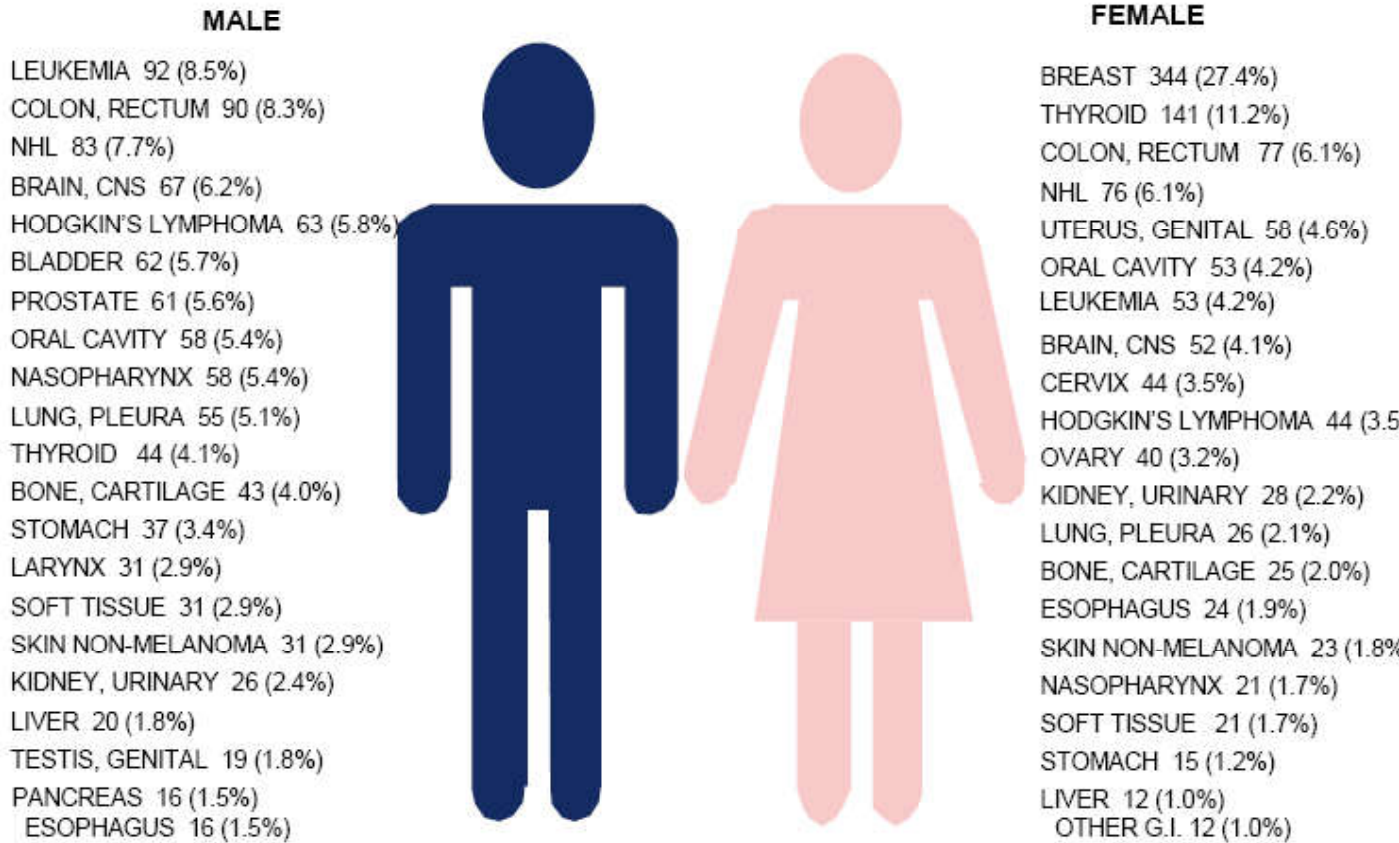
DISTRIBUTION OF 10 MOST COMMON PEDIATRIC MALIGNANCIES
1975 - 2005 (TOTAL CASES = 7,548)



**COMPARATIVE DATA - KFSH&RC vs NCR vs USA
(% to TOTAL CANCER CASES)**

SITE	KFSH&RC 2005 Analytics	NCR 2003 Saudis	USA 2005 Estimates
BREAST	14.9%	10.6%	15.5%
THYROID	7.9%	6.6%	1.9%
COLON, RECTUM	7.1%	8.7%	10.9%
NON-HODGKIN'S LYMPHOMA	6.8%	8.0%	4.1%
LEUKEMIA	6.2%	6.5%	2.5%
BRAIN, CNS	5.1%	3.2%	1.3%
HODGKIN'S LYMPHOMA	4.6%	3.7%	0.5%
LUNG, PLEURA	3.5%	3.7%	12.7%
BONE, CARTILAGE	2.9%	1.2%	0.2%
SOFT TISSUE	2.2%	1.8%	0.7%
SKIN MELANOMA	0.2%	0.3%	4.3%
PROSTATE (% to MALES)	2.6%	2.7%	32.7%

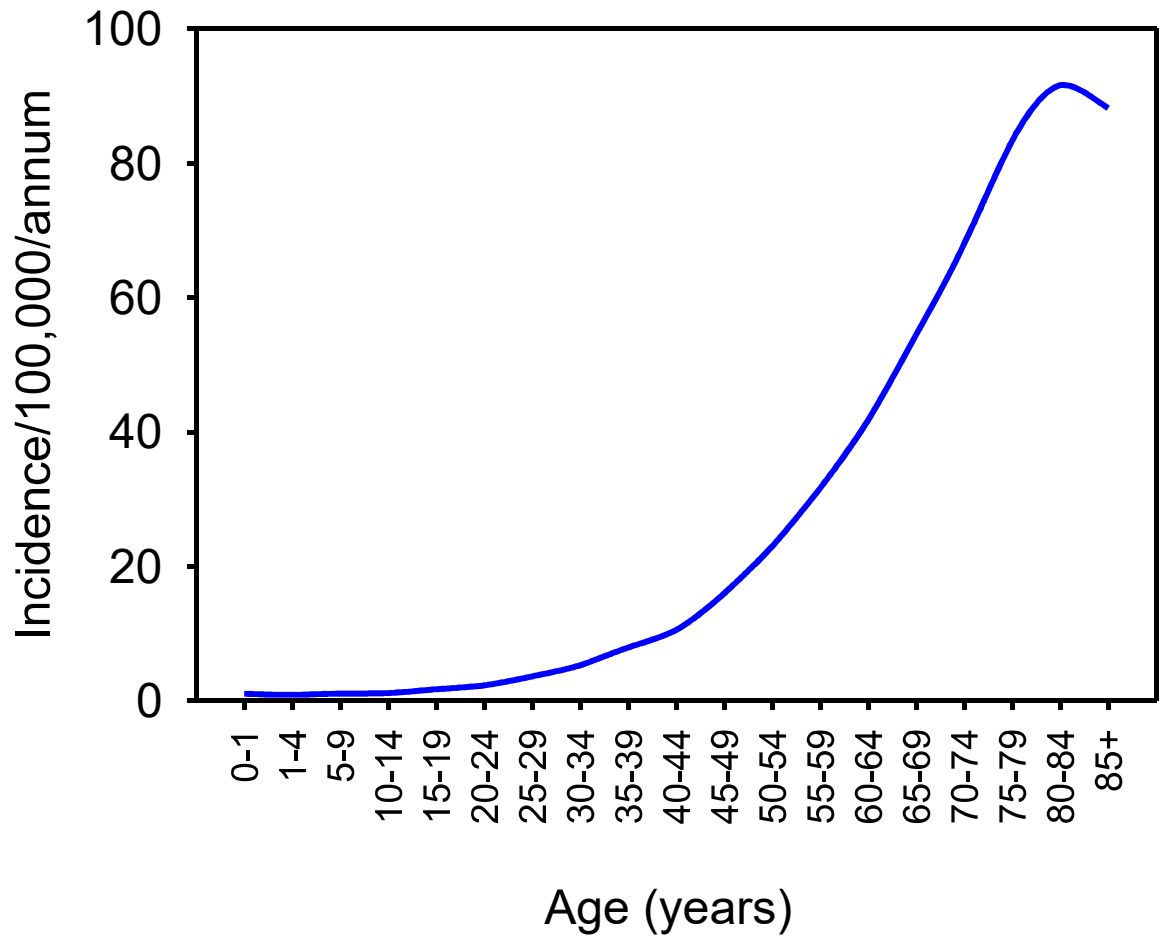
DISTRIBUTION OF 20 MOST COMMON MALIGNANCIES 2005 ANALYTIC CASES (TOTAL CASES = 2,336)



**ANALYTIC CASES SEEN AT KFSH&RC BY SITE* AND AGE
2005**

SITE	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79
Oral Cavity	0	3	0	1	3	3	4	2	7	10	13	14	7	15	11	5
Nasopharynx	0	0	1	1	3	2	6	10	6	10	13	8	5	8	6	0
Esophagus	0	0	0	0	0	0	2	0	1	3	3	1	5	5	7	6
Stomach	0	1	0	0	1	0	4	3	3	1	3	5	8	5	8	5
Colon, Rectum	0	0	0	0	1	5	6	15	8	24	23	20	15	17	15	11
Liver	3	2	0	1	0	1	1	0	3	2	1	3	5	6	1	3
Pancreas	0	0	0	0	0	0	1	1	2	0	1	3	4	4	5	0
Other G.I.	0	0	0	0	0	0	2	0	3	5	0	1	6	1	2	3
Larynx	0	0	0	0	0	1	0	1	1	2	4	6	6	3	6	2
Lung, Pleura	0	0	0	0	0	0	1	4	13	6	12	9	9	7	9	4
Multiple Myeloma	0	0	0	0	1	0	1	0	2	2	1	2	3	1	1	2
Lymphoid Leukemia	25	13	13	11	5	3	1	1	1	0	2	0	1	0	0	0
Myeloid Leukemia	8	4	5	7	6	3	8	6	5	9	1	0	1	0	0	0
Other Leukemias	2	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0
Reticuloendothelium	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Bone, Cartilage	1	7	20	23	7	1	0	1	1	1	1	1	1	1	1	1
Soft Tissue	5	4	7	5	4	2	1	5	4	3	5	3	2	1	0	1
Skin Melanoma	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	2
Skin Non-Melanoma	0	2	2	3	0	0	1	1	6	3	5	5	10	3	3	5
Breast	0	0	0	0	5	11	31	60	61	61	46	29	19	7	11	4
Uterus, Genital	0	0	1	0	4	1	3	1	6	4	6	5	7	7	9	3
Cervix	0	0	0	0	0	0	3	2	11	8	5	6	4	1	3	1
Ovary	0	2	2	1	1	3	0	2	4	6	6	1	2	4	2	2
Prostate	0	0	0	0	0	0	0	0	1	0	1	6	8	12	17	7
Testis, Genital	0	0	0	0	4	3	3	0	3	3	1	0	0	1	1	0
Bladder	1	0	0	1	0	2	0	2	3	4	8	11	13	8	8	4
Kidney, Urinary	10	3	1	0	1	0	1	3	6	3	3	4	7	5	3	3
Eye	10	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Brain, CNS	24	15	15	3	10	4	2	9	7	6	4	6	8	2	3	1
Thyroid	0	1	2	9	18	22	23	22	22	15	17	11	9	5	4	2
Other Endocrine	15	2	2	2	0	0	1	0	0	0	0	1	0	0	0	0
NHL - Lymph Nodes	3	5	2	4	8	6	7	4	5	4	10	4	13	8	4	4
NHL - Extra-nodal	4	1	3	3	3	2	3	2	5	11	4	9	5	5	1	3
Hodgkin's Lymphoma-LNs	7	16	19	16	17	7	6	2	4	3	2	1	1	0	1	2
HL - Extra-nodal	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Primary Unknown	0	0	0	0	1	0	1	5	0	1	2	4	5	6	4	0
All Other Sites	1	2	0	0	1	0	1	2	2	4	2	0	1	0	1	1
TOTAL	119	85	96	93	104	82	124	167	211	214	205	179	191	148	147	87

Age distribution of new NHL



Risk factors for NHL

- immunosuppression or immunodeficiency
- connective tissue disease
- family history of lymphoma
- infectious agents
- ionizing radiation

Clinical manifestations

- Variable
 - severity: asymptomatic to extremely ill
 - time course: evolution over weeks, months, years
- Systemic manifestations
 - fever, night sweats, weight loss, anorexia, p
- Local manifestations
 - lymphadenopathy, splenomegaly most com
 - any tissue potentially can be infiltrated

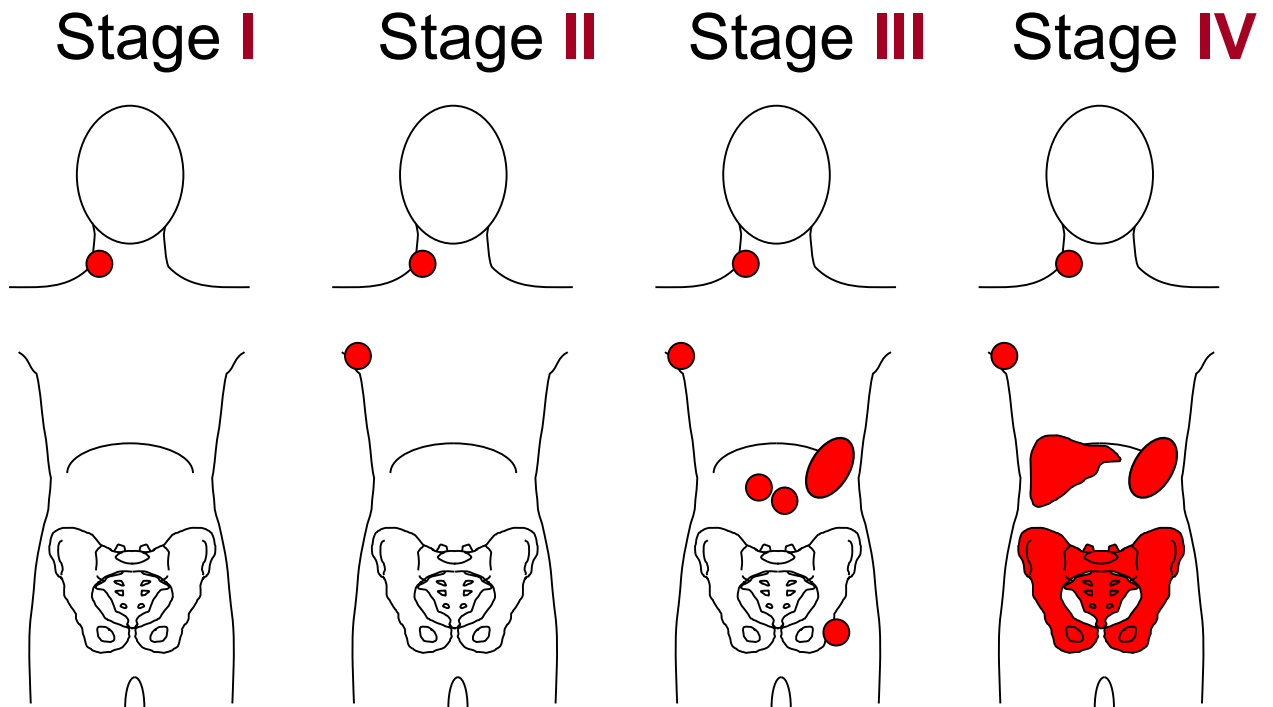
Other complications of lymphoma

- bone marrow failure (infiltration)
- CNS infiltration
- immune hemolysis or thrombocytopenia
- compression of structures (eg spinal cord, ureters)
- pleural/pericardial effusions, ascites

Non-Hodgkin's Lymphoma Staging

- Stage is the term used to describe the extent of tumor that has spread through the body (**I** and **II** are localized where as **III** and **IV** are advanced.
- Each stage is then divided into categories **A**, **B**, and **E**
 - **A**: No systemic symptoms
 - **B**: Systemic Symptoms such as fever, night sweats and weight loss
 - **E**: Spreading of disease from lymph node to another organ

Staging of lymphoma



A: absence of B symptoms

B: fever, night sweats, weight loss

Staging

Stages of Non-Hodgkin's Lymphoma

Stage I (early disease): the cancer is found only in a single lymph node region OR one organ or area outside the lymph node.

Stage II (locally advanced disease): the cancer is found in two or more lymph node regions on one side of the diaphragm (the breathing muscle that separates the abdomen from the chest), OR the cancer is found in one lymph node region plus a nearby area or organ.

Stage III (advanced disease): the disease involves lymph nodes both above and below the diaphragm OR one nodal area and one organ on opposite sides of the diaphragm.

Stage IV (widespread disease): the lymphoma is outside the lymph nodes and spleen AND has spread to one or more organs such as bone marrow, skin, or other organs.

Symptoms

- Painful Swelling of lymph nodes located in the neck, underarm and groin.
- Unexplained Fever
- Night Sweats
- Constant Fatigue
- Unexplained Weight loss
- Itchy Skin



Causes and Risk Factors

- The Exact causes are still unknown
 - Higher risk for individuals who:
 - Exposed to chemicals such as pesticides or solvents
 - Infected w/ Epstein-Barr Virus
 - Family history of NHL (although no hereditary pattern has been established)
 - Infected w/ Human Immunodeficiency Virus (HIV)

Lymphoma.org

Diagnosis

Staging Studies

- Bone marrow aspiration and biopsy
- Radionuclide scans:
- GI x-rays
- Spinal fluid analysis
- CT scans
- Magnetic Resonance Imaging (MRI)
- Biopsy

Diagnosis requires an adequate biopsy

- Diagnosis should be biopsy-proven before treatment is initiated
- Need enough tissue to assess cells and architecture
 - open bx vs core needle bx vs FNA

Treatment

- Non-Hodgkin's Lymphoma is usually treated by a team of physicians including hematologists, medical oncologists and a radiation oncologist.
- In some cases such as for Indolent lymphomas, the Doctor may wait to start treatment until the patient starts showing symptoms, known as “watchful waiting”

Treatment Options

- Chemotherapy
- Radiation
- Bone Marrow Transplantation
- Surgery
- Immunotherapy
- Using the bodies own immune system combined with material made in a lab.

Survival Rates

- Survival Rates vary widely by cell type and staging.
 - 1 Year Survival Rate: 77%
 - 5 Year Survival Rate: 56%
 - 10 Year Survival Rate: 42%

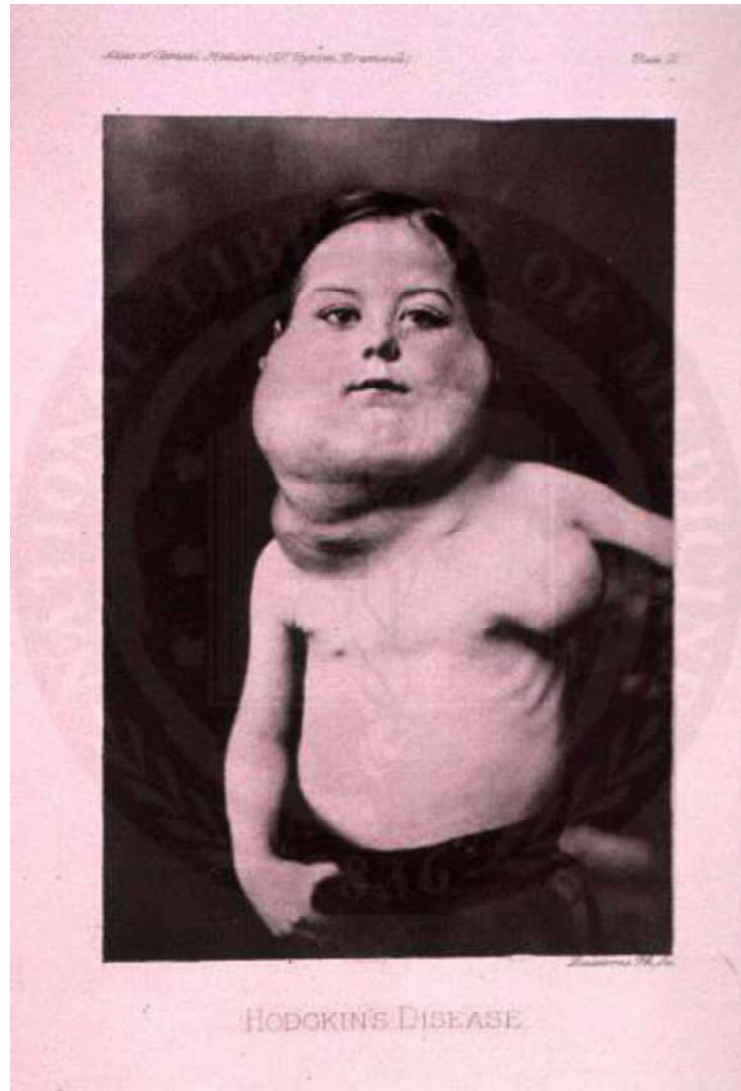
Cancer.org

Hodgkin lymphoma



Thomas Hodgkin
(1798-1866)

Classical Hodgkin Lymphoma



Hodgkin lymphoma

- cell of origin: germinal centre B-cell
- **Reed-Sternberg** cells (or **RS** variants) in the affected tissues
- most cells in affected lymph node are polyclonal reactive lymphoid cells, not neoplastic cells

Reed-Sternberg cell

