SPECIALIST TRAINING PROGRAMME IN TRANSFUSION MEDICINE

Objectives of Training and Training Requirements in Transfusion Medicine

I. Definition

The recognition that blood is a precious, and indispensable resource against a backdrop of increasing complexity in medical care has meant that transfusion medicine is now recognised internationally as a specialty in its own right with distinct requirements for training. Globally, transfusion medicine specialists are presented with the challenging tasks of managing an adequate and safe blood supply, and liaising closely with clinical colleagues and hospitals in ensuring optimal and appropriate use of blood and blood components as well as transfusion alternatives where available.

In the last two decades, there have been scientific and medical developments, which have led to improvements in patient care and advances in blood banking technology and operations. These have led to major reduction in the risk of transfusion-transmitted diseases; the refinement of plasma derivatives, apheresis technology, discovery of haematopoietic growth factors, identification of the molecular biology of blood groups; improvements in the use of blood components, defined transfusion therapy in the management of complex situations such as cardiovascular surgery, organ and marrow transplantation and haemoglobinopathies; improved management of acute blood loss; and the use of therapeutic apheresis to treat previously untreatable diseases such as TTP. Added to these are changes in regulatory oversight, cost containment, and the changing public perception of the blood supply system.

There will be continuing need for blood and for the physicians to carry out these activities. Current research will also herald new changes adding to the complexity of the discipline and widening the scope of the transfusion medicine specialist. The transfusion medicine specialist will have to translate research into clinical use, in areas such as red cell substitutes; platelet substitutes; viral, bacterial protozoal-inactivated blood components; haematopoietic growth factors to stimulate mobilisation of various blood cells in normal donors; rapid and efficient instruments to collect these cells; ability to enzymatically convert red cells to the group O phenotype; molecular techniques to detect red cell genotypes; and a complex array of cellular engineering procedures to produce novel blood components for transfusion or gene therapy.

Transfusion Medicine is a unique multidimensional discipline, which integrates science technology, medicine, public health administration and the community as a whole. Because transfusion therapy has strong interrelationships with several other disciplines, particularly haematology and immunology, training programmes in transfusion medicine must include appropriate knowledge and skills in these subjects. However, transfusion
II. Objective of Training

One of the main objectives of the training curriculum is to instil a level of competency in transfusion medicine that is commensurate with international standards. The transfusion medicine specialist will be required to conduct activities such as medical consultation regarding use of traditional blood components, therapeutic apheresis, immunohaematology clinical consultation, education of hospital medical staff, administrative roles in hospital, development and implementation of novel blood collection techniques, donor medical issues with increased collection complexity, consultation on component therapy for novel situations, technology implementation, and cellular engineering for production of new blood components, amongst others.

The MRCPath (UK) in Transfusion Medicine managed under the auspices of the Royal College of Pathologists (UK) is an exit postgraduate examination specifically intended for the certification of specialists in transfusion medicine. The overall aim of this curriculum is to enable the trainee to acquire the skills and knowledge to be a competent transfusion medicine specialist with a good grounding in haematology and immunology. He/she will be able to function as a consultant in the essential roles of medical expert, clinical decision maker, communicator, manager, health advocate, researcher, and professional.

On completion of the educational programme the trainee will have acquired the following general educational objectives and be able to:

1. Understand the importance of blood and blood components as a precious, life saving resource and be competent in the judicious use of this resource
2. Champion and understand the need for transfusion safety and its importance in all aspects of medical care
3. Act as the medical expert in providing advice and clinical decision making with regards to the need for blood transfusion and work with clinical colleagues in formulating evidence based guidelines
4. Function as a member of the health care team and coordinate the team in appropriate situations, especially working with surgical and anaesthetic colleagues to ensure that
optimal care is given to all patients, especially with blood product support in resuscitation and haemostasis

5. Communicate effectively, especially with the public and media in matters of the national blood supply

6. Understand the national and public health importance of safe blood components including a sound knowledge in transfusion transmitted pathogens.

7. Possess up to date knowledge of the immunohaematology of blood and blood components including its effects on the patient

8. Have a sound background in laboratory haematology and automation and quality control.

9. Understand the need for research and development in transfusion alternatives, molecular immunology and cellular therapy

10. Able to offer expert advice in histocompatibility and immunogenetics for stem cell and organ transplantation.

11. Incorporate comprehensive and evidence based medicine into all areas of its discipline.

12. Contribute to the education of students, other physicians, other health care professionals, and patients and their families.

13. Be able to undertake accurate self-appraisal, develop a personal continuing education strategy and pursue lifelong mastery of transfusion haematology.

14. Be able to critically evaluate the transfusion haematology literature and apply pertinent information to patient management.

15. Learn the diagnostic techniques required in the practice of haematology

16. Understand the areas of clinical haematology detailed in the curriculum as well as the communication skills required for the practice of clinical haematology.

17. Appreciate the value of research, audit and team working, which underpin haematology and transfusion practice.

During the course of the transfusion haematology training program, the trainee must undertake a broad range of practical clinical, laboratory and management experiences including on call for haematology and transfusion medicine consults. The training, especially in the laboratory will also be “hands on” bench work. He/she will attend a program of formal education activities; and have exposure to and involvement with current research activities.

II.1. Duration

1. Advanced Training in Transfusion Haematology consists of 5 years of training spent in both haematology and the transfusion service. It is preferable that the candidate possesses either the MRCP or M Med examination, although not compulsory. (Refer to Appendix 1)

2. The trainee will be competent in general haematology with sub specialisation into transfusion haematology
3. Part of the training requirements will be stints spent in the hospital virology/microbiology departments, laboratories devoted to flow cytometry, molecular techniques and to the immunology at the National University of Singapore.

4. There will be an overseas attachment to a Centre for Excellence in Transfusion as well as emphasis on a research project.
III. Basic Training Requirements

A Training Record will be maintained by the trainee. It will be counter-signed as appropriate by the Educational Supervisors to confirm the satisfactory fulfilment of the required training experience and the acquisition of the competencies that are enumerated in the Specialty Curriculum. It will remain the property of the trainee, and must be produced at the annual assessments. The educational objectives detail the knowledge, skills and attitudes essential in the training of the transfusion haematologist:

III.1. Content of Training Programme

**Transfusion Medicine**

During the course of the training curriculum, the trainee will learn

**Donor management:**
Donor recruiting, donor screening, donor retention, donor counselling, principles of donor selection, health questionnaire criteria. Familiarity with the AABB Standards and Technical Manual is acquired.

**Blood collection techniques**
Aseptic methods. Venesection. Apheresis and plasma exchange

**Blood component processing**

**Immunohaematology**

**Microbial testing**
Bacterial and viral testing. Methods of detection. NAT testing. Range of pathogens to test.

**Clinical Consult**

**Quality control**
Understanding the principles and importance of quality control in transfusion medicines. Initiating audits. Gaining the knowledge to write SOPs

**Transfusion safety**
All aspects of transfusion safety—“vein to vein” including clerical and safety procedures. An understanding of the hazards of transfusion including haemovigilance and the SHOT programme in UK. Liaise closely with the hospital transfusion committees.

**Management issues**
The importance of management in transfusion services. Understanding the principles of managing a precious resource. Knowledge of disaster planning. Liaison with regulatory agencies, ministries, health departments, hospital transfusion committees. Principles of cost accounting, budgeting, personnel management, international bloodbanking regulations.

**Data and laboratory systems**
Various aspects of the laboratory computer systems, potential of automation and near patient testing. Techniques of data collection and analysis needed for blood resource management. Be familiar with the need for access and security in these systems.

**Cell Therapy**
Be familiar with a new generation of blood products. Cell Processing Laboratory. Processing and storage of bone marrow and peripheral blood stem cells. Support of gene therapy protocols and generation of antigen specific lymphocytes and other engineered lymphocytes. Ex vivo cell culture work and application in transplantation. Knowledge of GMP facilities

**Blood Conservation Strategies**
Understanding the principles of maximum blood ordering schedules. Autologous blood collection. Preoperative, intraoperative and postoperative salvage mechanisms. Pharmacological alternatives to blood transfusion including erythropoietin, anti-fibrinolytics and recombinant factor VIIa.

**Histocompatibility and Immunogenetics**
Knowledge of the HLA system and its relevance to stem cell and organ transplantation. Principles of HLA typing including low resolution and high resolution typing.

**New technologies in transfusion haematology**
Gain an understanding of how molecular techniques are increasingly applied in immunohaematology. Genotyping red cells

**Platelets:**
Platelet Immunology. Problems associated with quantitative and qualitative platelet dysfunction. Platelet refractoriness and how to investigate and manage. Platelet antibodies.
Special Transfusion Circumstances
Understanding the specifics of dealing with the pregnant woman. Special requirements of the neonate and the transplant patient. Indications for leucodepletion, irradiation, washing of cells.

Research project
Research will be actively encouraged including writing of papers and presentation of data at international meetings. Part of the last year will be devoted to a research project.

Clinical Haematology

This will involve formal and informal instruction in clinical haematology as well as day to day care of the haematology patient. The trainee will be involved in both inpatient as well as outpatient care. This will include participation in out of hours cover for clinical haematology.

Diagnosis and treatment of acute leukaemias with particular emphasis on classification and the use of chemotherapy regimens. The trainee should receive formal training in the hazards, handling, administration and toxicity of chemotherapeutic drugs used in haematology. The trainee should become familiar with common trial protocols used for treatment of acute leukaemia.

Chronic leukaemias: The diagnosis, classification and staging of chronic leukaemias with particular emphasis on understanding the pathogenesis and natural history. Includes formal instruction in the molecular biology of disease.

Myeloma and lymphoma: Instruction in morphological diagnosis, classification and introduction to treatment protocols.

Haemophilia: Instruction in diagnosis and management of common inherited disorders of coagulation, particularly haemophilia (A and B) and von Willebrand's disease. Instruction in the preparation, safety and use of coagulation factor concentrates.

Thrombophilia: Instruction in the diagnosis and management of thrombophilic conditions. Indication for anticoagulation and control. Management of over-anticoagulation.

Acquired bleeding disorders: Instruction in the diagnosis and management of acquired haemorrhagic states, particularly those associated with DIC, massive transfusion, renal and hepatic disease and obstetric complications.

Haemoglobinopathies: Basic instruction in the management of thalassaemias with an understanding of other haemoglobin abnormalities. Antenatal screening methods, counselling and advice to parents, instruction in the molecular pathology of the disorders.
Bone marrow failure syndromes including diagnosis and long-term management of the pancytopenic patient including myelodysplastic syndromes and aplastic anaemia.

Myeloproliferative disorders including polycythemia rubra vera. Use and technique of therapeutic venesections.

Anaemias: the diagnosis, investigation and management of common anaemias including iron deficiency, megaloblastosis plus the other deficiency states and the congenital and acquired haemoleptic anaemias of immune and non-immune cause.

Training in autologous and allogeneic stem cell transplantation, including indications for transplantation, care of the immunosuppressed patient and the post transplant patient.

Haematology relating to other medical specialties

Introduction to haematological consultation with other specialties, medical, surgical, obstetrics and paediatric, in particular instruction in problems associated with massive transfusion, diagnosis and management of bleeding disorders in sepsis, management of haemostatic problems in pregnancy, introduction to neonatal haematology and the multiple problems experienced in ITU practice.

3. General aspects
There should be formal introduction to specific problems of communication in haematology, for instance breaking bad news, care of the dying, explanation of toxic effects of chemotherapy and other drug regimens.
Management of infection in the immunodeficient patient including antibiotic regimens for treatment and prophylaxis and the insertion and maintenance of central venous lines

Laboratory Haematology
The trainee will spend time in the laboratory and be familiar with automated blood counting; making and staining peripheral blood films and basic reporting of the blood films. Time will also be spent in the hospital blood bank involved in crossmatching of blood and recognition of clinically important alloantibodies.
Time will also be spent in the coagulation laboratory understanding and interpreting the various coagulation assays including factor assays in haemophilia treatment.

Specialist Laboratories
The trainee will become familiar with molecular techniques, with emphasis to its application in haematology and transfusion. He/she will also learn the basics of flow cytometry.

Attachments to other units:
Blood safety is inextricably linked to anti-microbial safety. The trainee will spend time in the virology and microbiology departments and be familiar with blood borne pathogens including methods of testing, confirmation and levels of sensitivity and specificity
As much of transfusion haematology is immuno-haematology, the trainee will become conversant in basic cellular immunology and immunology specific to erythrocytes, leucocytes and platelets.

**MRCPath Examinations Requirements**

This will be in accordance with the guidelines set up by the Royal College of Pathologists (UK).

**Part 1 examination**
Trainees will usually sit this examination after two years of post-registration training. The examination comprises the following.

a) **Two written papers**
These measure the trainee’s knowledge of transfusion medicine and laboratory and clinical haematology. Paper 1 is the same as paper 1 for the examination in haematology. Paper 2 contains the same compulsory question on blood transfusion practice as the haematology paper 2, plus four other questions that will examine the candidate’s knowledge of transfusion medicine. Successful candidates then progress to:

b) **A practical examination**
This examination is held in three centres in the UK. There is no variability between centres since the same question papers and slide material are used in the centres. The candidate in transfusion medicine will sit approximately half of the examination in morphology and coagulation as the haematology candidates. An additional practical in transfusion medicine will be set. There is:

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<tr>
<th>Section</th>
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<td>a morphology section: this consists of one section of ten short answers to questions that required a diagnosis from a blood film, bone marrow aspirate/trephine biopsy or from data interpretation.</td>
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<tr>
<td>a coagulation section: usually four questions to be answered in one hour. These comprise data interpretation on a range of clinical and laboratory problems found in coagulation.</td>
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<td>a blood transfusion section: usually ten questions in two separate sections, which require interpretation of transfusion medicine data. This paper is sat with the haematology candidates. A second paper will explore areas of transfusion practice not covered in the general blood transfusion examination.</td>
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<td>an oral examination: this will emphasise, but not be exclusively devoted to, transfusion medicine.</td>
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Candidates are required to pass all four sections of the examination. Candidates are expected to be familiar with the day-to-day clinical and laboratory problems that arise in their training departments.

**Part 2 examination**
Trainees will usually sit this examination during their final year of training. The examination comprises two structured vivas, each of 30 minutes. Candidates may, if they wish, elect for the second of these vivas to test an area of haematology other than transfusion medicine. Prior to the examination, candidates are provided with a list of
topics on which the examiners will base the vivas. The first viva will contain one compulsory topic relating to management.

The examination is held in The Royal College of Pathologists, London. There are two examiners for each viva and, of the total of four examiners, at least one will be a general haematologist. The examiners select four topics for each viva and these are marked separately and then added to provide a final mark.

Candidates will normally have membership of The Royal College of Physicians in the UK. Occasionally non-European Union trained overseas candidates may not have MRCP and they will be required to sit an additional clinical examination as part of the Part 2 examination.

The purpose of the Part 2 examination is to ensure that candidates have a comprehensive knowledge of up-to-date transfusion medicine practice.

Accreditation Specialist with the Ministry of Health

Having been successful in both parts of the MRCPath examination and thereafter, awarded the postgraduate degree MRCPath, the candidate will then proceed to apply for Specialist Accreditation with the Ministry of Health with a letter substantiating his/her successful completion of Advanced Training. The Accreditation will be awarded for Haematogist (Transfusion Medicine).
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<tr>
<th>Career Track</th>
<th>Educational Requirement</th>
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<td>MO trainee</td>
<td>MBBS. If in possession of MRCP, then will commence at year 1 as registrar.</td>
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<td>Year 1 MO trainee</td>
<td>1st 6 months CTM</td>
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<td></td>
<td>2nd 6 months Clinical Haem (SGH or NUH)</td>
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<td>Year 2 MO trainee</td>
<td>1st 6 months CTM</td>
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<td>2nd 6 months lab haematology (TTSH)</td>
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<tr>
<td>Year 3 Registrar</td>
<td>1st 6 months: Clinical Haem (SGH/NUH)</td>
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<td>Eligible for MRCPath Part 1</td>
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<td>2nd 6 months in CTM</td>
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<td>Registrar with MRCPath Part 1</td>
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<td>Year 4 Registrar</td>
<td>1st 6 months in Stem Cell Transplant (SGH/NUH)</td>
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<td>2nd 6 months CTM with particular emphasis on management and a project</td>
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<td>Year 5 Registrar</td>
<td>1st 3 months molecular/flow cytometry labs (SGH or NUH) and immunology</td>
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<td>3 months attachment to virology/HIV, microbiology unit SGH</td>
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<td>2nd 6 months CTM or possibility of HMDP attachment to overseas blood bank</td>
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<td>MRCPath Part 2 exam</td>
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<tr>
<td>Associate Consultant/Consultant</td>
<td>Accreditation with Specialist Accreditation Board as a Haematologist (Transfusion Medicine)</td>
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If candidate is in possession of MRCP already, The training would be shortened by 1 year (Year 4 training omitted). The attachment to an overseas blood bank can be slotted into the 5th year.