amenorrhea, decreased sperm counts, increased follicle-stimulating and luteinizing hormones, decreased testosterone or estrogen)	Irradiation to pituitary gland, testes, ovaries
Skeletal	
Growth retardation (short stature)	Irradiation, long-term steroids
Spinal deformities, scoliosis, kyphosis, asymmetric growth, pathologic fractures	Irradiation
Immune	
Asplenia (overwhelming infection, fever)	Splenectomy
Sensory Organs	
Cataracts (opacity over pupil)	Cranial irradiation, high-dose steroids
Hearing (decreased hearing, especially with high-frequency loss)	Cisplatin
Additional Effects	
Dental Problems	
Increased caries, periodontal disease, hypoplastic teeth, hypodontia (delayed or absent tooth development)	Irradiation to maxilla and mandible
Second Malignancies	
Bone and soft tissue tumors Leukemia (ALL or AML)	Irradiation, alkylating agents

ALL, Acute lymphoblastic leukemia; *AML*, acute myelogenous leukemia; *CNS*, central nervous system.

Because this tumor carries a poor prognosis for many children, evaluate and address the needs of the family in terms of coping with a life-threatening illness (see Chapter 17). Because of the high degree of metastasis at the time of diagnosis, many parents suffer guilt for not having recognized signs earlier. Parents need much support in dealing with these feelings and expressing them to the appropriate people.

Bone Tumors

General Considerations

Bone tumors consist of osteosarcoma and Ewing sarcoma and account for about 6% of all malignant neoplasms in children in the United States (Scheurer, Lupo, and Bondy, 2016). Osteosarcoma is the most common bone tumor with approximately 4.4 cases per 1 million annually in the United States, whereas Ewing sarcoma occurs in 1 case per 1 million annually among children younger than 20 years old (National Cancer Institute, 2015d). The peak age for pediatric bone tumors is 15 years old, and they occur more often in males.