CHEMOTHERAPY

HEAVY METALS

Sec #	Therapeutic Agent(s)	Potential Late Effects	Risk Factors	Highest Risk Factors	Periodic Evaluation	Health Counseling/ Further Considerations
20	**HEAVY METALS** Carboplatin (myeloablative doses OR any dose if age at diagnosis < 1 year) Cisplatin **Info Link** • In general, patients who received carboplatin in nonmyeloablative doses do not appear to be at risk for clinically significant ototoxicity. • Some studies have observed hearing loss among infants (with retinoblastoma) exposed to nonmyeloablative doses of carboplatin.	**Ototoxicity** Sensorineural hearing loss Tinnitus Vertigo	**Host Factors** Age < 4 years at treatment **Treatment Factors** Combined with: - Cranial/ear radiation - Ototoxic drugs (e.g., aminoglycosides, loop diuretics) **Medical Conditions** Chronic otitis Cerumen impaction Renal dysfunction	**Host Factors** CNS neoplasm **Treatment Factors** Cumulative cisplatin dose ≥ 360 mg/m^2 High dose cisplatin (i.e., 40 mg/m^2 per day × 5 days per course) Cisplatin administered AFTER cranial/ear radiation Carboplatin conditioning for HCT Radiation involving ear ≥ 30 Gy	**HISTORY** **Hearing difficulties (with/without background noise)** **Tinnitus** **Vertigo** Yearly **PHYSICAL** **Otoscopic exam** Yearly **SCREENING** **Complete audiological evaluation** Baseline at entry into long-term followup. If hearing loss is detected, test at least yearly, or as recommended by audiologist. If clinical suspicion of hearing loss at any time, test as clinically indicated. If audiogram is inconclusive or unevaluable, refer to audiologist for consideration of electrophysiologic testing e.g., otoacoustic emissions [OAEs]. **Info Link** • A "complete audiological evaluation" includes pure tone air and bone conduction, speech audiometry, and tympanometry for both ears. • Frequency-specific auditory brainstem response (ABR) can be performed if the above is inconclusive.	**Health Links** **Hearing Loss** **Educational Issues** **Considerations for Further Testing and Intervention** Audiology consultation for amplification in patients with hearing loss. Speech and language therapy for children with hearing loss. Otolaryngology consultation in patients with chronic infection, cerumen impaction, or other anatomical problems exacerbating or contributing to hearing loss. Refer patients with auditory deficits to school liaison in community or cancer center (psychologist, social worker, school counselor) to facilitate provision of educational resources. Consider specific needs and/or preferential classroom seating, FM amplification system, and other educational assistance as indicated. **SYSTEM = Auditory** **SCORE = 1**

SECTION 20 REFERENCES

Bertolini P, Lassalle M, Mercier G, et al. Platinum compound-related ototoxicity in children: long-term follow-up reveals continuous worsening of hearing loss. *J Pediatr Hematol Oncol*. Oct 2004;26(10):649-655.

Brock PR, Bellman SC, Yeomans EC, Pinkerton CR, Pritchard J. Cisplatin ototoxicity in children: a practical grading system. *Med Pediatr Oncol*. 1991;19(4):295-300.

Cushing B, Giller R, Cullen JW, et al. Randomized comparison of combination chemotherapy with etoposide, bleomycin, and either high-dose or standard-dose cisplatin in children and adolescents with high-risk malignant germ cell tumors: a pediatric intergroup study–Pediatric Oncology Group 9049 and Children's Cancer Group 8882. *J Clin Oncol*. Jul 1 2004;22(13):2691-2700.

Fouladi M, Gururangan S, Moghrabi A, et al. Carboplatin-based primary chemotherapy for infants and young children with CNS tumors. Cancer. Jul 15 2009 115(14):3243-3253.

Gilmer Knight KR, Kraemer DF, Neuwelt EA. Ototoxicity in children receiving platinum chemotherapy: underestimating a commonly occurring toxicity that may influence academic and social development. *J Clin Oncol*. 2005;Dec 1 23(34):8588-8596.

Gurney JG, Tersak JM, Ness KK, Landier W, Matthay KK, Schmidt ML. Hearing loss, quality of life, and academic problems in long-term neuroblastoma survivors: a report from the Children's Oncology Group. *Pediatrics*. Nov 2007;120(5):e1229-1236.

Jehanne M, Lumbroso-Le Rouic L, Savignoni A, et al. Analysis of ototoxicity in young children receiving carboplatin in the context of conservative management of unilateral or bilateral retinoblastoma. *Pediatr Blood Cancer*. May 2009 52(5):637-643.