

TRAINING CURRICULUM FOR PAEDIATRIC HAEMATOLOGY & ONCOLOGY (PHO)

Subspecialty Coordinators (In Alphabetical Orders)

Prof Chan Chi Fung, Godfrey

Dr Cheng Wai Tsoi, Frankie

Dr Cheuk Ka Leung, Daniel

Dr Chiang Kwok Shing, Alan

Dr Ho Kar Huen, Karin

Dr Ku Tak Loi, Dennis

Dr Lam Kee See, Grace

Prof Li Chi Kong

Dr Luk Chung Wing

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List of Drafting Panel Members (In Alphabetical Order)

Prof Chan Chi Fung, Godfrey

Chief of Service, Department of Paediatrics and Adolescent Medicine, Hong Kong Children's Hospital

Service Head, Haematology & Oncology, Hong Kong Children's Hospital

Dr Cheng Wai Tsoi, Frankie

Training Supervisor, Department of Paediatrics and Adolescent Medicine, Hong Kong Children's Hospital

Consultant, Department of Paediatrics and Adolescent Medicine, Hong Kong Children's Hospital

Dr Cheuk Ka Leung, Daniel

Consultant, Department of Paediatrics and Adolescent Medicine, Hong Kong Children's Hospital

Dr Chiang Kwok Shing, Alan

Honorary Consultant, Department of Paediatrics and Adolescent Medicine, Hong Kong Children's Hospital

Clinical Associate Professor, Department of Paediatrics and Adolescent Medicine, Li Ka Shing Faculty of Medicine, the University of Hong Kong

Dr Ho Kar Huen, Karin

Associate Consultant, Department of Paediatrics and Adolescent Medicine, Princess Margaret Hospital

Dr Ku Tak Loi, Dennis

Associate Consultant, Department of Paediatrics and Adolescent Medicine, Hong Kong Children's Hospital

Dr Lam Kee See, Grace

Associate Consultant, Department of Paediatrics and Adolescent Medicine, Hong Kong Children's Hospital

Prof Li Chi Kong

Professor, Department of Paediatrics, the Chinese University of Hong Kong

Dr Luk Chung Wing

Consultant, Department of Paediatrics and Adolescent Medicine, Hong Kong Children's Hospital

Contact Information

Dr Chiang Kwok Shing, Alan

Honorary Consultant, Department of Paediatrics and Adolescent Medicine, Hong Kong Children's Hospital.

Associate Professor, Department of Paediatrics and Adolescent Medicine, Li Ka Shing Faculty of Medicine, the University of Hong Kong

9/F, Doctors' Office, Tower B. No. 1, Shing Cheong Road, Hong Kong Children's Hospital.
Kowloon Bay, Hong Kong.

Room 115, 1/F, New Clinical Building. 102, Pokfulam Road, Queen Mary Hospital. Hong Kong

Tel: 852-22554091

Email: chiangak@hkucc.hku.hk

Dr Cheng Wai Tsoi, Frankie

Training Supervisor, Department of Paediatrics and Adolescent Medicine, Hong Kong Children's Hospital.

Consultant, Department of Paediatrics and Adolescent Medicine, Hong Kong Children's Hospital

9/F, Doctors' Office, Tower B. No. 1, Shing Cheong Road, Hong Kong Children's Hospital.
Kowloon Bay, Hong Kong.

Tel: 852-351336349

Email: chengwtf@ha.org.hk

Stakeholder / Partners (In Alphabetical Order)

Dr Chiu Ka Ho, Jackie

Associate Consultant, Department of Paediatrics, Queen Elizabeth Hospital

Dr Li Chak Ho, Rever

Consultant, Department of Paediatrics and Adolescent Medicine, Tuen Mun Hospital

Dr Ling Siu Cheung

Consultant, Department of Paediatrics and Adolescent Medicine, Princess Margaret Hospital

Dr So Chi Chiu, Jason

Chief of Service, Department of Pathology, Hong Kong Children's Hospital

Preface

Hong Kong Paediatric Haematology & Oncology Study Group has been established for 30 years since 1992. Territory-wide Paediatric Oncology Service at the Hong Kong Children's Hospital has also been commenced since July 2019. All these are the results of selfless devotion and collaboration among the local paediatricians. It also involves the endless efforts and contributions of at least four generations of colleagues before we can arrive at where we stand today.

Since 1992, our seniors taking care of children with cancers from different hospitals worked together and formed the Hong Kong Paediatric Haematology & Oncology Study Group. The treatment protocols of common childhood cancers were then unified and shared. Subsequently, with the help of Children's Cancer Foundation, full time data managers were employed to manage the database and then we could prospectively capture the treatment outcome and complications of all patients under our care. Since then, we have the first and most comprehensive population based epidemiology data of Chinese children with cancers.

With the help of many senior paediatricians, the Government and Children's Cancer Foundation, the plan of establishing a long-awaited Hong Kong Children's Hospital was finally approved. We witnessed her commencement of operation just a few years ago. Now patients can have more unified care in one unit and paediatric trainees can maximise their exposure and learning. Moreover, the service of Hong Kong Children's Hospital not only cover highly complex oncological diseases, but also—most of the rare or complicated haematological diseases, for example, rare coagulopathies and haemoglobinopathies.

On the other hand, for other common haematological disorders, namely haemophilia and thalassaemia, patients will receive routine care in their original regional hospitals and will be reviewed in a comprehensive clinic at the Children's Hospital around once to twice a year. Thus patients from different regional hospitals can have standardised (keep British English for the whole document) treatment approach and care.

At this unique point of time, it is a good opportunity for us to plan ahead for the professional development in the field of Paediatric Haematology & Oncology. We envisage there is a genuine need in Hong Kong to establish a training programme aiming at providing a formal and structured training for paediatric trainees with interest in further development in this field.

Under the template of subspecialty training programme, the Hong Kong Children's Hospital will serve as the major hub for the future Paediatric Haematology & Oncology (PHO) Training Centre.

The draft panel members of the proposed curriculum are Fellows of the Hong Kong College of Paediatricians, all of whom are recognized locally, regionally, and internationally as the leading experts in this field.

Prof Chan Chi Fung, Godfrey

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Programme Description

Paediatric Haematology & Oncology (PHO) is a branch of paediatric medicine focusing on the diagnosis and treatment of infants, children, and adolescents with cancers and non-malignant haematological disorders.

A subspecialist in PHO should have the necessary medical knowledge and skills to deal with the prevention, diagnosis, and management of a broad range of conditions affecting children with cancers and *non-malignant disorders of the blood*. In addition to providing clinical care in PHO in children, a PHO subspecialty specialist should also make significant contributions to the development of knowledge in the field and educate the next generation of subspecialists.

The major training centre will be the Hong Kong Children's Hospital (HKCH)

In their period of general higher paediatric training, they are eligible for commencing the PHO Subspecialty Training, with the approval of the subspecialty board of PHO, with incorporation of cumulative of maximum 12 months of training in PHO in the 3 years of higher training in general paediatrics.

The curriculum is designed to train trainees to prepare them to provide up-to-standard clinical care, to develop essential skills and attitude to pursue a life-long career in the relevant subspecialty.

Our 36-month training curriculum comprises 27 months of core clinical rotation in a recognized haematology & oncology tertiary care centre with training in leukaemia / lymphoma / haematology (9 months); solid tumours / neuro-oncology (9 months); haematopoietic stem cell transplantation (6 months) and general haematology (3 months). The above can take place in HKCH or any recognised tertiary haematology oncology centre with prior approval by PHO subspecialty board. The remaining 9 months is an elective module. PHO subspecialty trainees can choose to have more in-depth exposure in any area of PHO, including related laboratory or any other relevant areas, or to have attachment in overseas haematology & oncology tertiary care centres with a recognised training programme with prior approval by the Programme Director. The duration of overseas training is 3 months minimum to 12 months maximum. Trainees can apply prospective accreditation from subspecialty board to accreditate overseas training period as part of the core clinical rotation.

A 3-month of external rotation (out of training centre) to broaden the exposure in different aspects of PHO is encouraged. Trainees need to apply prospective accreditation from subspecialty board to accreditate this external rotation.

Training modalities will be competence-based and integrates clinical care with small group tutorials, clinical case dissertations, postgraduate courses, journal clubs, clinical and laboratory meetings, inter-disciplinary conferences, and grand rounds. During the 36 months of PHO subspecialty training, trainees need to pursue at least one basic or clinical research project. Supervision is provided by the trainers with relevant expertise.

Obtaining the qualification of a postgraduate diploma or degree (e.g. MSc, MPhil, PhD or MD) related to PHO may be recognized as completion of training for up to a maximum of 6 months subject to approval by the Programme Director.

A mentor will be assigned to each trainee to overlook the training journey and will report back to subspecialty board in regular basis.

Mission and Objectives

Upon completion of training, a subspecialty specialist is expected to be competent in PHO, capable of performing consultant's role in the subspecialty. He/she should acquire sufficient knowledge of the subspecialty, including the theoretical basis in related medical science and research.

Subspecialty specialist should demonstrate the requisite knowledge, skills, and attitude for effective patient-centered care and service to a diverse population. In all aspects of subspecialist practice, the specialist should be able to address relevant ethical issues and issues of gender, age, culture, beliefs, and ethnicity in a professional manner.

The mission of PHO training programme is to train up paediatric subspecialists who are

(1) be clinically competent and able to commence independent practice in the field of PHO

(2) possess habits of life-long learning to build their knowledge, skills and professionalism in the field of PHO

1. Clinical competence is defined as:

- a. Acquisition of core knowledge of clinical manifestations, pathophysiology, management of diseases and conditions in the subspecialty of PHO. This knowledge base should include an appropriate content of epidemiology, genetics, biochemistry, pharmacology, statistics, ethics, and human behaviour in relation to the practice of PHO.
- b. Acquisition of the clinical skill of history taking, physical examination and appropriate request of laboratory and imaging studies
- c. Acquisition of adequate skill in the performance and interpretation of diagnostic and therapeutic procedures common in the practice of PHO
- d. Acquisition of the ability to formulate appropriate differential diagnoses and management plans based on the ability to critically analyse the clinical data, and integrate this analysis with the basic foundation of medical knowledge
- e. Acquisition of the ability in recommending treatment options for patients and get appropriate informed treatment consent from families and patients
- f. Acquisition of key knowledge to treat both the common and rare diseases in the field of PHO
- g. Demonstration of good understanding of the principles, indications, contraindications, risks, costs and expected outcomes of the various treatments
- h. Development of sufficient communication skills with patients, peers and paramedical personnel with the aim at providing up-to-standard level of care of patients in the field of PHO
- i. Demonstration of ability in further development of qualities of professionalism and humanistic skills including integrity, ethics, compassion, willingness to teach and inspire junior trainees, and respect for patients, peers and paramedical personnel
- j. Acquisition of appropriate level of skill and expertise in research and capability of demonstrating competence in the understanding of the design, implementation and interpretation of research studies, specifically including research methodology, critical interpretation of data, critical interpretation of published research, and the responsible use of informed research consent

2. Life-long learning is a key component for clinically competent paediatricians and requires the acquisition and critical analysis of knowledge, skills and professionalism and regular professional assessment. PHO subspecialty specialist needs to be capable of demonstrating their ability to be life-long learners by their:

- a. Independent study habits in the acquisition of clinical and research knowledge and skills
- b. Attendance, presentation and participation in the organization of local scientific conferences
- c. Attendance and presentation at regional and international professional scientific conferences
- d. Commitment in the design, implementation, analysis and reporting of clinical audits and research projects

Training Curriculum

Training Curriculum Outline

The outline of our training curriculum is a 36-month training programme. The programme comprises 27 months of core rotation-based training in Leukaemia / Lymphoma / Haematology (9 months); Solid Tumours / Neuro-oncology (9 months); Haematopoietic Stem Cell Transplantation (6 months) and General Haematology (3 months) respectively. The above will take place in Hong Kong Children's Hospital or recognized tertiary haematology oncology centre with prior approved by the subspecialty board. The general haematology module can be achieved by consultative medicine format. The remaining 9 months is an elective rotation which include laboratory exposure or any areas related to PHO or training in one regional or overseas haematology & oncology tertiary care centre with a recognised programme (or combined programmes) subjected to the prior approval by the Programme Director and subspecialty board.

Responsibilities of PHO Subspecialty Trainee for patient management:

- a. PHO In-patients, Ambulatory and Outpatient Care:
 1. The subspecialty trainee is posted to Leukaemia/ Lymphoma / Haematology (LLH); Solid Tumour & Neuro-oncology (ST&NO); Chemotherapy Ambulatory Care Centre and Haematopoietic Stem Cell Transplant Unit
 2. The subspecialty trainee is responsible to work under supervision with team heads, the multidisciplinary team which includes general paediatric trainees, nurses, pharmacists, allied health professionals and social workers involved in the care of PHO patients to formulate the plan of care and implement associated procedures and treatment options
 3. The subspecialty trainee is responsible to work with team heads in preparing and giving presentations related to specific patient problems or topics on rounds, at weekly team meetings or at a variety of multidisciplinary conferences
 4. The subspecialty trainee is responsible to work under supervision with team heads in taking haematology oncology referrals and consultations from regional paediatric units or private practitioners and liaise with them for management plan of these patients
 5. For radiation oncology exposure, subspecialty trainee is responsible to work under supervision with team heads in preparation of multi-disciplinary team meeting to liaise with radiation oncologists for treatment plan. Trainee needs to attend the radiation oncology clinics during their ST&NO rotation with involvement in patient counselling, planning of radiotherapy and follow up of patients
- b. PHO Specialist Outpatient Clinics:
 1. The subspecialty trainee is responsible to work under supervision with team head in specialist outpatient clinics in Haematology, Oncology and BMT at least 1 session per week in recognized training site (at least 2 sessions per week in the overlapping year with general paediatric higher training)
 2. The subspecialty trainee needs to attend general haematology outpatient clinics in regional paediatric units (at least 2 sessions per week, minimum number of cases 15 per week) with team heads

- c. Patients for Continuity Care and Follow Up
 - a. Subspecialty trainee will be assigned patients for continuity care and follow up. Trainees are expected to actively participate in the entire treatment journey of the patients.

Foundational Knowledge of PHO

- a. General principles of anatomical pathology related to PHO
- b. Physiological changes in growth and development related to cancers and non-malignant haematological disorders in paediatric patients, including but not limited to normal values and the maturation of haematopoietic organs and tissues
- c. Pathophysiological processes related to cancers and non-malignant haematological disorders
- d. Cellular and molecular biology, genetics, biochemistry, pharmacology, pathophysiology and immunology related to the understanding of cancers and non-malignant haematological disorders
- e. Disorders of immune function related to PHO
- f. Psychological processes in paediatric patients with cancers and non-malignant haematological disorders
- g. Diagnostic workup for a patient with a potential underlying malignancy
- h. General principles of diagnostic imaging as they apply to PHO
- i. Understand potential genetic implications for patients and families with inherited cancer predispositions, and the importance of genetic counselling
- j. Supportive care related to the management of PHO patients
 - i. Prevention and treatment of infectious diseases in immunocompromised hosts
 - ii. Prevention and treatment of chemotherapy-related organ dysfunctions
 - iii. Management of pain, recognition and assessment of patients in need of pain and symptom management, including use of appropriate pain scales, Recognition of the psychosocial needs of the patient and family in the context of palliative care and complex pain management
 - iv. Management of mucositis
 - v. Nutritional support
 - vi. Anti-emetic therapy
 - vii. Blood product support and transfusion medicine
 - viii. Care and use of central venous access devices
 - ix. Psychosocial support
- k. Long-term follow-up of PHO patients for the purposes of
 - i. Disease monitoring
 - ii. Detecting late effects of therapy, recognizing the particular risks and needs of children, including but not limited to early mortality, second malignancy,

cardio-pulmonary toxicity, neurocognitive deficits, endocrine dysfunction, and psychosocial challenges

iii. Promotion and maintenance of a healthy lifestyle

l. Palliative Care

i. Palliative care includes but not limited to appropriate use of medications and other therapies to provide complex symptom relief for children

ii. Community and hospital resources that can support appropriate palliative care services

iii. Recognition of the psychosocial needs of the patient and family in the context of palliative care and complicated pain management

m. Manage paediatric oncological emergencies, include but not limited to

i. Fever and neutropenia

ii. Tumour lysis syndrome

iii. Superior mediastinal syndrome

iv. Hyperleukocytosis

v. Spinal cord compression

vi. Splenic sequestration crisis

vii. Stroke

viii. Life-threatening haemorrhage

ix. Haemolytic crisis

x. Pulmonary embolism

Fundamental skills and Required Competency of PHO Trainees

1. A subspecialty trainee can perform a complete and appropriate assessment of patient so as to identify and explore issues in PHO related areas that need to be appropriately addressed
2. Subspecialty trainee can elicit a history that is relevant, concise, and accurate to context and preferences, for the purposes of diagnosis and/or management of PHO related conditions
3. Perform appropriate and comprehensive assessments, demonstrate sensitivity to patients' needs and can modify them based on the patients' age, gender, sexual orientation, and ethnicity
4. Select medically appropriate investigative methods in a resource-effective and ethical manner
5. Demonstrate effective clinical problem-solving skills and judgment to address patient problems, so as to generate differential diagnoses and management plans

6. Plan and coordinate an appropriate diagnostic workup for any new patient with a potential underlying malignancy
7. Work effectively with other haematology oncology team members, other paediatric subspecialties and other specialties for overall patient management in the field of PHO
8. Obtain appropriate informed consent for therapies
9. Competently perform diagnostic bone marrow aspiration, bone marrow trephine biopsy, stem cell harvesting, diagnostic lumbar puncture, administration of intrathecal chemotherapy independently
10. Document and disseminate information related to procedures performed and their outcomes
11. Demonstrate proficient and appropriate use of procedural skills, both diagnostic and therapeutic
12. Select chemotherapy and other forms of systemic therapies, and describe the acute and chronic side effects related to the therapies
13. Integrate multimodal therapies, including surgery and radiation therapy, for individualized patient care plans
14. Manage medical emergencies and complications that may arise as a result of cancer or non-malignant haematological disorders and their treatment
15. Provide supportive care, including but not limited to the prevention and management of pain, nausea, vomiting, and infections, appropriate use of blood components and growth factors; and the care and management of complications of central venous access devices.
16. Provide comprehensive, multidisciplinary care, including prevention and monitoring of complications, for patients with chronic haematological conditions, including but not limited to thalassaemia, bleeding and thrombotic disorders
17. Give effective presentations and lead patient-focused discussion in relation to specific patient problems or topics on clinical rounds and in multidisciplinary conferences
18. Demonstrate insight into their own limits of expertise

Attitudes of PHO Subspecialty Trainees

1. Subspecialty trainee should be supportive when he/she provides information, and counselling to patients and families
2. Subspecialty trainee should appreciate the patients' perspective, concerns and the impact of the disease and transplant procedures on the patients and their family
3. Subspecialty trainee should appreciate the importance of teamwork, effective communication and coordination among health care providers

Rotation in Leukaemia / Lymphoma / Haematology (9 months)

Key knowledge in haematopathology and laboratory medicine as it relates to Leukaemia Lymphoma and Haematology, including but not limited to knowledge of the appropriate indications for, methods of, and limitations of

- a. Peripheral blood morphology
- b. Bone marrow aspirations +/- biopsies
- c. Cerebrospinal fluid (CSF) assessment
- d. Haemostasis and thrombosis evaluation
- e. Transfusion medicine
- f. Flow cytometry, including but not limited to immunophenotyping
- g. Cytogenetics and molecular diagnostics

Key knowledge in diagnosis and management of paediatric haematological malignancies and complicated haematological conditions, including but not limited to

- a. Acute lymphoblastic leukaemia
- b. Acute myeloid leukaemia
- c. Non-Hodgkin lymphoma
- d. Hodgkin Lymphoma
- e. Chronic Leukaemias,
- f. Myelodysplastic syndromes and Pre-leukaemic disorders.
- g. Bone marrow failure syndromes
- h. Langerhans Cell Histiocytosis
- i. Haemophagocytic Lymphohistiocytosis
- j. Haemophilia with inhibitor
- k. Rare bleeding disorders

Key knowledge in cancer chemotherapy and common protocols including but not limited to their roles, mechanisms of action, and toxicities related to specific chemotherapy agents.

Key knowledge in long-term follow up for patients with haematological malignancies.

Rotation in Solid Tumours / Neuro-oncology (9 months)

Key knowledge in diagnosis and management of paediatric solid tumours and neuro-oncology, including but not limited to

- a. Central nervous system (CNS) tumours
- b. Retinoblastoma
- c. Wilm's tumour
- d. Neuroblastoma
- e. Hepatoblastoma
- f. Ewing sarcoma
- g. Osteosarcoma
- h. Rhabdomyosarcoma
- i. Germ cell tumour
- j. Others miscellaneous solid tumours

Key knowledge in cancer chemotherapy and common protocols including but not limited to its role, mechanisms of action, and toxicities related to specific chemotherapy agents

Key knowledge in the role, indications, and complications of surgery as applied to the management of children with cancers.

Key knowledge in the role, indications, and complications of radiation therapy as applied to the management of children with cancers.

Key knowledge in managing long-term follow up for patients with solid tumours or neuro-oncological malignancies.

Rotation to General Haematology (3 months)

Key knowledge in diagnosis and management of paediatric haematological diseases, including but not limited to

- a. Disorders of haematopoiesis
- b. Red cell aplasia and polycythaemia
- c. Red cell disorders
- d. Haemoglobinopathies
- e. Red cell membrane defects

- f. Red cell enzyme deficiencies
- g. Nutritional anaemias
- h. Iron deficiency
- i. Megaloblastic anaemia
- j. Dyserythropoiesis
- k. Immune haemolytic anaemia
- l. Lymphopenia and lymphocytosis
- m. Leukopenia and leukocytosis
- n. Neutropenia and neutrophilia
- o. Eosinophilia
- p. Neutrophil function defects
- q. Disorders of haemostasis and thrombosis
- r. Thrombocytopenia and thrombocytosis
- s. Amegakaryocytic thrombocytopenia and thrombocytosis
- t. Platelet dysfunction
- u. Congenital coagulation disorders
- v. Acquired coagulation disorders
- w. Hypercoagulable states
- x. Disorders of fibrinolysis
- y. Splenomegaly and disorders of splenic function
- z. Lymphadenopathy
- aa. Histiocytic disorders

Rotation to Haematopoietic Stem Cell Transplantation (6 months)

Key knowledge of Haematopoietic Stem Cell Transplantation (HSCT)

- a. Basic principles of autologous and allogeneic HSCT
- b. Indications for autologous and allogeneic HSCT
- c. Importance and interpretation of HLA typing
- d. Selection of potential donors (autologous, HLA-matched, mismatched and haploidentical family donors, unrelated donors) and stem cell sources (bone marrow, peripheral blood stem cell, cord blood)
- e. Evaluation of donors and recipients
- f. Work effectively with BMT nurse coordinators, Hong Kong Bone Marrow Donor Registry (HKBMDR) and stem cell laboratory for coordination of transplant and for recipient and donor management
- g. Principles and procedures of stem cell procurement, processing, cryopreservation, thawing, and infusion
- h. Selection and implementation of transplant preparative regimens and graft-versus-host disease (GVHD) prophylaxis

- i. Management of donor-recipient ABO incompatibility
- j. Diagnosis and management of the common complications of HSCT, including graft rejection, graft failure, engraftment syndrome, GVHD, infections and other common short-term and long-term complications
- k. Post-transplant immunization
- l. Long-term follow-up for HSCT recipients

Elective Rotation (9 months)

Subspecialty trainees can attach to either a clinical laboratory exposure or one or two oncology or haematology related areas (or in combinations of the above) for more in-depth exposure. This can be carried out in either local site or overseas sites. This rotation suits and facilitates the training preference of trainees. Trainees need to seek prior approval from Programme Director and subspecialty board before starting the elective rotation.

For elective clinical laboratory exposure, learning objectives in laboratory elective module are as follow:

- a. Development of basic skills in reading peripheral blood and bone marrow smears, and familiarising with modern ancillary diagnostic techniques such as cytogenetics, flow cytometry, immunohistochemistry and molecular diagnostics
- b. Exposure to essential aspects of specimen handling in surgical pathology
- c. Exposure to microbiology laboratory
- d. Exposure to general haematology laboratory
- e. Basic principle in laboratory technique in transfusion medicine
- f. Understand the basic principle in laboratory technique in genetics and genomics and the use in the field of PHO

Training Interruption

The subspecialty training programme should be continuous and in full time basis. Subspecialty trainee should have at least 50% involvement in the subspecialty during normal working hour throughout their training period. Subspecialty trainees can apply for recognition of interrupted training and should fulfill the following criteria:

- a. there must be a justifiable reason for the interruption, either because of medical, maternity or other compassionate reasons (excluding entitled vacation leaves and study leaves)
- b. the trainee should show his/her intention for further training
- c. the interruption should not more than 84 calendar days during the whole period of training, if the leave period exceeds 84 calendar days, the subsequent action will be determined by subspecialty board
- d. must follow the regulations laid down by the Academy (including the Grandfather Clause: By-Law 16)
- e. final decision is at the discretion of the PHO subspecialty board and College Council

Method of Evaluation and Exit Assessment in PHO

The application for subspecialty training should normally be submitted to the PHO Subspecialty Board before initiation of subspecialty training. The trainee who is admitted into PHO subspecialty training programme should undergo training fulltime.

In order for the training programme to achieve its goal and objectives, an evaluation process incorporating regular review by subspecialty trainers and exit assessment of the subspecialty trainees is established.

Regular Review by Subspecialty Trainer

Regular review by subspecialty trainer every 3 months will be required to allow flexibility and early identification of potential problems or deficiencies. The overall performance of each subspecialty trainee is reviewed in annual assessment by the subspecialty board through assessment of the portfolio and training log and feedback from subspecialty trainers.

Trainee should keep a written record of patients seen, number of special procedures conducted and follow-up in a logbook which should be kept up-to-date and endorsed by subspecialty trainers. The logbook should also contain information on educational activities, training received, problems encountered and feedback by trainers.

The trainee should attend and provide evidence of attendance at local, regional and/or international haematology, oncology or HSCT meetings or training courses organized or co-organized by international professional bodies at least once per year. At least 2 presentations (oral or poster presentations) at meetings are required during the 36 months PHO subspecialty training.

Final Exit Assessment

The final exit assessment will take place once each year. The trainee has to submit 2 dissertations on topics relevant to PHO for assessment. The 2 dissertations should include at least one research study, and at least one should be accepted for publication in an international or local journal upon completion of subspecialty training. The trainee should be the first author or corresponding author of these 2 dissertations. The dissertations should not overlap with the dissertations submitted for general paediatric exit assessment. The trainee should attend a viva examination conducted by an Assessment Board. The viva examination is in the format of structured viva examination with adequate coverage of materials including the 4 key essential areas: (i) leukaemia / lymphoma; (ii) solid tumours and neuro-oncology; (iii) haematopoietic stem cell transplantation; (iv) haematology. The assessment board comprises at least 3 assessors appointed by the PHO Subspecialty Programme Director with an option of appointing an overseas external assessor who is PHO specialist.

Trainees who successfully pass the regular review assessment and final exit assessment will be invited to apply for Fellowship in the subspecialty of Paediatric Haematology & Oncology of the Hong Kong College of Paediatricians.

Appendix 1: Checklist for Special Procedures with Minimum Number of Procedures Required

1. Apheresis (3)
2. Bone Marrow Aspiration +/- Trepine Biopsy (30)
3. Haematopoietic Stem Cell Harvest for Stem Cell Donor (3)
4. Intrathecal Chemotherapy Administration (30)