

Long Term Effects in Pediatric Cancer Survivors: What is the Cost of a Cure?

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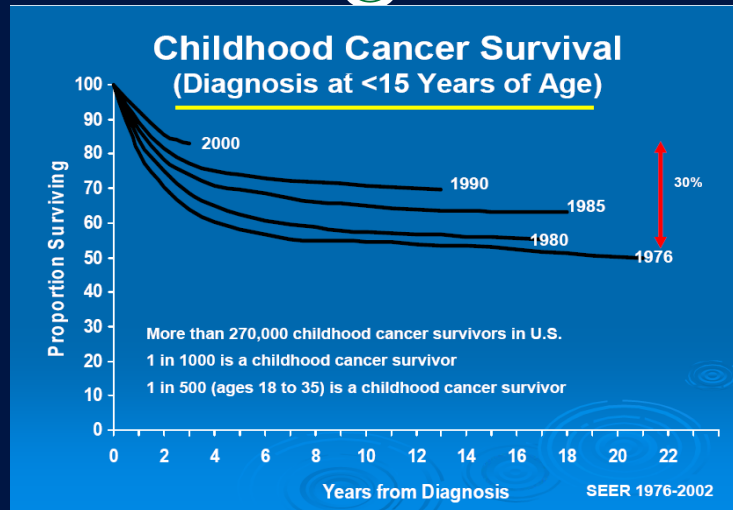
Learning Objectives

- Recognize survivors of childhood cancers are at risk for the development of long-term toxicities
- Describe some of the more common long-term toxicities seen in pediatric cancer survivors
- Identify therapeutic interventions and lifestyle changes important to managing long-term sequelae in pediatric cancer survivors
- Identify pertinent resources available to healthcare practitioners who care for long-term cancer survivors

Introduction

Surviving a pediatric cancer has become the expectation rather than the exception

Introduction



Issues with Survivorship

- **Childhood Cancer Survivor Study (CCSS)**
 - Retrospective longitudinal cohort study
 - Supported by the NCI and directed through U of Minnesota
 - Tracking numerous outcomes of more than 14,000 cancer survivors (and their healthy siblings)
 - × Treated at one of 26 participating institutions
 - × Diagnosed with childhood cancer 1970-1986
 - Before the age of 21 years
 - Leukemia, CNS tumor, Hodgkin's lymphoma, NHL, Wilms tumor, neuroblastoma, soft tissue sarcoma or bone tumor
 - × Five or more years out from therapy

Robison LL. *Med Pediatr Oncol* 2002;38:229-239

Issues with Survivorship

- Chronic health conditions in adult survivors of childhood cancers (from CCSS)
 - 10,397 survivors with mean age = 26.6 years (18-48)
 - 3,034 siblings with mean age = 29.2 years (18-56)

Oeffinger KC. *New Engl J Med* 2006;355:1572-1582

Issues with Survivorship

Table 2. Cancer Survivors and Siblings with a Chronic Health Condition, According to the Severity Score.[‡]

Health Condition	Survivors (N=10,397)	Siblings (N=3034)
	no. (%)	
No condition	3887 (37.4)	1917 (63.2)
Grade 1 (mild)	1931 (18.6)	610 (20.1)
Grade 2 (moderate)	1635 (15.7)	349 (11.5)
Grade 3 (severe)	2128 (20.5)	128 (4.2)
Grade 4 (life-threatening or disabling)	653 (6.3)	30 (1.0)
Grade 5 (fatal)	163 (1.6)	NA [†]
Any condition [‡]		
Grades 1–4	6482 (62.3)	1117 (36.8)
Grade 3 or 4	2858 (27.5)	158 (5.2)
Multiple health conditions		
≥2	3905 (37.6)	397 (13.1)
≥3	2470 (23.8)	163 (5.4)

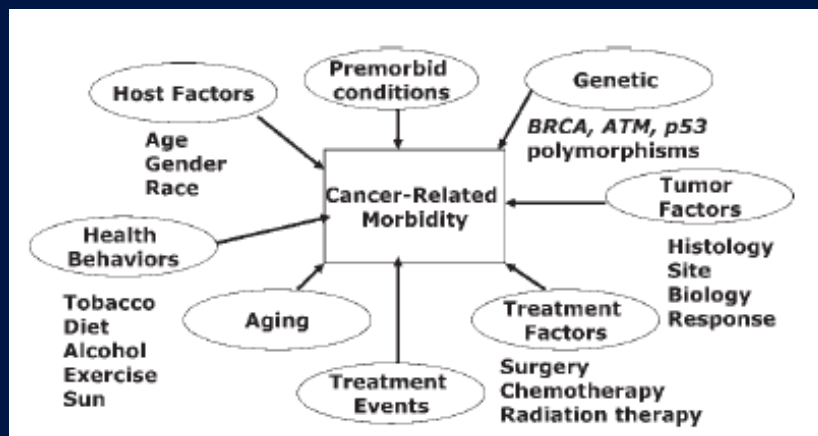
Oeffinger KC. *New Engl J Med* 2006;355:1572-1582

Issues with Survivorship

- Adjusted relative risk of a chronic condition in a survivor compared to sibling was 3.3 and for a severe or life-threatening condition it was 8.2
- Cumulative incidence (30 years after cancer diagnosis) of a chronic health condition was 73.4% and for a severe, disabling or life-threatening condition or death it was 42.2%

Oeffinger KC. *New Engl J Med* 2006;355:1572-1582

Issues with Survivorship



Hudson MM. *Cancer* 2005;104(11 Suppl) 2638-42

Defining Cancer Survivorship

- What are the components?
 - Cancer
 - ✦ Hematological malignancy versus solid tumor
 - Treatment modality
 - ✦ Primary versus secondary
 - Time
 - ✦ Starting from when?
 - ✦ Endpoints?
 - Patient
 - ✦ Physiological versus psychological
 - Family and friends

Mullan F. *New Engl J Med* 1985;313:270-273
 Feuerstein M. *J Cancer Surviv* 2007;1:5-7

“Having cancer changed my life, and changed my life forever”

“Surviving traumatic illness like leukemia at my age made me think I could survive anything. But the getting better part – well, it nearly broke me... Getting better brings about its own problems just as much as being sick does, and, as I found, these are rarely identified, let alone discussed. And while there are some fantastic positives to be gained from undergoing an ordeal like cancer, if the negatives are never addressed, how can they be overcome?”

- Heather, age 23 (diagnosed with ALL at 15)

Drew S. *Chronic Illn* 2007;3:278-295.

Central Nervous System



- Neurocognitive impairment – most worrisome outcome among survivors and parents
 - Wide array of problems with attention, concentration, memory, processing speed, executive function and visual perception skills most commonly affected
 - Patients at greatest risk are those with CNS tumors and ALL
 - Patient risk factors include female gender and younger age (< 3 years old) at the time of treatment

Kurt BA. *J Pediatr* 2008;152:458-466
 Oeffinger KC. *CA Cancer J Clin* 2004;54:208-236
 Oeffinger KC. *Pediatr Clin N Am* 2008;55:251-273

Central Nervous System



- Neurocognitive impairment – therapeutic causes
 - Radiation therapy (> 24 Gy) is most problematic
 - Chemotherapy agents (methotrexate, high dose cytarabine and corticosteroids)
 - Surgery
- Neurocognitive impairment – management
 - Routine assessments made throughout treatment by trained professionals
 - Special education and cognitive remediation
 - Pharmacological interventions

Kurt BA. *J Pediatr* 2008;152:458-466
 Oeffinger KC. *CA Cancer J Clin* 2004;54:208-236
 Oeffinger KC. *Pediatr Clin N Am* 2008;55:251-27

Endocrine



- Serious and life-long consequences occur secondary to endocrine system toxicities that result from chemotherapy and radiation therapy
- Estimated to affect approximately 40% of all childhood cancer survivors
 - Growth hormone abnormalities
 - Thyroid abnormalities
 - Diabetes
 - Adrenal insufficiency
 - Obesity/Metabolic syndrome
 - Gonadal abnormalities

Stava CJ. *J Cancer Surviv* 2007;1:261-274
Nandagopal R. *Horm Res* 2008;69:65-74

Endocrine



- Growth hormone abnormalities
 - Cranial radiation (18-24 Gy) cause isolated growth hormone deficiency and higher doses (> 30-40 Gy) can result in panhypopituitarism
 - Risk appears to be inversely related to age at exposure
 - Benefits of hormone replacement still are unclear
 - × Improvements in cardiac dysfunction, bone density and quality of life
 - × Decrease in metabolic syndrome
 - × No effect on tumor recurrence
 - × Increased risk of secondary malignancy

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Ergun-Longmire B. *J Clin Endocrinol Metab* 2006;91:3494-3498

Endocrine



- **Thyroid abnormalities**
 - Includes hyper- and hypothyroidism, thyroid nodules and thyroid cancer
 - ✦ Can occur in as little as 6 months to as much as 7 years or more after starting therapy
 - ✦ Median time of onset is approximately 12 months
 - Greatest risk to those patients that receive radiation therapy, are female and received treatment prior to the age of 10 years old

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Endocrine



- **Diabetes**
 - Therapies – corticosteroids, L-asparaginase products, streptozocin and calcineurin inhibitors
 - Glycosuria – ifosfamide, cisplatin and high-dose methotrexate
- **Adrenal insufficiency**
 - Therapies – mitotane, busulfan, corticosteroids
- **Management of endocrine abnormalities**
 - Annual evaluation of hormones and blood chemistries
 - Supportive care analogous to general population

Stava CJ. *J Cancer Surviv* 2007;1:261-274
 Nandagopal R. *Horm Res* 2008;69:65-74

Obesity/Metabolic Syndrome

- Varying data

- When adult survivors of **childhood ALL** were compared to their healthy siblings:
 - ✦ Risk of obesity was greatest for females diagnosed before the age of 4 years treated with cranial radiation ≥ 20 Gy (dose dependent)
 - ✦ Risk of obesity not associated with treatments consisting of only chemotherapy
- When adult survivors of other tumors were analyzed, patients were not found to be a risk for obesity and some were found to be at risk of being underweight
- Rate of activity is less in survivors (brain tumors and bone tumors in particular) compared with healthy siblings

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Cardiotoxicity

- Significant complication following treatment

- Risk of cardiac death is up to 10-fold higher in childhood cancer survivors than in the general population
- Third most common cause of death in childhood cancer survivors
- Most common causes are radiotherapy to the chest or head/neck and anthracycline chemotherapy agents
- Manifestations
 - ✦ Cardiomyopathy
 - ✦ Pericarditis
 - ✦ Congestive heart disease
 - ✦ Valvular heart disease
 - ✦ Premature coronary artery disease

Shankar SM. *Pediatrics* 2008;121:e387-e396

Cardiotoxicity

- Anthracycline chemotherapies and risks

Population	Cumulative doxorubicin dose	Risk of cardiotoxicity
Adult	500-550 mg/m ²	4%
	551-600 mg/m ²	18%
	≥ 600 mg/m ²	36%
Pediatric	< 300 mg/m ²	
	≥ 300 mg/m ²	11-fold increased risk

- Other risk factors: mediastinal and neck radiotherapy, young age, female gender, administration method, longer follow-up, African American race, Trisomy 21, other chemotherapies, pre-existing cardiovascular disease

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 Shankar SM. *Pediatrics* 2008; 121:e387-e396
 Gianni L. *J Clin Oncol* 2008; 26:3777-3784

Cardiotoxicity

- Recent update (Abstract 9509 – 2008 ASCO mtg)

- 14,358 survivors (treated 1970-1986) and 3,899 siblings
 - ✦ Mean age at diagnosis = 7.8 years
 - ✦ Mean age at follow-up = 27.5 years
- Diagnosis: leukemia, CNS tumors, HL and NHL, renal tumors, neuroblastoma, and bone and soft tissue sarcomas
- Findings

Complication	Relative risk vs. sibling	Overall risk 30 years after treatment
Atherosclerosis	10 times greater	2%
Congestive heart failure	5.7 times greater	4%
Myocardial infarction	4.9 times greater	1%
Pericardial disease	6.3 times greater	3%
Valvular disease	4.8 times greater	4%

Cardiotoxicity

- Anthracycline equivalent doses

Drug	Conversion Factor Dose
Doxorubicin	50 mg/m ²
Daunorubicin	60 mg/m ²
Idarubicin	10 mg/m ²
Epirubicin	75 mg/m ²
Mitoxantrone	12.5 mg/m ²
Zorubicin	100 mg/m ²

Shankar SM. *Pediatrics* 2008;121:e387-e396

Cardiotoxicity

- Reducing the risk associated with anthracyclines

- Method of administration
- Liposomal preparations and novel analogs
- Cardioprotectants
 - × Dexrazoxane
- Adjunctive therapies
 - × Beta-blockers
 - × ACE inhibitors
 - × Calcium channel blockers
- Healthy lifestyle

- Screening guidelines

Barry E. *Expert Opin Pharmacother* 2007; 8: 039-1058
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Pulmonary

- Pulmonary toxicity is often asymptomatic but can progress to serious complications
- Associated with chemotherapy and radiotherapy
 - Bleomycin → pulmonary fibrosis and interstitial pneumonitis
 - Busulfan (500 mg/m²) and carmustine (1500 mg/m²) → pulmonary fibrosis
 - Methotrexate → interstitial pneumonitis
- Risk factors include young age, asthma and smoking
- Screening guidelines
- Lifestyle changes

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Renal

- Ifosfamide-induced Fanconi's Syndrome (FS)
 - Tubulopathy (hypophosphatemia and/or proteinuria)
 - Risk factors
 - × Cumulative dose
 - < 24 gm/m² = 0.4% 24-60 gm/m² = 6.5% >60 gm/m² = 8%
 - × Age (less than 5 years of age at diagnosis)
 - × Previous or concomitant cisplatin therapy (carboplatin?)
 - × Unilateral nephrectomy
 - × Radiation therapy
 - GFR can not predict or determine damage
- Renal function (Scr and magnesium levels)

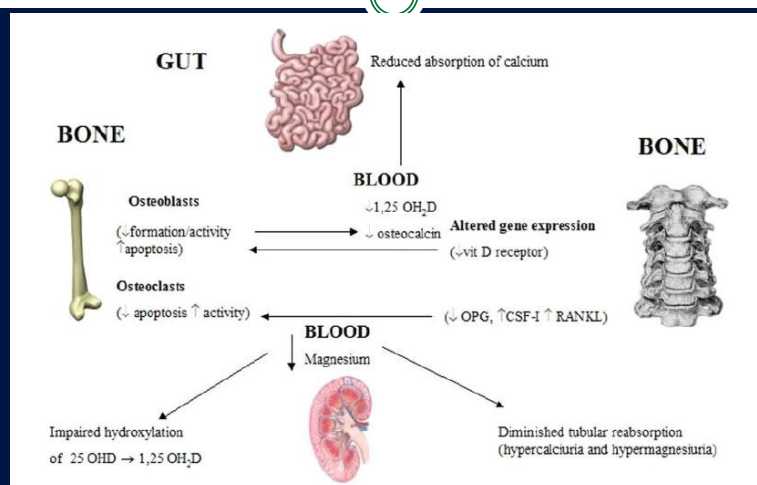
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Gastrointestinal/Hepatic

- Although acute problems are common during treatment, long-term complications are infrequent
 - Gastrointestinal
 - ✦ Intestinal fibrosis and enteritis from radiation (> 60 Gy)
 - ✦ Adhesions from surgery
 - Hepatic
 - ✦ Fibrosis and cirrhosis from radiation (> 35 Gy), methotrexate, dactinomycin, mercaptopurine and thioguanine
 - ✦ Hepatitis

Kurt BA. *J Pediatr* 2008;152:458-466
 Oeffinger KC. *CA Cancer J Clin* 2004;54:208-236

Musculoskeletal



Sala A. *Cancer* 2007;109:1420-1431

Musculoskeletal



- **Avascular necrosis (AVN)**
 - Definition: Massive necrosis of bone and bone marrow occurring as the only or largely predominant abnormality
 - Corticosteroid use
 - × Risk increases more with cumulative total dose rather than daily dose
 - × Higher incidence in females and when used in patients age ≥ 10 years (and now high BMI is a concern)
 - × Time of onset is variable (average is 6-8 months)
 - × Most likely to affect the hips and knees
 - × Use associated with high serum lipids, increased fat cell mass and increased intraosseous pressure

Mandel K. *J Clin Oncol* 2004;22:1215-1221
 Burger B. *Pediatr Blood Cancer* 2005;44:220-225
 Lafforgue P. *Joint Bone Spine* 2006;73:500-507

Musculoskeletal



- **Bone mineral density (not osteopenia/osteoporosis)**
 - Altered bone metabolism that interferes with attainment of peak bone mass
 - Radiation
 - × Cranial XRT (≥ 18 Gy) or fractionated TBI (> 12 Gy) \rightarrow growth hormone deficiency
 - × Neuroendocrine axis XRT (≥ 40 Gy) \rightarrow gonadotropin deficiency
 - × Gonadal XRT
 - Ovarian dysfunction and premature menopause at ≥ 10 Gy in prepubertal females and at ≥ 5 Gy in pubertal females
 - Leydig cell dysfunction and associated androgen insufficiency at ≥ 20 Gy to testes

Wasilewski-Masker K. *Pediatrics* 2008;121:e705-e713

Musculoskeletal

- Bone mineral density
 - Chemotherapy
 - ✦ Corticosteroids (> 9,000 mg/m² of prednisone equivalents)
 - ✦ Methotrexate (> 40 gm/m²)
 - ✦ Alkylator effects on endocrine system
 - Screening
 - ✦ Bone mineral evaluation by dual-radiograph absorptiometry (DXA) or quantitative computed tomography (QCT) at baseline and then as clinically warranted
 - Lifestyle and management
 - ✦ Calcium supplements
 - ✦ Exercise
 - ✦ Bisphosphonates?

Wasilewski-Masker K. *Pediatrics* 2008;121:e705-e713

Miscellaneous

Organ (Effects)	Causative Agents	Monitoring	Comments
Eyes (Cataracts)	Busulfan, Corticosteroids, Radiation to head	Visual acuity exam and exam for cataracts yearly	Ophthalmologist consult is often warranted; Wear sunglasses with UV protection when outdoors
Ears (Hearing loss)	Cisplatin Carboplatin Radiation to head	Annual audiogram when problems detected	Avoid loud noises (lawn mowers, vacuum cleaners) and wear ear protection if unavoidable
Skin (Fibrosis, Telangiectasias)	Radiation	Yearly skin exams at doctor's visits and monthly skin exams at home	Wear sunscreen and protective clothing when outdoors; Avoid tanning booths

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Fertility – Males

- Alkylators and platinum compounds affect testicular function (dose dependent)
 - Cyclophosphamide in doses of 7.5 gm/m² significantly prolong or sterility which may be irreversible (may start seeing effects with 3 gm/m²)
 - Ifosfamide doses of 42 gm/m²
 - Cisplatin doses of 500 mg/m²
- Radiation to the brain or pelvis can disrupt the pituitary/gonadal axis (2.5 Gy to testes)
- Fertility preservation options
 - Sperm cryopreservation

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 Meistrich ML. *Cancer* 1992;70:2703-2712
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Fertility – Females

- Offending agents
 - Radiation to pelvis
 - ✖ Alone – 2 Gy to ovaries
 - ✖ Combination with alkylators – 1 Gy to ovaries
 - ✖ TBI (before or after age 10 years)
 - Chemotherapy agents
 - ✖ Transplant preparative regimens
 - ✖ Alkylators
 - ✖ Cisplatin
 - ✖ Plant alkaloids

Sklar C. *Med Pediatr Oncol* 1999;33:2-8
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 Bath LE. *BJOG* 2002;109:107-114

Fertility – Females

- Fertility preservation options
 - Zygote cryopreservation/in vitro fertilization
 - ✦ Most widely used and highest success rates
 - Inhibition of ovulation with gonadotropin-releasing hormone (GnRH) agonists
 - ✦ Not uniformly proven effective
 - ✦ May be alternative to above option
 - Oocyte cryopreservation/transplantation
 - ✦ Still in early phase development
 - ✦ Lower success rates and availability (can delay treatments!)
 - Ovarian transposition/radiation field modification
 - ✦ Invasive procedure

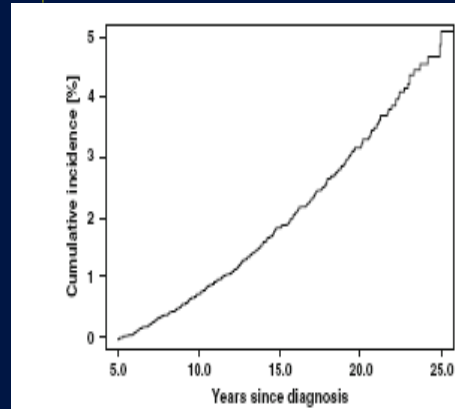
Fertility

- Pregnancies and birth
 - Among 1,953 women in the Childhood Cancer Survivor Study, 4,029 live births reported
 - No correlation between chemotherapy and pregnancy outcomes
 - Previous pelvic radiation associated with low birth weight
- Resources
 - [www.Fertile Hope.org](http://www.FertileHope.org)
 - Yahoo blog on adoption after cancer

Green DM. *Am J Obstet Gynecol* 2002;187:1070-1080

Secondary Cancers

- Cumulative risk of any cancer at 20 years following therapy reported to be 3-5% (may be higher)
 - Represents a 3- to 6-fold higher risk than general population
 - Highest risk patients: Hodgkin's lymphoma and retinoblastoma survivors as well as those who received radiotherapy



Neglia JP. *J Natl Cancer Inst* 2001, 93:618-629
Kleinerman RA. *J Clin Oncol* 2005, 23:2272-2279

Secondary Cancers

- Standard incidence ratios (SIR) in the Childhood Cancer Survivor Study (CCSS) cohort

Secondary malignancy	SIR	(95% CI)	Median time (yr)
All cancers	6.4	(5.7-7.1)	11.7
Bone	19.1	(12.7-27.7)	9.6
Breast	16.2	(12.8-20.8)	15.7
Thyroid	11.3	(8.2-15.3)	13.3
CNS tumors	9.9	(6.9-13.63)	9.5
AML	7.9	(3.6-15)	6.1
Soft tissue sarcoma	6.3	(4.3-8.9)	10.6
Melanoma	4.0	(2.4-6.3)	14.6
Lymphoma	1.5	(0.8-2.6)	13.8
Other	4.0	(3.1-5.2)	13.9

Neglia JP. *J Natl Cancer Inst* 2001, 93:618-629.

Secondary Cancers

• Secondary AML/MDS

- Associated with exposure to alkylating agents and/or topoisomerase II inhibitors (epipodophyllotoxins, anthracyclines)
- Risk \approx cumulative dose/exposure
- Peak occurrence is 4-6 years after exposure
- Associated with genetic rearrangements
 - ✦ Alkylator exposure \rightarrow chromosomes 5, 7, 8 or 9
 - ✦ Topoisomerase II inhibitors \rightarrow 11q23

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Secondary Cancers

• Breast cancer

- Chest radiotherapy poses greatest risk
- Childhood malignancy risk
 - ✦ Hodgkin's lymphoma, NHL, Wilms tumor, bone and soft tissue sarcomas
- Other risks
 - ✦ Family history of breast cancer or thyroid disease
 - ✦ Pelvic radiation reduces the risk
- Breast cancer screening of at-risk patients
 - ✦ 8 years after chest radiotherapy or at age 25 yrs (which ever is later)
 - ✦ ACS \rightarrow annual mammography and breast MRI screening

Kenney LB. *Ann Intern Med* 2004, 141:590-597
Saslow D. *CA Cancer J Clin* 2007, 57:75-89

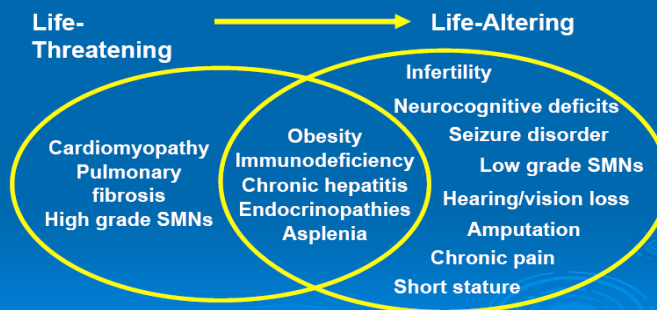
Psychosocial

- Anxiety, depression and mental health disorders
- Strained social interactions
- Academic underachievement
- Vocational and employment challenges
- Health care access and insurance issues
- Marriage and adoption issues

Mulrooney DA. *Curr Treat Options Oncol* 2008;9:51-66
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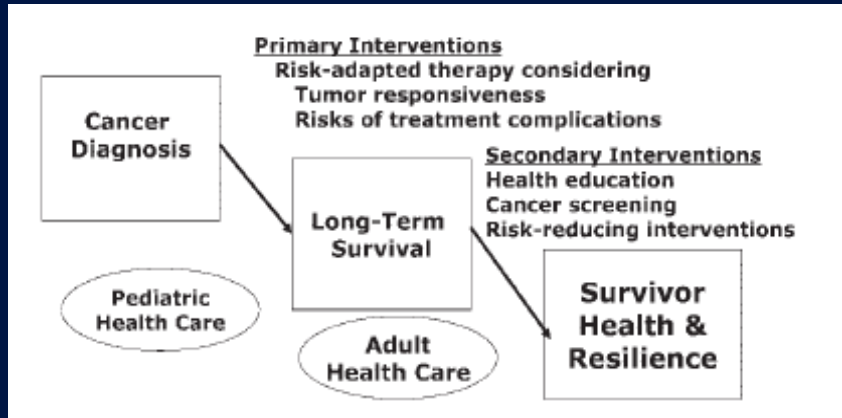
Long Term Follow-Up

Spectrum of Late Effects in Childhood Cancer Survivors



Hudson, 2005

Long Term Follow-Up



Hudson MM. *Cancer* 2005;104(11 Suppl) 2638-42

Challenges

- **Survivor-related**
 - Lack of knowledge and understanding
 - False sense of security
 - Mobility
- **Psychological**
 - Fears and hearing more bad news
- **Health provider-related**
 - Pediatric ← → Adult disconnect, planning and communication
- **Health system-related**
 - Lack of programs and trained staff
 - \$\$\$ (insurance and research)

Mertens AC. *Health Policy* 2004;69:169-178

Models of Care

Establishing and Enhancing Services for Childhood Cancer Survivors LONG-TERM FOLLOW-UP PROGRAM RESOURCE GUIDE



Children's Oncology Group Nursing Discipline Clinical Practice Subcommittee/Survivorship in collaboration with the Late Effects Committee



Models of Care

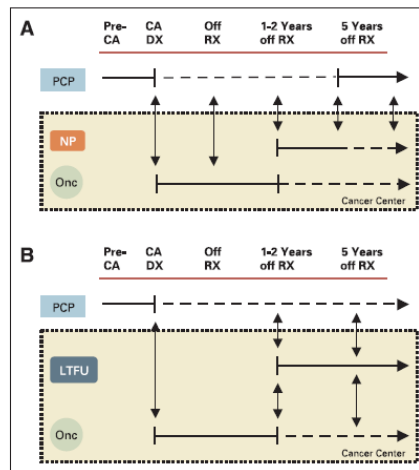


Fig 2. Academically based comprehensive survivor program models. (A) Nurse practitioner-led shared care; (B) multidisciplinary long-term follow-up program, stratified high-risk population. Solid line connotes primary responsibility; dashed line connotes secondary responsibility. CA, cancer; DX, diagnosis; Off RX, completion of cancer therapy; PCP, primary care physician; Onc, oncology team; NP, oncology nurse practitioner; LTFU, long-term follow-up program.

Oeffinger KC. *J Clin Oncol* 2006;24:5117-5124

Guidelines

Long-Term Follow-Up Guidelines for Survivors of Childhood, Adolescent, and Young Adult Cancers

Version 2.0 – March 2006

CureSearch
Children's Oncology Group

www.survivorshipguidelines.org

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Guidelines

CHEMOTHERAPY

ALKYLATING AGENTS (cont)

Sec #	Therapeutic Agent(s)	Potential Late Effects	Risk Factors	Highest Risk Factors	Periodic Evaluation	Health Counseling Further Considerations
13	ALKYLATING AGENTS Ifosfamide	Renal toxicity Glomerular toxicity Tubular toxicity (renal tubular acidosis, Fanconi's syndrome, hypophosphatemic rickets)	Host Factors Younger age at treatment Monospecific Treatment Factors Higher cumulative dose Combined with other nephrotoxic agents, such as: - Cisplatin - Carboplatin - Aminoglycosides - Amphotericin - Immunosuppressants - Methotrexate - Radiation impacting the kidney Medical Conditions Tumor infiltration of kidney(s) Pre-existing renal impairment Nephrectomy	Host Factors Age < 5 years at time of treatment Treatment Factors Ifosfamide dose ≥ 20 grams/m ² Renal radiation dose ≥ 15 Gy	PHYSICAL Blood pressure (Yearly) SCREENING Creatinine Na, K, Cl, CO ₂ , Ca, Mg, PO ₄ (Baseline at entry into long-term follow-up. If abnormal, repeat as clinically indicated.) Urinalysis (Yearly)	Health Links Kidney Health See also: Single Kidney Health Considerations for Further Testing and Intervention Electrolyte supplements for patients with persistent electrolyte wasting. Nephrology consultation for patients with hypertension, proteinuria, or progressive renal insufficiency SYSTEM = Urinary SCORE = 1

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Guidelines

Health Link

Healthy living after treatment for childhood cancer

Kidney Health
Version 2.0 - 3/06

Kidney Health after Childhood Cancer

The kidneys are vital organs responsible for filtering out waste products from the blood, controlling blood pressure, and stimulating red blood cell production. Treatment for childhood cancer can sometimes damage the kidneys. It is important to understand how the kidneys function so that you can keep your kidneys as healthy as possible.

How do the kidneys work?

The kidneys are two bean-shaped organs, each approximately the size of an adult fist, located below the ribcage near the middle of the back. The kidneys filter about 200 quarts of blood each day, removing harmful waste products and excess water, and returning important elements (such as calcium, sodium and potassium) to the blood. Filtering occurs in tiny units inside the kidneys, known as nephrons. Each kidney has approximately one million nephrons. After the blood is filtered by the nephrons, the excess water and waste products become urine. The urine flows from the kidneys to the bladder through tubes called ureters. The bladder then stores the urine until it is full, at which time the waste is emptied from the body through the urethra.



How is kidney function measured?

Kidney function is measured in percentages. Two normal kidneys account for 100% of kidney function. A single kidney provides about 50% of kidney function. One can lead a normal life with one kidney as long as the single kidney remains healthy. When kidney function drops to less than 50% of normal, the risk of health problems increases. Serious health problems are more frequent when kidney function drops to below 20%. Dialysis or transplant is necessary if kidney function falls to 15% or below.

What treatments for childhood cancer can cause kidney problems?

Certain treatments used for childhood cancer can sometimes cause kidney problems. There may also be other risk factors present that can increase the chance of kidney problems. If you have any of the following risk factors, you should take extra care to keep your kidneys healthy:

Radiation involving the kidneys, including:

- Kidney (renal or flank) radiation

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Long Term Follow-Up

Therapeutic Summary

CANCER TREATMENT SUMMARY				
Protocol	Title/Description	Initiated	Completed	On-Study
CCG 1882 Regimen B	Poor Prognosis Acute Lymphoblastic Leukemia	2-3-97	5-6-00	No
Chemotherapy				
	Drug Name	Route	Cumulative Dose	
	Vincristine	IV	48 mg/m ²	
	Prednisone	PO	1905 mg/m ²	
	Dexamethasone	PO	985 mg/m ²	
	L-Asparaginase	IM	90,000 units/m ²	
	Doxorubicin	IV	100 mg/m ²	
	Doxorubicin	IV	75 mg/m ²	
	Total anthracycline chemotherapy			= 175 mg/m²
				First dose at age 4 years
	Cyclophosphamide	IV	3000 mg/m ²	
	6-Thioguanine	PO	840 mg/m ²	
	6-Mercaptopurine	PO	titrated to WBC	
	Methotrexate	PO	titrated to WBC	
	Cytarabine (max single dose = 75 mg/m ²)	IV	1800 mg/m ²	
	Cytarabine	IT	70 mg (1 dose)	
	Methotrexate	IT	288 mg (24 doses)	
	Total # of Ps during therapy = 25			
Radiation				
	None			

Journal of Cancer Survivorship



- The journal presents peer reviewed papers relevant to improving the understanding, prevention, and management of the multiple areas related to cancer survivorship that can affect quality of care, longevity and quality of life.
- Started March 2007 by Springer US
- Editor in Chief: Michael Feuerstein, Ph.D., MPH
 - Departments of Medical and Clinical Psychology and Preventive Medicine and Biometrics, Uniformed Services University of the Health Sciences, Bethesda, MD

Resources



- National Childhood Cancer Foundation (NCCF)
 - Information and resources for survivors of pediatric cancers
 - Extensive guidelines for long-term follow-up
 - ✦ www.survivorshipguidelines.org
 - www.curesearch.org
- National Coalition for Cancer Survivorship
 - “Cancer Survival Toolbox” and educational resources for survivors as well as advocacy and insurance information
 - www.canceradvocacy.org
- Lance Armstrong Foundation (LAF)
 - Education and public health resources as well as advocacy
 - www.livestrong.org

Resources



- **American Cancer Society (ACS)**
 - Educational literature, support groups and supplies for pediatric cancer survivors
 - www.cancer.org
- **Canadian Cancer Society (CCS)**
 - As above for ACS
 - www.bc.cancer.org
- **Childhood Cancer Ombudsman Program**
 - Assistance with access to education, employment, healthcare and medical coverage to childhood cancer survivors
 - gpmonaco@river.net

Resources



- **Candlelighters Childhood Cancer Foundation**
 - Referrals, education, quarterly newsletters, educational resource guides, and books (*Educating the Child with Cancer* and *Childhood Cancer Survivors: A Practical Guide to Your Future*) for childhood cancer survivors
 - www.candlelighters.org
- **Candlelighters Childhood Cancer Foundation Canada**
 - As above
 - www.candlelighters.org.ca

Resources

- Institutions & Healthcare Organizations
 - National Cancer Institute
 - ✦ <http://www.cancer.gov/cancertopics/factsheet/Therapy/followup>
 - Memorial Sloan-Kettering Cancer Center
 - ✦ <http://www.mskcc.org/mskcc/html/2936.cfm>
 - Georgetown University
 - ✦ <http://lombardi.georgetown.edu/survivorship/pedshandbook/index.htm>
 - Provincial Pediatric Oncology AfterCare Program
 - ✦ <http://www.pogo.ca/care/aftercareclinics/>

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*It's not the years in your life that count.
It's the life in your years.*

Abraham Lincoln

Questions



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