



BC PROVINCIAL
Pediatric Oncology
Hematology Network

Newsletter



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



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www.kidscancer.bc.ca

Issue number 6 Summer 2006

BRAIN TUMOURS IN CHILDREN

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INCIDENCE:

Brain tumours are the most common solid neoplasm in childhood and affect about 30 children a year in BC.

DISEASE PRESENTATION:

Brain tumours in children differ from those in adults with respect to their location within the brain, the type of tumour and response to therapy. Most tumours in children occur in the infratentorial region (cerebellum or brain stem). Others occur in the supratentorial region and rarely in the spine.

The usual symptoms are a result of raised intracranial pressure (ICP) from blockage of the cerebrospinal fluid or because of the mass effect of the tumour. Symptoms include prolonged and frequent headaches, recurrent vomiting, lethargy and irritability. Papilloedema is often present. Infants may present with a large head or bulging fontanelle.

Other presentations depend on the site of the tumour within the brain and may include dizziness, disturbances of vision, difficulties with balance or speech, seizures, endocrinopathies, mental disturbances and personality change.

DIAGNOSIS:

If a tumour is suspected, the patient should be referred to a pediatrician or a neurologist for a detailed neurological examination which includes a CT scan or MRI of the brain when indicated. New techniques such as functional MRI help identify any essential structures in close proximity to the tumour. CT PET scan helps to determine the extent of tumour affecting the brain in some more challenging cases.

INITIAL MANAGEMENT:

Referral:

If a brain tumour is confirmed, the child (age <17 years) should be referred to the neuro-oncology program at BC Children's Hospital (BCCH), usually to the on-call pediatric neurosurgeon. The neuro-oncology program is a combined neuroscience and oncology program composed of a multidisciplinary specialist team (with representation from neurosurgery, oncology, neurology, pathology, radiology, nursing, psychology, radiation oncology, endocrinology, physiotherapy, occupational therapy, nutrition, and social work).

Emergency therapy:

Dexamethasone 1-2mg/kg IV or, more rarely emergency surgical decompression may be required prior to transfer to reduce the problems associated with raised ICP or cerebral edema. This should be discussed with the neurosurgical consultant.

TYPES OF BRAIN TUMOURS:

Although brain tumours can be divided into cancerous (malignant) and non cancerous (non malignant), this is not a very helpful way of understanding the disease, its treatment and the likelihood of cure. Brain tumours pose

a specific problem related to where they are situated and the ability to remove the tumour and prevent a local recurrence. In general this is different from other types of childhood cancers in which treatment has to be aimed at preventing metastatic disease as well as controlling the initial tumour.

Brain tumours are generally named after the type of cell from which they are thought to have arisen as well as their location within the brain.

Common pathologic types of tumours:

Astrocytomas		45%
Low grade	90%	
High grade	10%	
Medulloblastomas		15%
Neuronal/glial tumours		
e.g gangliogliomas		10%
Ependymomas		10%
Craniopharyngiomas		5%
Germ Cell Tumours		5%
Primitive Neuro-ectodermal Tumours (PNET)		5%
Other		5%

STAGING INVESTIGATIONS:

Patients require careful assessment of the local tumour extent with MRI +/- CT scan. The following are recommended additional pre-operative staging investigations:

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The Association of Pediatric Oncology Nurses (APON) is the leading professional organization for registered nurses caring for children and adolescents with cancer and blood disorders and their families. APON's mission is to provide and promote expert practice in pediatric hematology/oncology nursing to its members and the public at large.

BC CHAPTER

If you are interested in joining the British Columbia Chapter of APON, or if you would like more information about APON, please contact Kerri O'Reilly, Clinical Nurse Coordinator, Oncology/Hematology/BMT, BC Children's Hospital.

Contact Information:

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- i. Pineal and suprasellar lesions: These may be germ cell tumours and serum +/- CSF should be tested for the tumour markers beta human chorionic gonadotrophin (β -HCG) and alpha fetoprotein (AFP). Whole head and spinal MRI should also be undertaken pre-operatively.
- ii. Midline posterior fossa tumours: Pre-operative MRI of whole head and spine. It is difficult to differentiate radiologically patients with medulloblastomas that have a propensity to metastasize throughout the CSF pathway from patients with localized low grade astrocytomas.
- iii. Suspected high grade supratentorial lesions: Pre-operative MRI of whole head and spine for patients with radiological signs suggestive of a high grade tumour (high grade astrocytoma, PNET or ependymoma).
- iv. Pituitary, suprasellar, and optic pathway lesions: Visual acuity and visual fields (age permitting) as well as an endocrinological evaluation.

TREATMENT:

Raised ICP:

Therapy must first be directed to reducing this medically with dexamethasone, and surgically by tumour resection, external ventricular drain, ventriculostomy, or ventriculo-peritoneal shunt.

Principles of treatment:

Therapy depends not only on the pathology and site but also on the age of the patient at presentation as well as the stage and extent of disease. Treatment recommendations are based on the most current medical evidence. Through participation in the Children's Oncology Group (COG) and the Canadian Pediatric Brain Tumour Consortium, we have access to the latest treatments and outcomes. Patients may be eligible for clinical trials. These trials evaluate therapies to support the optimal balance between improved survival, function and quality of life. The molecular characteristics of tumours are also being studied in order to understand the causation as well as differences in outcome.

Neurosurgery:

In general surgical removal of the tumour or biopsy is required by a pediatric neurosurgeon experienced in managing pediatric brain tumours at a tertiary pediatric center (BCCH). If

emergency decompression is required, consultation with BCCH should be obtained. New diagnostic and surgical tools have enabled the neurosurgeons to obtain more complete resections than was previously possible. The availability at BCCH of stereotactic guided techniques, 3D MRI, MR spectroscopy, and intraoperative ultrasound, allows accurate definition of the tumour and normal structures of the brain to help guide the neurosurgeons to achieve a safe resection. Scans obtained within 72 hours of surgery are performed to evaluate the completeness of resection.

Radiation therapy:

In general this is necessary for incompletely removed tumours and those that have a high chance of recurrence such as high grade ependymomas and gliomas, medulloblastomas, PNET's and germ cell tumours. New radiotherapy technology allows precise delivery of radiotherapy with minimal radiation to surrounding normal structures thus minimizing long-term sequelae of therapy. Despite this, radiation is not usually recommended for children age <3 years. This is because of the high risk of reduced cognitive function especially when a large volume of the brain is irradiated.

Chemotherapy:

Primary treatment with chemotherapy is generally reserved for situations in which surgery and radiation therapy cannot be given without significant risks. Although brain tumours are generally less sensitive to chemotherapy than other pediatric solid tumours, recent studies have shown increasing benefit of chemotherapy especially in medulloblastomas and germ cell tumours as well as in younger children in whom radiation cannot be safely used.

Current research involves using chemotherapy at the same time as radiation therapy to try and enhance the effectiveness of radiation treatment. Chemotherapy may also be used if there is tumour recurrence.

Antiangiogenesis:

The disappointing results of the cytotoxic effects of chemotherapy have led to research using chemotherapy and specific monoclonal antibodies such as antiangiogenic agents. Such research, while encouraging, has not yet been of proven benefit.

SPECIFIC TUMOUR TYPES:

Low grade astrocytomas:

Complete surgical removal offers a very high chance of cure. A period of observation is often recommended for incompletely resected lesions since regrowth of tumour may be very slow. If regrowth occurs, chemotherapy is effective in 1/3 of cases. Others may benefit from radiation treatment.

Optic pathway tumours:

Patients present with loss of visual acuity or a field defect. This may be associated with neurofibromatosis type 1 (NF-1) and may be the first manifestation of NF-1. These tumours are usually low grade astrocytomas and a biopsy may not be required. Therapy is aimed at preserving vision (see low grade astrocytomas).

Craniopharyngiomas:

These tumours may be solid or cystic and present with endocrinopathies and visual loss. Our approach is individualistic. The therapeutic options are surgery, radiotherapy or intracystic chemotherapy.

Germ cell tumours:

These are midline tumours that usually present in the pineal or suprasellar regions.

- i. Pure germinomas are very responsive to irradiation. Current trials are evaluating whether chemotherapy will enable lower doses and volumes of radiation to be used.
- ii. Non germinomatous germ cell tumours - Since these tumours can be diagnosed by tumour markers, initial surgery is not required for a pathological diagnosis. Treatment involves resection, chemotherapy and radiation.

Brain stem gliomas:

These are divided into intrinsic pontine gliomas and the exophytic type.

The intrinsic pontine lesions usually present with cranial nerve palsies and ataxia, are aggressive astrocytomas and do not enhance with contrast. Biopsy is not required for the typical lesion. Radiation offers a small chance of cure. To date, adjuvant chemotherapy has not been shown to improve outcome. Current trials use chemotherapy concurrently with radiation to enhance radiation effects and to provide antiangiogenic effects.

Predominantly exophytic tumours may be slower growing and may be

amenable to at least partial surgical resection.

Medulloblastomas:

These malignant brain tumours are often curable. They arise in the cerebellum and often present with hydrocephalus or ataxia. They have a propensity to spread along the CSF pathway. Rarely the tumour spreads to the bone presenting with osteoblastic lesions. Chemotherapy has improved the outcome for these patients and enabled the dose of radiation to be reduced in low risk patients. Treatment depends on the age of the patient, the stage of disease, and the extent of the surgical resection. Current research involves studying the molecular nature of the tumour. Current clinical trials are evaluating the safety of further reductions in the dose of radiation.

Brain tumours in infants (age <3 years):

Our current approach is to avoid radiation (because of the significant neurocognitive sequelae) if possible by using myeloablative chemotherapy and peripheral stem cell rescue.

Ependymomas:

Surgery is the primary modality of therapy with radiation for patients with residual tumour or anaplastic histology. Recent trials have shown some benefit from adjuvant chemotherapy.

Spinal cord tumours:

These are very rare. They usually present with pain or extremity weakness or loss of sensation. Astrocytomas and ependymomas are the commonest pathologies. Surgery is the prime therapy with further treatment depending on extent of resection as well as the age and pathology.

Recurrent tumours:

Management is difficult and may involve surgery, radiation and chemotherapy. Patients may be eligible for Phase II drugs that are being evaluated to see if the tumour responds. This transition from curative to palliative is extremely difficult for families, and they often turn to other agencies for additional information or for second opinions. The neuro-oncology team collaborates with family members in filtering information, exploring appropriate options for their child, and providing optimal care and guidance.



Julia, her mother (left), and Suzanne Steenburgh, Neuro-Oncology nurse from BC Children's Hospital

8 year old Julia is receiving treatment for a brain tumour. She says the best part about being sick is not having her little brother around to bug her all the time. She misses going to school and looks forward to when she can go back after her treatment is completed.

CHALLENGES FOR FAMILIES OF A CHILD WITH A BRAIN TUMOUR

Suzanne Steenburgh, RN, BScN

There can be many challenges that accompany the diagnosis of a brain tumour. Not only might children have to contend with complex physical limitations as a result of their tumour and treatment, but many children experience emotional, behavioural, and cognitive changes as well. Children who have been treated for a brain tumour may have learning problems necessitating assistance in school, difficulty socializing with peers, behavioural problems and short term memory loss, among others. These losses can be the most difficult for families to cope with. Having to learn new ways to communicate with their child at a time when their world has been turned upside down is a challenge like none other. These losses however, are not always permanent. With rehabilitation and improvement, parents can sustain their hope for a brighter future.

Support Services and Rehabilitation:

At BCCH, we have a multidisciplinary neuro-oncology team to provide care for our brain tumour patients and their families. This team includes a neuro-oncology nurse to coordinate and provide many aspects of care, a neuropsychologist to identify learning problems and to assist in reintegrating children back into school, a dietician to optimize nutrition, physiotherapists and occupational therapists to maximize rehabilitation. Spiritual care as well as a parent support group are also available. Patient and family counseling services are provided by social workers and psychologists to provide practical assistance related to travel, finances and accommodation, and counseling is also available to individuals, parents and siblings. As well, programs such as art therapy, music therapy, play therapy and relaxation programs are available.

For more information about the neuro-oncology program at BCCH, contact: Suzanne Steenburgh, Neuro-Oncology Nurse
phone: 604-875-2345 ext 6017 or e-mail: ssteenburgh@cw.bc.ca

Resources:

BC Community Brain Injury Program
<http://www.cbip.bc.ca/>
Brain Tumour Foundation of Canada
<http://www.braintumour.ca/braintumour.nsf/eng/home>
Canadian Brain Tumour Consortium
<http://www.cbtc.ca/>
Brain Tumour Support Group
<http://www.braintumour.org/>
Brain tumour trials
<http://www.virtualtrials.com/tumourtype.cfm>

Recommended Reading:

Brain Tumour Patient Resource Handbook. Pediatric Version
3rd Edition © 1996 by the Brain Tumour Foundation of Canada

Childhood Brain and Spinal Cord Tumours: A guide for families, friends and caregivers by Harry Friedman. © 2002 Patient Centered guides



NEW FEBRILE NEUTROPENIA PROTOCOL

period of 28 months (October 2003 to February 2006).

A total of 64 children with 114 positive blood cultures yielded 124 micro-organisms. **Gram positive bacteria** represented 66% of all organisms isolated: Coagulase negative Staphylococcus (41), viridans group Streptococcus (15), Enterococcus spp. (12), and Staphylococcus aureus (3) were most common. There was no vancomycin resistant Enterococci (VRE) isolated. All Staphylococcus aureus isolates were methicillin sensitive (MSSA). **Gram negatives** represented 27%: E. coli (12), Enterobacter spp. (7) and Klebsiella spp. (6) were most commonly seen. No Pseudomonas aeruginosa was isolated. Three E. coli specimens were described as extended spectrum β -lactamase (ESBL) strains. Finally, anaerobes represented 4% and Yeast 2% of all blood cultures.

This review underscores the growing importance of Gram positive infections in febrile neutropenic patients and puts into question the continuing use of ceftazidime in any empiric regimen. In this study, ceftazidime, an antibiotic primarily aimed at Pseudomonas aeruginosa and other Gram negative bacteria, provided no coverage for

60% of the identified organisms. Additionally, it provided sub-optimal coverage for an additional 20% of organisms. We also describe a low rate of multi-drug resistant organisms on our oncology unit, with no VRE or methicillin resistant Staphylococcus aureus (MRSA) seen as yet.

Following this review, we have recommended a change in first line therapy, using a combination of an anti-pseudomonal penicillin with a β -lactamase inhibitor (piperacillin/tazobactam) and gentamicin (an aminoglycoside with synergistic effect on gram positives such as Enterococcus spp.).

Although we recommend these new guidelines for treating febrile neutropenic patients at BC Children's Hospital, it is important that each community hospital also be aware of their own microbial flora and provide this information to us so that we can advise on appropriate modifications and coverage as necessary.

Thanks to Willson Jang, Simon Dobson, Sheila Pritchard and Edith Blondel-Hill for all their help and advice on this project.

Stéphane Paulus, Fellow
Division of Immunological and Infectious Diseases
British Columbia Children's Hospital

In the last few months, we have reviewed the empiric antibiotic therapy guidelines for febrile neutropenic children admitted on the oncology unit at BC Children's Hospital (BCCH). These patients must be treated promptly with adequate broad spectrum antibiotics intravenously as the presence of bacteremia (a bacterium in the blood) carries significant morbidity and mortality. Ongoing microbiological surveillance has been set up to monitor the variation in the ecology of bacteremia in children with cancer at BCCH. As antibiotic resistance patterns change, it is inevitable that the empiric antibiotic choices need regular review and the guidelines be modified. In order to optimize our choice of empiric antibiotics, we have studied the characteristics of the positive blood cultures in oncology patients over a

NETWORK ACTIVITIES

Education Events

An educational workshop was held on February 9, 2006 in Courtney at the Crown Isle Resort for the Northern Vancouver Island Communities. Physicians, nurses, and allied health staff from Nanaimo, Comox, and Campbell River enjoyed an evening of learning and networking. Dan Mornar, parent and patient advocate, and two members of the BC Childhood Cancer Parents Association also held a parent support group meeting with some parents from the area.

A chemotherapy administration and supportive care course was conducted from February 6-9, 2006 at Kelowna General Hospital for nurses in the Interior Health Authority. The same course was presented to nurses at Prince George Regional Hospital from June 20-23, 2006.

Long Term Follow-Up

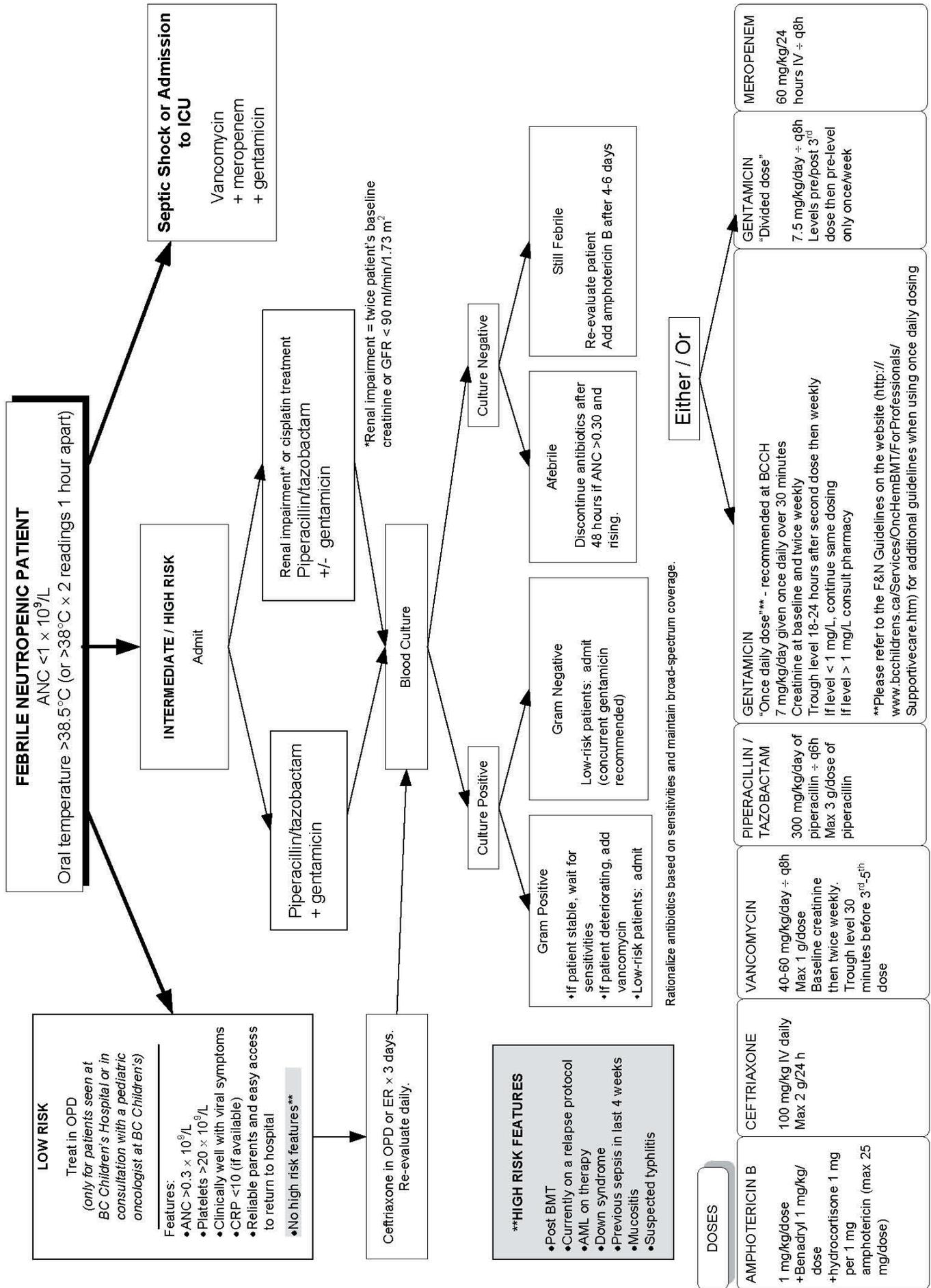
We are continuing to pursue funding for the Surveillance Program for Adult Survivors of Childhood Cancer. Plans are going ahead to start monthly clinics in September 2006 in Vancouver, expanding to satellite clinics in the regional centres by 2008.



Visit our new and improved web site for information and resources for patients as well as health care professionals and families who care for children with cancer

EMPIRIC ANTIBIOTIC PROTOCOL FOR FEVER AND NEUTROPENIA

These are only guidelines and full clinical evaluation is required for all febrile patients.



The Provincial Pediatric Oncology/Hematology Network

The Network is an interdisciplinary organization whose goal is to ensure appropriate diagnosis, management, follow-up, and end-of-life care for pediatric patients with malignancies and blood disorders.

The Network supports community hospitals and practitioners, and develops partnerships with other health care facilities to enable seamless and integrated care for patients and families on treatment and off treatment.

It will further develop and enhance the research programs of basic, translational, and clinical research to better childhood cancer control and improve outcomes for these patients and their families.

For More Information

To learn more about the Provincial Pediatric Oncology/Hematology Network, or to submit articles or stories to this newsletter, please contact:

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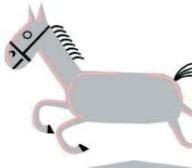
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A SPIRIT QUEST-TEEN ADVENTURES 2006

Every year, Teen Adventures offer various activities for teens with blood disorders and teen cancer survivors. All activities are sponsored by the Oncology/Hematology/BMT department of BC Children's Hospital through Balding for Dollars. In 2006, the teens enjoyed another adventure-filled year in Tofino, Clayoquot Sound and the South Chilcotin Mountains. In August, they will participate in whitewater rafting on the Thompson and Fraser Rivers.



For more information about Teen Adventures contact:
 Dan Mornar, dmornar@cw.bc.ca, (604) 875-2345, ext 6477 or
 Nita Takeuchi, ntakeuchi@cw.bc.ca, (604) 875-2664

BC CANCER AGENCY 2006 ANNUAL CONFERENCE NOVEMBER 23-25, 2006

The Provincial Pediatric Oncology/Hematology Network is committed to providing opportunities for education that allow health care professionals to remain up-to-date in the rapidly advancing field of pediatric oncology, and to ensure that the care delivered to the children is focused on caring for the whole child and the family.

This year's pediatric oncology educational day (**November 25, 2006**) at the BC Cancer Agency Annual Conference will focus on the latest in childhood leukemia and issues surrounding care for these children. This will be a valuable opportunity for learning, consulting, and networking in a multidisciplinary forum with your provincial partners.

Please visit our web site www.kidscancer.bc.ca for conference updates and the BC Cancer Agency conference web site <http://www.bccancer.bc.ca/HPI/ACC2006/default.htm> for other sessions that may be of interest to pediatric oncology health care providers, general conference information, and registration.

OBJECTIVES:

- To enhance clinical skills and knowledge about childhood leukemia and care for the child & family
- To strengthen community partnership and improve communication within the provincial network

TIME	SESSION
0830-0930	ALL & AML: biology, risk, stratification, related therapies & novel therapies
0930-1000	Acute toxicities of treatment for Leukemia
1000-1030	Break
1030-1115	Blood & Blood Products Transfusion & Reactions
1115-1200	Late Effects of Treatment for Leukemia
1200-1300	Lunch
1300-1400	Communication & Cancer: How to talk to patients and families about cancer
1400-1600	Strengthening partnership in care

