

#### Adult Childhood Survivorship Program

#### Provincial Survivorship and Primary Care Program

Survivorship Forum June 8, 2016

### Presenter's disclosure

Relationships with commercial interest
 –None



# Welcome!

- Matt Hallat
  - Spokesperson





# LEAF Team

- Karen Goddard MD – Medical Director
- Avril Ullett
  - Program Leader
- Beverley Biggs
  - Counsellor
- Kimberley-Anne Reid – Nurse Practitioner



## **Overview**

- Late Effects of Childhood Cancer and Treatment
- Adult Childhood Cancer Survivors Program
  - Program Development
  - Program Components
- Late Effects, Assessment and Follow-up (LEAF) Clinic



## **Survival Rates**



# Improvement related to:

- Multimodality approach:
  - Surgery
  - Systemic therapy (chemotherapy)
  - Radiation therapy
- Therapy intensification
  - Bone marrow transplant
  - Interval compression of chemotherapy
- Better supportive care during therapy
- Development of new targeted therapeutic agents



#### Childhood Cancer is a rare disease

New Cancer Diagnoses in BC in 2009

- Adults 18,815
- Children 145



Why is it so important what happens to these patients?



## Incidence

- About 12,000 children in the US (birth 14 years)
- In Canada 1,310 patients (0-19 years)
- Over 83% of these patients are cured of their cancer
- In 2010, 1 in 250 of the adult population in North America was a survivor of childhood cancer
- Over 3000 survivors of childhood cancer in BC since 1980. These patients are now aged 1-50.
- Life years saved by treating childhood cancer 2<sup>nd</sup> only to breast cancer



# Survivorship



#### In memoriam Ellen Stovall 1946-2016



### Late Effects

**Definition:** side effects that occur within more

than 5 years after diagnosis.

- At age 45 years:
  - 95.5% cumulative prevalence of any chronic health condition
  - 80.5% for a serious/disabling or life-

threatening chronic condition





# Late Effects

- Late effects include:
  - Physical problems
    - Organ damage
      - Development affected
      - High risk of late effects in adults treated for childhood cancer
    - Secondary tumors
  - Psychological problems
    - Depression, anxiety
    - Career and financial
    - Relationships



#### **Survivors at Risk**

Researchers followed more than 1,700 adults who had been treated for cancer as children and found that those who had received certain types of treatment were very likely to develop certain health problems later in life.





Sources: St. Jude Children's Research Hospital; JAMA

The Wall Street Journal

#### **Tumor Related Damage**

Invasion into and pressure on different structures

- Wilms tumor
  - One kidney usually completely destroyed by disease and has to be removed





#### **Tumor Related Damage**

- <u>Craniopharyngioma</u> tumor growth and cyst expansion leads to compression of:
  - Optic apparatus
    - Blindness
  - Pituitary
    - Endocrinopathy





# Surgery Related Damage

- Surgery
  - Prime modality for local control
- Lymph node dissection
  - Lymphedema
- <u>Splenectomy</u>
  - Life threating infection
    Pneumococcal vaccine
    Medic Alert bracelet





# **Chemotherapy Related Damage**

- Chemotherapy prime modality for systemic control
- Depends on agent and sensitivity of target organs
  - Adriamycin: cardiomyopathy
  - Cisplatin: nephrotoxicity and hearing loss
  - Alkylating agents: infertility and second cancers
  - Vincristine: peripheral neuropathy





# Radiation Therapy (RT)

- In children (unlike adults) affects normal growth/development
- Severity of late effects depends on:
  - Age at the time of therapy
  - Total dose given
  - Fractionation
  - Region treated:
    - Some organs more sensitive and easily damaged
    - Amount of normal tissue treated
  - Concurrent chemotherapy can sensitize normal tissues
  - Underlying genetic problems:
    - Radio-genomics





# **Determining the Risk**

- Adult survivors of childhood cancer may be at:
- Low risk
  - Many patients treated for leukemia
  - No radiation therapy
  - Combination low dose chemotherapy
- Intermediate risk
  - More intensive chemotherapy
- High risk
  - Intensive chemotherapy (including alkylating agents and adriamycin)
  - Any previous history of radiation therapy



# Organs at Risk

- <u>Central nervous system</u>
- <u>Orbit</u>
- <u>Hearing</u>
- Peripheral Nervous system
- Endocrine
- GU system
- <u>Respiratory</u>
- Gastro-intestinal
- <u>Musculoskeletal</u>
- <u>Reproductive organs</u>
- <u>Cardiovascular</u>
- <u>Skin</u>





### Musculoskeletal

- Bone/Muscle/soft tissues
  - "Hypoplasia" reduced growth within the RT field





# Endocrinopathy

- Pituitary dysfunction
  - GH
  - TSH
  - FSH & LH
  - ACTH







# Reproductive system

- Gonads very sensitive to both RT and chemotherapy
  - Alkylating agents
  - RT to ovaries:
    - The dose of RT needed to destroy 50% of the oocytes = LD50
    - Oocytes are very sensitive with an LD  $_{50}$  of < 200 cGy
- Damage to developing uterus

RMS



# Metabolic Syndrome

- Associated with treatment for childhood cancer
- Cranial radiation therapy and TBI (whole body RT prior to transplant) significantly increase the risk
- Etiology
  - Poorly understood post chemotherapy alone
  - Radiation therapy: Hypothalamic effect Radiation therapy to pancreas
- Characterized by:
  - Central obesity
  - Hypertension
  - Hyperlipidemia
  - Diabetes





# **Other CNS Problems**

#### • Brain

- Developmental delay
  - Poor short term memory
  - Poor executive function
- Seizures
- Cerebrovascular events
  - Vascular malformations
  - Early aging of small blood vessels
  - Thrombotic and haemorrhagic





# Hearing Loss

- Radiation Therapy:
  - Conductive: wax build up
  - Sensorineural: direct damage to cochlea
- Chemotherapy:
  - Sensorineural
  - Cisplatin causes high frequency hearing loss Sensory hair cells in the cochlea





### **Visual Problems**

Cataracts





# **Dental Problems**

- Radiation therapy is associated with:
  - Developmental abnormalities involving roots and enamel (Rx at young age)
  - Xerostomia
    - Due to parotid gland damage
    - Associated with dental decay
  - Trismus
  - Damage to the blood supply of the mandible
- Chemotherapy
  - Developmental abnormalities involving roots and enamel (Rx at young age)

Dental extraction after high dose RT to the jaw can be associated with osteoradionecrosis



# Second Neoplasm

- A second cancer or second malignant neoplasm (SMN) is defined as a histologically distinct second cancer that develops after the first.
- Definition:
  - Tumor in new location and not from direct spread or metastasis of the primary cancer
  - Tumor in the same location as the primary cancer but of different histological type



### Incidence

- Childhood Cancer Survivor Study
  - 30 year cumulative incidence of second malignancy = 9%



Fig 1. Cumulative incidence of second malignant neoplasms (SMNs) and nonmelanoma skin cancer (NMSC) in childhood cancer survivors. At the 30-year follow-up, the cumulative incidence of SMNs and NMSC continues to increase with time since 5 years after diagnosis of primary childhood cancer.



# Thyroid cancer





# **Thyroid Cancer Screening**

- Check routine thyroid function tests (serum TSH & T4) at least every year
- Examine thyroid every year for nodules
- Thyroid ultrasound scan every 3 years
  - Shows thyroid parenchyma in more detail
  - Suspicious nodules can either be followed closely to look for growth or ultrasound guided fine needle aspiration (FNA) biopsy can be organized

#### CHILDREN'S ONCOLOGY GROUP

The world's childhood cancer experts

What is Cancer?

Types of Children's Cancer

Tests and Procedures

Treatment Options

Treatment Side Effects

#### Survivorship Guidelines

The Children's Oncology Group Long-Term Follow-Up Guidelines for Survivors of Childhood, Adolescent and Young Adult Cancers were developed as a collaborative effort of the Nursing Discipline and the Late Effects Committee. The purpose of these guidelines is to:



# **Radiation-induced Meningioma**

- <u>RT induced meningioma</u>
  - Multiple
  - Atypical
  - More likely to recur after surgery







## **Screening for Meningioma**

• MR scan every 3 – 5 years







# Skin Cancer

- Increased risk of cancers in previous radiation therapy field
  - Basal cell carcinoma
  - Melanoma

#### **Skin Cancer Information**

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#### What Is Skin Cancer?

Skin cancer is the uncontrolled growth of abnormal skin cells. It occurs when unrepaired DNA damage to skin cells (most often caused by ultraviolet radiation from sunshine or tanning beds) triggers mutations, or genetic defects, that lead the skin cells to multiply rapidly and form malignant tumors.

#### What to Look for











Actinic Keratosis

Basal Cell

Dysplastic Nevi Melanoma

Squamous Cell



# Skin Cancer

- Screening:
  - Careful examination of skin in previous RT field
  - Previous history of chemotherapy: Look for melanocytic lesions
  - Prevention:
    - Hat, T-shirt, sunscreen
    - "Dear 16 year old me"





Dear 16-year-old Me
# Colorectal Cancer (CRC)

- 2- 3% risk of CRC 30 40 years after treatment for childhood cancer and increasing.
- Associated with abdominal radiation therapy
- Risk is proportional to dose and volume of RT
  - Increased by 70% with each 10-Gy increase in RT dose.
  - Increased RT volume increased risk (group 1 OR, 1.5; P .001; group 2 OR, 1.8; P .001).
- Alkylating agent exposure associated with 8.8X increased risk of secondary CRC.



Secondary Colorectal Carcinoma After Childhood Cancer

Kerri Nottage, Joshua McFarlane, Matthew J. Krasin, Chenghong Li, Deokumar Srivastava, Leslie L. Robison, and Melissa M. Hudson



# Secondary Breast Cancer

- Commonest solid tumor among female survivors of Hodgkin lymphoma
- Moderately high-dose mediastinal RT
  - Scatter to adjacent (breast) tissue
- Adolescent girls most at risk







# Secondary Breast Cancer

- After treatment for Hodgkin lymphoma in adolescence
  - 37X risk of breast cancer
  - Bilateral disease more common
  - Increased risk:
    - Over 12 years of age at diagnosis
    - Higher dose of radiation



Unilateral and bilateral breast cancer in women surviving pediatric Hodgkin's disease. Basu SK<sup>1</sup>, Schwartz C, Fisher SG, Hudson MM, Tarbell N, Muhs A, Marcus KJ, Mendenhall N, Mauch P, Kun LE, Constine LS.



# **Breast Cancer Screening**

- Who is this recommended for?
- Women who received:
  - RT associated with significant scattered radiation to the breast
  - Doses of 20 Gy or higher to the following fields:
    - Mantle
    - Mediastinal
    - Whole lung
    - Axillary fields



## **Breast Cancer Screening**

#### • Recommendations:

If thoracic RT given (20 Gy or more in childhood, adolescence or early adulthood):

Problem	Screening/Investigation	Frequency
Increased Breast cancer risk	Breast self examination	monthly
	Breast examination by HCP	Annually until aged 25 and then 6 monthly thereafter
	Breast MR	Annually starting at age 25 or 8 years after the RT was given
	Mammograms	Annually starting at age 25 or 8 years after the RT was given



## Screening

# Screening guidelines available <u>Children's Oncology Group</u>





The world's childhood cancer experts

#### Thyroid Problems after Childhood Cancer

Some people who were treated for cancer during childhood may develop endocrine (hormone) problems as a result of changes in the function of a complex system of glands known as the endocrine system.

#### What is the endocrine system?

The endocrine system is a group of glands that regulate many body functions including growth, puberty, energy level, urine production, and stress response. Glands of the endocrine system include the pituitary, hypothalamus, thyroid, adrenals, pancreas, ovaries (in females), and testes (in males). The hypothal-





#### **Radiation-induced GBM**





## Screening

- Screening not possible for all late effects:
  - Some radiation induced malignancies such as sarcomas and malignant brain tumors







# **Psychological Risk Factors:**

- Increased psychological distress : depression, anxiety and PTSD
- Decreased health-related quality of life
- Interpersonal relationship issues
- Slower cognitive processing





## Many brain tumor survivors:

- Need very modified school programs and support
- Rely on permanent disability pension:
  - Differences across the province and between different provinces regarding available programs
    - Access to vocational/recreational rehab
- Drug costs covered by parents benefits plan
- Other costs not covered:
  - Hearing aids



#### Many Survivors of Childhood Cancer:

- Engage in Risky Health Behaviours:
  - Smoking
  - Alcohol and Drug use
  - Altered sleep patterns
  - Suffer from Chronic Fatigue





## **Other Psychosocial Issues:**

- Low educational attainment
- Low household income
- Unemployment
- Unmarried/partnered



- Less likely to achieve independent living
- Less likely to be in a long term relationship



#### Other Issues:

- Fertility
- Sexuality
- Body image



Poverty and affordable housing



# Impact on Life

- Huge range of late effects:
  - Low risk:
    - Many (but not all) previous lymphoma and leukemia patients
    - Function very well
    - Minimal risk for long-term health problems
  - High risk:
    - Any radiation, high dose chemotherapy including alkylating agents and anthracylines
    - Some leukemia patients, brain tumors and solid tumors (e.g. sarcomas)
    - Lives may be "devastated"
  - Long term health care:
    - Counseling
    - Screening/Surveillance for late effects



# Screening

- Generally, follow up care depends on "risk category"
  - High risk: Hospital based and family practitioner
  - Low risk: Family practitioner
- Survivorship Care Plan:
  - Coordinated post-treatment plan
  - Built by survivor's oncology team
  - Includes
    - Summary of the survivor's treatment
    - Direction for future care
- Screening recommendations: COG Long Term FU Guidelines



The world's childhood cancer experts

What is Cancer? Types of Children's Cancer Tests and Procedures Treatment Options Treatment Side Effects

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### History

- History of previous illness and therapy critical to understanding risks
   and organizing appropriate screening
- Generate a "care plan"





### Prevention

Information about late effects critical for prevention:

- Initial therapy
  - Give treatments which are less likely to cause longterm damage
    - Avoid or reduce radiation therapy
    - Targeted therapy
      - We don't know about the late effects of these agents yet
  - Tailored therapy
    - Genomic studies to identify people more likely to develop side effects



### Prevention

- Information/education
  - Childhood cancer survivors
    - Know how to seek advice
  - Health care Professionals
    - Do the correct investigations





#### Prevention

- Lifestyle:
  - Diet
  - Exercise
  - Smoking
  - Sun/UV exposure









## Lifestyle

#### Cancer Survivors Who Stay Active Live Longer

By GRETCHEN REYNOLDS MAY 16, 2012 12:01 AM R 81 Comments





# **Prevention is Complex**

#### • Risk of cerebrovascular disease:

- Radiation therapy (RT)
  - Dose, fractionation and area treated
- Chemotherapy at time of RT
- Genetic factors
- Endocrinopathy
  - GH deficiency
- Metabolic syndrome
  - Hyperlipidemia
  - Hypertension
  - Diabetes
- Lifestyle
  - Smoking and exercise
- Genetic factors
- Prophylactic aspirin
  - Hemorrhagic and thrombotic
- Publication just accepted:
  - A cross-sectional cohort study of cerebrovascular disease and late effects after radiation therapy for craniopharyngioma

BC Cancer Agency CARE + RESEARCH An agency of the Provincial Health Services Authority

Clinical Investigation: Central Nervous System Tumor

Long-Term Outcomes and Complications in Patients With Craniopharyngioma: The British Columbia Cancer Agency Experience

Andrea C. Lo, MD,<sup>\*,†</sup> A. Fuchsia Howard, PhD,<sup>‡</sup> Alan Nichol, MD, FRCPC,<sup>\*,†</sup> Keerat Sidhu, BSc,<sup>\*,†</sup> Farah Abdulsatar, BSc,<sup>\*,†</sup> Haroon Hasan, BSc,<sup>\*</sup> and Karen Goddard, MD, FRCPC<sup>\*,†</sup>

\*Department of Radiation Oncology, British Columbia Cancer Agency Vancouver Centre; <sup>1</sup>Department of Surgery, University of British Columbia, and <sup>1</sup>School of Population and Public Health, University of British Columbia, Vancouver, British Columbia, Canada

Received Nov 5, 2013, and in revised form Jan 9, 2014. Accepted for publication Jan 16, 2014.

International Journal of Radiation Oncology biology • physics

www.redjournal.org

#### Resources

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



Types of Children's Cancer

The world's childhood cancer experts

What is Cancer?

Late Effects of Treatment for Children's Cancer

BC Cancer Agency CARE + RESEARCH An agency of the Provincial Health Services Authority

#### Resources

#### – National Cancer Institute:







#### Resources

#### Pediatric Oncology Education Materials

Late Effects	Late Effects
General Overview Introduction Resources References	General Overview
	On average approximately age) develop childhood car annually1.
CNS Orbit	More than 80% of these ch disease. This was very dif survive. <sup>2</sup>
Peripheral NS	In general, cure rates have
Hearing Cardiac Respiratory	<ul> <li>Multiple treatment mo</li> <li>Radiation therapy</li> <li>Chemotherapy</li> <li>Surgery</li> </ul>
Musculoskeletal	<ul> <li>Therapy intensification</li> </ul>
Bone Marrow Skin	period of time) <sup>3</sup> <ul> <li>Improved supportive of</li> </ul>



print [printer friendly] | email

10,400 North American children (between birth and 14 years of ncer each year and these numbers seemingly increase

hildren will be long term survivors who have been cured of their ferent 20 to 30 years ago, when many children did not

e been improved by using:

- dalities
  - y (RT)
- n (using higher total doses of chemotherapy over a shorter
- care



#### Adult Childhood Cancer Survivors Program Program Development

January 2014: task group formed

 Survivors and family members of survivors, community family physicians, and representatives from BCCA and BCCH including oncologists, senior leaders, survivorship, researchers, and nursing.

March-October 2014: monthly meetings to develop program

October 2014: business case finalized and submitted to PHSA executive

November 2014: business case sent to Ministry of Health

January 2015: Ministry of Health, BC Cancer Foundation and BC Children's Hospital Foundation agree to fund program



#### **Program Components**

•Multidisciplinary, specialized Late Effects, Assessment and Follow-up (LEAF) clinic

•Recall program

•Transition program

•Registry

•Primary care, patient and family education and support

•Primary care attachment and support



#### **Program Timeline**

#### Start-up (Year 0)

- Recruit and train staff; establish program governance; develop engagement, communication, education, research and evaluation plans
- Define, plan, implement recall process

#### Year 1

- Recall initiated for high risk patients
- Patients transitioning out of BCCH are stratified by risk and transferred to appropriate provider
- High risk and complex patients seen in Specialty Clinic

#### Year 2

• Recall for high risk patients completed

#### Year 3

- Data analysis begins
- Recall for low and moderate risk patients begins

#### Year 4 and 5

- Recall complete
- Program evaluation report complete





#### **LEAF Clinic Visit - Medical**

- Review of past cancer diagnosis and treatment
  - Review patient summary
  - Patient receives copy of summary
- Assessment of past, current and chronic health problems
- Discuss future health risks
- Make plan for surveillance and treatment
- Order investigations as required
- Summary consult back to primary care provider and involved specialists



#### **LEAF Clinic Visit - Psychosocial**

- Consultation and assessment
- Short-term counselling
- Case management
- Advocacy and referral to other BCCA and BCCH programs, and community programs and health providers



#### LEAF Clinic Psychosocial Support:

- Advocacy with the Ministry of Social Development re: MNS and Non-local medical transportation Requests
- Information and advice on future planning:
  - BC Housing/Supportive Housing
  - RDSPs
  - Representation Agreements
  - Advanced Care Planning.





#### LEAF Clinic Psychosocial Support:

- Support provided province-wide with a variety of modalities
  - In person
  - Telephone (telephone counselling to come at
    - a later time)
  - Email resources and link to appropriate
    - resources



# Eligiblity

- Diagnosed age 17 and under
- Currently over age 18
- Currently 5 years off of active treatment
- Already discharged from BC Children's Hospital

## **Referrals to LEAF Clinic**

- BC Children's Hospital
- BC Cancer Agency
- Primary Care Providers
- Allied Health/Community Referrals
- Self-referrals



# Thank you!

Any questions about the care of an adult childhood cancer survivor under 21 years of age?

- Contact:
  - Sheila Pritchard
    - <u>spritchard@cw.bc.ca</u>
  - Marion Nelson (nurse practitioner)
    - mnelson@cw.bc.ca

Any questions about the care of an adult childhood cancer survivor over 21 years of age?

- Contact:
  - Karen Goddard (radiation oncologist)
    - kgoddard@bccancer.bc.ca
  - Kimberley-Anne Reid (nurse practitioner)
    - <u>Kimberley-Anne.Reid@bccancer.bc.ca</u>
  - Beverley Biggs (Social Worker)
    - Beverley.Biggs@bccancer.bc.ca
  - Avril Ullett (Program Leader)
    - <u>Avril.Ullett@bccancer.bc.ca</u>





