

Oncologic and Hematologic Emergencies in Children

Megan E. Mickley
Camilo Gutierrez
Michele Carney

REFERENCES

1. <http://www.seer.cancer.gov>. (National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch. Surveillance, Epidemiology, and End Results [SEER] Program. SEER*Stat Database: Incidence – SEER 9 Regs Public-Use, Nov 2003 Sub [1973–2001]; 2014.) Accessed February 1, 2015.
2. Murphy SL, Xu J, Kochanek KD: *Deaths: Final Data for 2010. National Vital Statistics Reports*. Hyattsville, MD: National Center for Health Statistics, 2013.
3. American Cancer Society: *Global Cancer Facts & Figures*. 2nd ed. Atlanta, GA: American Cancer Society, 2011.
4. American Cancer Society: *Cancer Facts & Figures 2014*. Atlanta, GA: American Cancer Society, 2014.
5. Esparza SD, Sakamoto KM: Topics in pediatric leukemia—acute lymphoblastic leukemia. *MedGenMed* 7: 23, 2005. [PMID: 16369328]
6. Cheng J, Sakamoto KM: Topics in pediatric leukemia—acute myeloid leukemia. *MedGenMed* 7: 20, 2005. [PMID: 16369325]
7. Pui CH, Mullighan CG, Evans WE, et al: Pediatric acute lymphoblastic leukemia: where are we going and how do we get there? *Blood* 120: 1165, 2012. [PMID: 22730540]
8. O'Brien MM: Acute leukemias in children. *Dis Mon* 54: 202, 2008. [PMID: 18346479]
9. Belson M, Kingsley B, Holmes A: Risk factors for acute leukemia in children: a review. *Environ Health Perspect* 115: 138, 2007. [PMID: 17366834]
10. Woodruff TJ, Axelrad DA, Kyle AD, et al: Trends in environmentally related childhood illnesses. *Pediatrics* 113 (Suppl): 1133, 2004. [PMID: 15060210]
11. Rubnitz JE, Gibson B, Smith FO: Acute myeloid leukemia. *Hematol Oncol Clin North Am* 24: 35, 2010. [PMID: 20113895]
12. Tasian SK, Pollard JA, Aplenc R: Molecular therapeutic approaches for pediatric acute myeloid leukemia. *Front Oncol* 4: 55, 2014. [PMID: 24672775]
13. Jones OY, Spencer CH, Bowyer SL, et al: A multicenter case-control study on predictive factors distinguishing childhood leukemia from juvenile rheumatoid arthritis. *Pediatrics* 177: e840, 2005.
14. Teo WY, Chan MY, Ng KC, et al: Bony presentations of childhood haematological malignancy to the emergency room. *J Paediatr Child Health* 48: 311, 2012. [PMID: 2207629]
15. Bunin NJ, Piu CH: Differing complications of hyperleukocytosis in children with acute lymphoblastic leukemia. *J Clin Oncol* 3: 1590, 1985. [PMID: 3864942]
16. Pui CH, Evans WE: Treatment of acute lymphoblastic leukemia. *N Engl J Med* 354: 166, 2006. [PMID: 16407512]
17. Moore AS, Kearns PR, Knapper S, et al: Novel therapies for children with acute myeloid leukaemia. *Leukemia* 27: 1451, 2013. [PMID: 23563239]
18. Kelly KM, Lange B: Oncologic emergencies. *Pediatr Clin North Am* 44: 809, 1997. [PMID: 9286286]
19. Slichter SJ: Evidence-based platelet transfusion guidelines. *Hematology Am Soc Hematol Educ Program* 172, 2007.
20. Slichter SJ: Platelet transfusion therapy. *Hematol Oncol Clin North Am* 21: 697, 2007. [PMID: 17666286]
21. Sullivan MT, Wallace EL: Blood collection and transfusion in the United States in 1999. *Transfusion* 45: 141, 2005. [PMID: 15660821]
22. Zuckerman T, Ganzei C, Tallman MS, et al: How I treat hematologic emergencies in adults with acute leukemia. *Blood* 120: 1993, 2012. [PMID: 22700723]
23. Dinand V: Current strategies in the management of pediatric Hodgkin's lymphoma. *Indian J Med Paed Oncol* 29: 27, 2008.
24. Bazzell F, Rihani R, Howard S, et al: Comparing adult and pediatric Hodgkin lymphoma in the Surveillance, Epidemiology and End Results Program, 1988–2005: an analysis of 21 734 cases. *Leuk Lymphoma* 51: 2198, 2010. [PMID: 21054151]
25. Abramson SJ, Price AP: Imaging in pediatric lymphomas. *Radiol Clin North Am* 46: 313, 2008. [PMID: 18619383]
26. Khafaga YM, Belgaumi AF: Pediatric Hodgkin's lymphoma: changing concepts and moving points in radiation therapy. *Transfus Apher Sci* 49: 56, 2013. [PMID: 23769169]
27. Yeh JM, Diller L: Pediatric Hodgkin lymphoma: trade-offs between short- and long-term mortality risks. *Blood* 120: 2195, 2012. [PMID: 22826564]
28. Gross TG, Termuhlen AM: Pediatric non-Hodgkin lymphoma. *Curr Hematol Malign Rep* 3: 167, 2008. [PMID: 20425462]
29. Gore L, Trippett TM: Emerging non-transplant-based strategies in treating pediatric non-Hodgkin's lymphoma. *Curr Hematol Malig Rep* 5: 177, 2010. [PMID: 20640605]
30. Hargrave DR, Zacharoulis S: Pediatric CNS tumors: current treatment and future directions. *Expert Rev Neurother* 7: 1029, 2007. [PMID: 17678498]
31. Abdullah S, Aaddoumi I, Bouffet E: Advances in the management of pediatric central nervous system tumors. *Ann N Y Acad Sci* 1138: 22, 2008. [PMID: 18837879]
32. Baldwin RT, Preston-Martin S: Epidemiology of brain tumors in childhood—a review. *Toxicol Appl Pharmacol* 199: 118, 2004. [PMID: 15313584]
33. Medina LS, Pinter JD, Zurakowski, et al: Children with headache: clinical predictors or surgical space-occupying lesions and the role of neuroimaging. *Radiology* 202: 819, 1997. [PMID: 9051039]
34. Packer RJ, MacDonald T, Vezina G: Central nervous system tumors. *Pediatr Clin North Am* 55: 121, 2008. [PMID: 18242318]
35. Maris JM, Hogarty MD, Bagatell R, et al: Neuroblastoma. *Lancet* 369: 2106, 2007. [PMID: 17586306]
36. Rao AA, Naheedy JH, Chen JY, et al: A clinical update and radiologic review of pediatric orbital and ocular tumors. *J Oncol* 2013: 975908, 2013. [PMID: 23577029]
37. Dome JS, Perlman EJ, Graf N: Risk stratification for Wilms tumor: current approach and future directions. *Am Soc Clin Oncol Educ Book* 34: 215, 2014. [PMID: 24857079]
38. Maas MH, Cransberg K, van Grotel M, et al: Renin-induced hypertension in Wilms tumor patients. *Pediatr Blood Cancer* 48: 500, 2007. [PMID: 16794999]
39. Friedman AD: Wilms tumor. *Pediatr Rev* 34: 328, 2013. [PMID: 23818087]
40. Kivela T: The epidemiological challenge of the most frequent eye cancer: retinoblastoma, an issue of birth and death. *Br J Ophthalmol* 93: 1129, 2009. [PMID: 19704035]
41. Huang HJ, Yee JK, Shew JY, et al: Suppression of the neoplastic phenotype by replacement of the RB gene in human cancer cells. *Science* 242: 1563, 1988. [PMID: 3201247]
42. Houston SK, Murray TG, Wolfe SQ, et al: Current update on retinoblastoma. *Int Ophthalmol Clin* 51: 77, 2011. [PMID: 21139478]
43. Mosbech CH, Rechnitzer C, Brok JS, et al: Recent advances in understanding the etiology and pathogenesis of pediatric germ cell tumors. *J Pediatr Hematol Oncol* 36: 263, 2014. [PMID: 24575549]
44. Boublíkova L, Buchler T, Stary J, et al: Molecular biology of testicular germ cell tumors: unique features awaiting clinical application. *Crit Rev Oncol Hematol* 89: 366, 2014.
45. Cushing B, Perlman EJ, Neys MM, et al: Germ cell tumors, in *Principles and Practice of Pediatric Oncology*, 5th ed. Philadelphia: Lippincott Williams & Wilkins, 2006.
46. Matel D, Brown J, Frazier L: Updates in the management of ovarian germ cell tumors. *Am Soc Clin Oncol Educ Book* 2013. doi: 10.1200/EdBook_AM.2013.33.e210.
47. Billmire DF, Cullen JW, Rescorla FJ, et al: Surveillance after initial surgery for pediatric and adolescent girls with stage 1 ovarian germ cell tumors: report from the Children's Oncology Group. *J Clin Oncol* 32: 465, 2014. [PMID: 24395845]
48. Botter SM, Neri D, Fuchs B: Recent advances in osteosarcoma. *Curr Opin Pharmacol* 16C: 15, 2014. [PMID: 24632219]
49. Bielack S, Kempf-Bielack B, Delling G, et al: Prognostic factors in high-grade osteosarcoma of the extremities or trunk: an analysis of 1,702 patients treated on neoadjuvant cooperative osteosarcoma study group protocols. *J Clin Oncol* 20: 776, 2002. [PMID: 11821461]
50. Lee RK, Chu WC, Leung JH, et al: Pathological fracture as the presenting feature in pediatric osteosarcoma. *Pediatr Blood Cancer* 60: 1118, 2013. [PMID: 23281226]
51. Allison DC, Carney SC, Ahlmann ER, et al: A meta-analysis of osteosarcoma outcomes in the modern medical era. *Sarcoma* 2012: 704872, 2012. [PMID: 22550423]
52. Hawkins DS, Spunt SL, Skapek SX: Children's Oncology Group's 2013 blueprint for research: soft tissue sarcomas. *Pediatr Blood Cancer* 60: 1001, 2013. [PMID: 23255356]
53. Lewis MA, Hendrickson AW, Moynihan TJ: Oncologic emergencies: pathophysiology, presentation, diagnosis, and treatment. *CA Cancer J Clin* 61: 287, 2011. [PMID: 21858793]
54. Bertuch AA, Strother D: Fever in children with chemotherapy-induced neutropenia. *UpToDate*. Waltham, MA, 2007.
55. McCarville MB, Adelman CS, Li C, et al: Typhlitis in childhood cancer. *Cancer* 104: 380, 2005. [PMID: 15952190]
56. Lehrnbecher T, Phillips R, Alexander S, et al: Guideline for the management of fever and neutropenia in children with cancer and/or undergoing hematopoietic stem-cell transplantation. *J Clin Oncol* 30: 4427, 2012. [PMID: 22987086]
57. Picazo JJ: Management of the febrile neutropenic patient: a consensus conference. *Clin Infect Dis* 39: S1, 2004. [PMID: 15250013]
58. Rolston KV: Challenges in the treatment of infections caused by gram-positive and gram-negative bacteria in patients with cancer and neutropenia. *Clin Infect Dis* 40: S246, 2005. [PMID: 15768330]
59. McCurdy MT, Shanholtz CB: Oncologic emergencies. *Crit Care Med* 40: 2212, 2012. [PMID: 22584756]
60. Coiffier B, Altman A, Pui CH, et al: Guidelines for the management of pediatric and adult tumor lysis syndrome: an evidence-based review. *J Clin Oncol* 26: 2767, 2008. [PMID: 18509186]
61. McKay C, Furman WL: Hypercalcemia complicating childhood malignancies. *Cancer* 72: 256, 1993. [PMID: 8508415]
62. Kerdudo C, Aerts I, Fattet S, et al: Hypercalcemia and childhood cancer: a 7-year experience. *J Pediatr Hematol Oncol* 27: 23, 2005. [PMID: 15654274]
63. Lim YJ, Park EK, Koh HC, et al: Syndrome of inappropriate secretion of antidiuretic hormone as a leading cause of hyponatremia in children who underwent chemotherapy or stem cell transplantation. *Pediatr Blood Cancer* 54: 734, 2010. [PMID: 20205255]
64. Moritz ML: Syndrome of inappropriate antidiuresis and cerebral salt wasting syndrome: are they different and does it matter? *Pediatr Nephrol* 27: 689, 2012. [PMID: 22358189]
65. Jain R, Bansal D, Marwaha RK, et al: Superior mediastinal syndrome: emergency management. *Indian J Pediatr* 80: 55, 2013. [PMID: 23054856]
66. Seth R, Bolia R, Jain R, et al: Superior mediastinal syndrome: a rare presenting feature of acute myeloid leukemia. *Indian J Pediatr* 80: 165, 2013. [PMID: 22674250]
67. Lam JC, Chui CH, Jacobsen AS, et al: When is a mediastinal mass critical in a child? An analysis of 29 patients. *Pediatr Surg Int* 20: 180, 2004. [PMID: 15064964]
68. Behl D, Hendrickson AW, Moynihan TJ: Oncologic emergencies. *Crit Care Clin* 26: 181, 2010. [PMID: 19944281]
69. Wilne S, Walker D: Spine and spinal cord tumours in children: a diagnostic and therapeutic challenge to healthcare systems. *Arch Dis Child Educ Pract Ed* 95: 47, 2010. [PMID: 20351151]

70. Pollono D, Drut R, Ibanez O, et al: Spinal cord compression: a review of 70 pediatric patients. *Pediatr Hematol Oncol* 20: 457, 2003. [PMID: 14631620]
71. Simon T, Neumann CA, Hero B, et al: Short- and long-term outcome of patients with symptoms of spinal cord compression by neuroblastoma. *Dev Med Child Neurol* 54: 347, 2012. [PMID: 22329756]
72. Fleming AJ, Chi SN: Brain tumors in children. *Curr Probl Pediatr Adolesc Health Care* 42: 80, 2012. [PMID: 22433905]
73. Wiens AL, Hattab EM: The pathological spectrum of solid CNS metastases in the pediatric population. *J Neurosurg Pediatr* 13: 1, 2014. [PMID: 24138145]
74. Pitfield AF, Carroll AB, Kissoon N: Emergency management of increased intracranial pressure. *Pediatr Emerg Care* 28: 200, 2012. [PMID: 22307193]
75. Hardesty DA, Sanborn MR, Parker WE, et al: Perioperative seizure incidence and risk factors in 223 pediatric brain tumor patients without prior seizures. *J Neurosurg Pediatr* 7: 609, 2011. [PMID: 21631197]
76. Noje C, Cohen K, Jordan LC: Hemorrhagic and ischemic stroke in children with cancer. *Pediatr Neurol* 49: 237, 2013. [PMID: 23942224]
77. Passos J, Nzwaloh H, Margues J, et al: Stroke in children with cancer: the tip of the iceberg? *Pediatr Neurol* 50: e3, 2014. [PMID: 24314674]
78. Athale UH, Siciliano S, Cheng J, et al: Central venous line dysfunction is an independent predictor of poor survival in children with cancer. *J Pediatr Hematol Oncol* 34: 188, 2012. [PMID: 22278202]
79. Halton J, Nagel K, Branda LR, et al: Do children with central venous line (CVL) dysfunction have increased risk of symptomatic thromboembolism compared to those without CVL dysfunction, while on cancer therapy? *BMC Cancer* 12: 314, 2012. [PMID: 22835078]
80. Rinke ML, Milstone AM, Chen AR, et al: Ambulatory pediatric oncology CLABSIs: epidemiology and risk factors. *Pediatr Blood Cancer* 60: 1882, 2013. [PMID: 23881643]
81. Orgel E, Ji L, Pastor W, et al: Infectious morbidity by catheter type in neutropenic children with cancer. *Pediatr Infect Dis J* 33: 263, 2014. [PMID: 24263218]
82. Mangum DS, Verma A, Weng C, et al: A comparison of central lines in pediatric oncology patients: early removal and patient centered outcomes. *Pediatr Blood Cancer* 60: 1890, 2013. [PMID: 23868811]
83. Athale UH, Chan AK: Hemorrhagic complications in pediatric hematologic malignancies. *Semin Thromb Hemost* 33: 408, 2007. [PMID: 17525898]
84. Hobson MJ, Carney DE, Molik KA, et al: Appendicitis in childhood hematologic malignancies: analysis and comparison with typhlitis. *J Pediatr Surg* 40: 214, 2005. [PMID: 15871157]
85. Riachi E, Krauel L, Rich BS, et al: Risk factors and predictors of severity score and complications of pediatric hemorrhagic cystitis. *J Urol* 191: 186, 2014. [PMID: 23954584]
86. Gringeri A, Ewenstein B, Reininger A: The burden of bleeding in hemophilia: is one bleed too many? *Haemophilia* 20: 459, 2014. [PMID: 24472015]
87. Zimmerman B, Valentino LA: Hemophilia: in review. *Pediatr Rev* 34: 289, 2013. [PMID: 23818083]
88. Franchini M, Mannucci PM: Hemophilia A in the third millennium. *Blood Rev* 27: 179, 2013. [PMID: 23815950]
89. Callaghan MU, Wong TE, Federici AB: Treatment of acquired von Willebrand syndrome in childhood. *Blood* 122: 2019, 2013. [PMID: 23878141]
90. Castaman G, Goodeve A, Eikenboom J, et al: Principles of care for the diagnosis and treatment of von Willebrand disease. *Haematologica* 98: 667, 2013. [PMID: 23633542]
91. Branchford BR, Di Paola J: Making a diagnosis of VWD. *Hematology Am Soc Hematol Educ Program* 2012: 161, 2012. [PMID: 23233576]
92. Cariappa R, Wilhite TR, Parvin CA, et al: Comparison of PFA-100 and bleeding time testing in pediatric patients with suspected hemorrhagic problems. *J Pediatr Hematol Oncol* 25: 474, 2003. [PMID: 12794526]
93. Sadowitz PD, Amanullah S, Souid A-K: Hematologic emergencies in the pediatric emergency room. *Emerg Med Clin North Am* 20: 177, 2002. [PMID: 11826633]
94. Eventov-Friedman S, Vinograd O, Ben-Haim M, et al: Parents' knowledge and perceptions regarding vitamin K prophylaxis in newborns. *J Pediatr Hematol Oncol* 35: 409, 2013. [PMID: 23242324]
95. Schulte R, Jordan LC, Morad A, et al: Rise in late onset vitamin K deficiency bleeding in young infants because of omission or refusal of prophylaxis at birth. *Pediatr Neurol* 50: 564, 2014. [PMID: 24842255]
96. Baker RD, Greer FR: Diagnosis and prevention of iron deficiency and iron-deficiency anemia in infants and young children (0-3 years of age). *Pediatrics* 126: 1040, 2010. [PMID: 20923825]
97. Shaw J, Meeder R: Transient erythroblastopenia of childhood in siblings: case report and review of the literature. *J Pediatr Hematol Oncol* 29: 659, 2007. [PMID: 17805047]
98. Buchanan GR: Immune thrombocytopenia during childhood: new approaches to classification and management. *J Pediatr* 165: 437, 2014. [PMID: 24973290]
99. Recht M: Thrombocytopenia and anemia in infants and children. *Emerg Med Clin North Am* 27: 505, 2009. [PMID: 19646651]
100. Beck CE, Nathan PC, Parkin PC, et al: Corticosteroids versus intravenous immune globulin for the treatment of acute immune thrombocytopenic purpura in children: a systematic review and meta-analysis of randomized controlled trials. *J Pediatr* 147: 521, 2005. [PMID: 16227040]
101. Newburger PE, Dale DC: Evaluation and management of patients with isolated neutropenia. *Semin Hematol* 50: 198, 2013. [PMID: 23953336]
102. Boxer LA: How to approach neutropenia. *Hematology Am Soc Hematol Educ Program* 2012: 174, 2012. [PMID: 23233578]