Common Pediatric Cancers	
Hematologic Cancers	
B-ALL	
Presentation	Non-specific/constitutional, bone pain, fever, malaise, lymphadenopathy, HSM, cytopenias, unilateral testicular enlargement
Epidemiology	• Peak incidence 2-5 yrs, M>F, 70-80% ALL. • Increased risk in Down syndrome, NF 1, Bloom syndrome, and ataxia telangiectasia
Notes about Grouping, Staging or Potential Prognostic Features	• **Low risk**: WBC <50K/uL AND age 1-9.9 yrs AND favorable cytogenetic (hyperdiploidy, trisomies 4/10/17 or ETV6-RUNX1) AND favorable response to treatment. • **Standard risk**: low risk features EXCEPT favorable cytogenetic changes • **High risk**: 10+ yrs, unfavorable cytogenetic, residual disease in BM after induction (MRD - measured @ BCH by next gen sequencing, > 1x10^-4 post-therapy measured at two time points) • **Very high risk**: high-risk AND failure to achieve remission at the end of induction therapy, OR certain cytogenetic markers (extreme hypodiploidy, t(9;22) BCR/ABL translocation, t(4;11) MLL rearrangement, iAMP21 amplification)
T-ALL	
Presentation	Anterior mediastinal mass (airway compression, SVC syndrome), hyperleukocytosis, constitutional symptoms
Epidemiology	Peak incidence 15-19 yrs, M>F, ~15% ALL. T-ALL and T-cell lymphoblastic lymphoma (NHL) distinguished by BM involvement (Leukemia if >25% blasts in CSF)
Notes	• **High risk**: 10+ yrs, unfavorable cytogenetic, residual disease in BM after induction (MRD - measured @ BCH by next gen sequencing, > 1x10^-4 post-therapy measured at two time points) • Refer to Smith, J Clin Oncol. 1996 Jan;14(1):18-24 for risk stratification based on age and presenting WBC count
AML	
Presentation	Non-specific/constitutional symptoms, cytopenias. Hyperleukocytosis (tumor lysis syndrome, DIC). **Extramedullary symptoms**: HA, lethargy, AMS, CN palsy, myeloid sarcomas/ chloromas.
Epidemiology	• **Down's Syndrome**: 10-20x risk of AML, transient myeloproliferative disorder. • **Therapy-related AML**: secondary malignancy, typically assoc. with alkylating agents and topoisomerase inhibitors
Notes	• **Favorable**: t(8;21)(q22;q22); RUNX1-RUNX1T1, inv(16)(p13.1q22) or t(16;16)(p13.1;q22); CBFB-MYH11, Mutated NPM1 without FLT3-ITD (normal karyotype), Mutated CEBPA (normal karyotype) • **Intermediate**: sub-stratified based on response to induction therapy (Minimal residual disease by flow cytometry) • **Adverse**: t(6;9)(p23;q34); DEK-NUP214, Monosomy 5 or del(5q); Monosomy 7; Complex karyotype; High allelic ratio FLT3-ITD
Hodgkin's Lymphoma	
Presentation	Lymphadenopathy, constitutional B-symptoms, mediastinal mass effect, splenomegaly
Epidemiology	**Bimodal**: Peak incidence late teenage years, most common childhood cancer in 15-19 yo; second peak in adults age >50. Association with EBV infection

Common Pediatric Cancers continued on next page →

Common Pediatric Cancers	
Hematologic Cancers	
Hodgkin's Lymphoma	
Notes	Risk stratification based on Ann Arbor staging with Cotswolds modifications for HL: • **Stage I**: involvement of single lymph node (LN) region • **Stage II**: involvement of ≥2 LN regions on same side of diaphragm • **Stage III**: involves LN regions on both sides of the diaphragm • **Stage IV**: Diffuse or disseminated involvement of one or more extranodal organs or tissue beyond that designated E (contiguous extranodal disease), with or without associated lymph node involvement. • *All cases are subclassified to indicate the absence (A) or presence (B) of "B symptoms" (systemic symptoms of significant unexplained fever, night sweats, or unexplained weight loss exceeding 10% of body weight during the six months prior to diagnosis) **High Risk disease = IIIB and IVB** Poor prognosis associated with higher stage, presence of B symptoms, presence of bulky disease, extranodal extension
Non-Hodgkin's Lymphoma	
Presentation	Varies by location and type. Lymphadenopathy, mediastinal mass, palpable mass, intussusception, cranial nerve palsy.
Epidemiology	Median age: 10 yrs, increase incidence with age. Increased risk in congenital and acquired immunodeficiency syndromes. Association with EBV infection
Notes about Grouping, Staging or Potential Prognostic Features	• Risk stratification based on Murphy (St. Jude's) staging system. • More Common Subtypes include: Burkitt lymphoma, Diffuse large B cell lymphoma, lymphoblastic lymphoma and anaplastic large cell lymphoma • Post-transplant lymphoproliferative disease frequently resembles non-Hodgkin lymphoma in a recipient of a solid organ transplant or stem cell transplant, and is also typically staged using Murphy (St. Jude's) staging system.
Musculoskeletal Tumors	
Rhabdomyosarcoma	
Presentation	Head & neck: orbital tumors (proptosis, ophthalmoplegia, parameningeal lesions. GU (botryoid RMS): hematuria, urinary obstruction, pelvic mass, constipation Extremities: painful mass +/- overlying erythema
Epidemiology	Most common soft tissue tumor in childhood, majority of cases <6 yrs, M>F. Associated with neurofibromatosis, Li-Fraumeni (anaplastic RMS), Beckwith-Wiedemann, and Costello syndromes
Notes	Prognosis based on histology, TNM stage, clinical group. 4 major histologic subtypes: • **Embryonal**: intermediate prognosis • **Botryoid**: variant of embryonal RMS, favorable prognosis • **Alveolar**: relatively poorer prognosis • **Anaplastic**
Osteosarcoma	
Presentation	Localized bone pain, tender mass, pathological fracture. Predilection for long bone metaphysis (femur, tibia, humerus). Typically metastasizes to lung.
Epidemiology	Peak incidence 13-16 yrs, M>F, Most common primary bone malignancy. Associated with Li-Fraumeni, Rothmund-Thomson, Bloom and Werner syndromes
Notes	Metastatic disease at diagnosis; Low tumor necrosis percentage after initial chemotherapy.

Common Pediatric Cancers	
Musculoskeletal Tumors	
Ewing's Sarcoma	
Presentation	Localized pain/swelling. Tender soft tissue mass. Pathological fractures. Predilection for axial skeleton, pelvis and diaphysis of long bones. Metastases to lung and bone/marrow
Epidemiology	Peak incidence 10-15 yrs but wide age distribution, M>F, Caucasians>AA. Increased risk: Li-Fraumeni, MEN2
Notes	Prognosis based on presence of metastases, primary tumor location and size, age, the response to therapy, and certain chromosomal translocations.
Nervous System Tumors	
Treated by Neuro-Oncologists	
Medulloblastoma	
Presentation	Cerebellar mass, hydrocephalus, increased ICP. Midline tumors: gait ataxia or truncal instability; lateral cerebellar: limb dyscoordination. Dizziness, diplopia
Epidemiology	Peak incidence 5-9 yrs. Most common malignant brain tumor of childhood. Associated with Gorlin syndrome, familial adenomatous polyposis.
High-Risk Features	Age, extent of disease (modified Chang criteria), histopathologic subtype, and molecular subtype Tumors with WNT signaling pathway mutations have the best prognosis (>95% 5-year OS); "group 3" (MYC mutations) have the worst
Gliomas	
Presentation	Depending on location, size and rate of growth: Seizures, hemiparesis, ataxia, increased ICP, cranial neuropathies.
Epidemiology	Associated with NF1, Li-Fraumeni, Tuberous Sclerosis, von Hippel-Lindau, familial adenomatous polyposis
High-Risk Features	Several distinct entities based on histopathology. Typically prognostic factors include: histology/ grade, age at diagnosis
Treated by Non-Neuro Oncologists	
Neuroblastoma	
Presentation	Varies by location. Adrenal/abdominal; thoracic (respiratory distress, Horner's syndrome, nerve root/spinal cord compression). Mets causing pain, proptosis/raccoon eyes. Paraneoplastic symptoms (catecholamine production).
Epidemiology	Median age of diagnosis 18 mo, Caucasian>AA
High-Risk Features	MYCN amplification, metastatic (non MS), older age, crossing the midline
Retinoblastoma	
Presentation	Leukocoria (54%), strabismus, nystagmus, red eye, decrease vision, iris heterochromia
Epidemiology	Median age at diagnosis is 18 mo, later with unilateral disease. Majority present <5 yo. Germline mutations in RB1 (associated with sarcomas and melanoma)
High-Risk Features	Poor prognosis: delay in diagnosis >6 mo, h/o intraocular surgery, cataract, use of external beam radiotherapy, invasion of local anatomy, tumor anaplasia

Common Pediatric Cancers continued on next page →

Common Pediatric Cancers	
Kidney Tumors	
Wilm's Tumor	
Presentation	Abdominal mass, abd pain, hematuria, fever, HTN
Epidemiology	Median age at diagnosis 4 yo, typically <15 yo. Bilateral disease 5-7%. Increased incidence in: WAGR syndrome, Beckwith-Wiedemann, Denys-Drash, and Bloom syndromes
High-Risk Features	National Wilms Tumor Study (NWTS) staging system (post-resection and pre-chemotherapy) Worse prognosis based on anatomic extent of the tumor
Liver Tumors	
Hepatoblastoma	
Presentation	Asymptomatic abdominal mass, hemihyperplasia, sexual precocity (synthesis of ectopic gonadotropins), anorexia
Epidemiology	Children <3 yrs, Associated with low birth weight (<1000 g), Beckwith Wiedmann syndrome, trisomy 18, trisomy 21, Acardia syndrome, Li-Fraumeni syndrome, and familial adenomatous polyposis
High-Risk Features	Risk stratification based on: PRE-Treatment EXTent of disease (PRETEXT) group, histology, AFP level
Hepatocellular Carcinoma	
Presentation	Abdominal mass, anorexia, weight loss, jaundice
Epidemiology	Peak incidence 15-19 yrs, rarely diagnosed <5 yrs. Increased risk in: Alagille syndrome, glycogen storage diseases, biliary atresia, infantile cholestasis, perinatally acquired HepB, tyrosinemia
High-Risk Features	Risk stratification based on staging: location, resectability, and response to any pre-surgical therapy
Germ Cell Tumors	
Teratoma	
Presentation	• **Sacrococcygeal**: prenatal diagnosis via U/S, or caudal mass at birth. • **Ovarian**: abd mass, abd pain, distension, emesis, obstructive symptoms • **Testicular**: testicular mass, +/- pain
Epidemiology	• **Sacrococcigeal**: Congenital • **Ovarian**: increase incidence with age, peak incidence 15-19 yrs, can be bilateral • **Testicular** more common <5 yrs
High-Risk Features	Worse prognosis based on malignant transformation and anatomic extent of the tumor. Late presentation associated with worse prognosis (esp Sacrococcigeal)
Yolk Sac Tumor	
Presentation	• **Testis**: painless testicular mass, torsion, elevated AFP • **Ovary**: Abd/pelvic mass, abd pain, torsion, ascites • **Intracranial**: see germinoma
Epidemiology	Prepubertal children, M=F, pure yolk sac tumors median age 1.5 yrs. Bimodal distribution in puberty