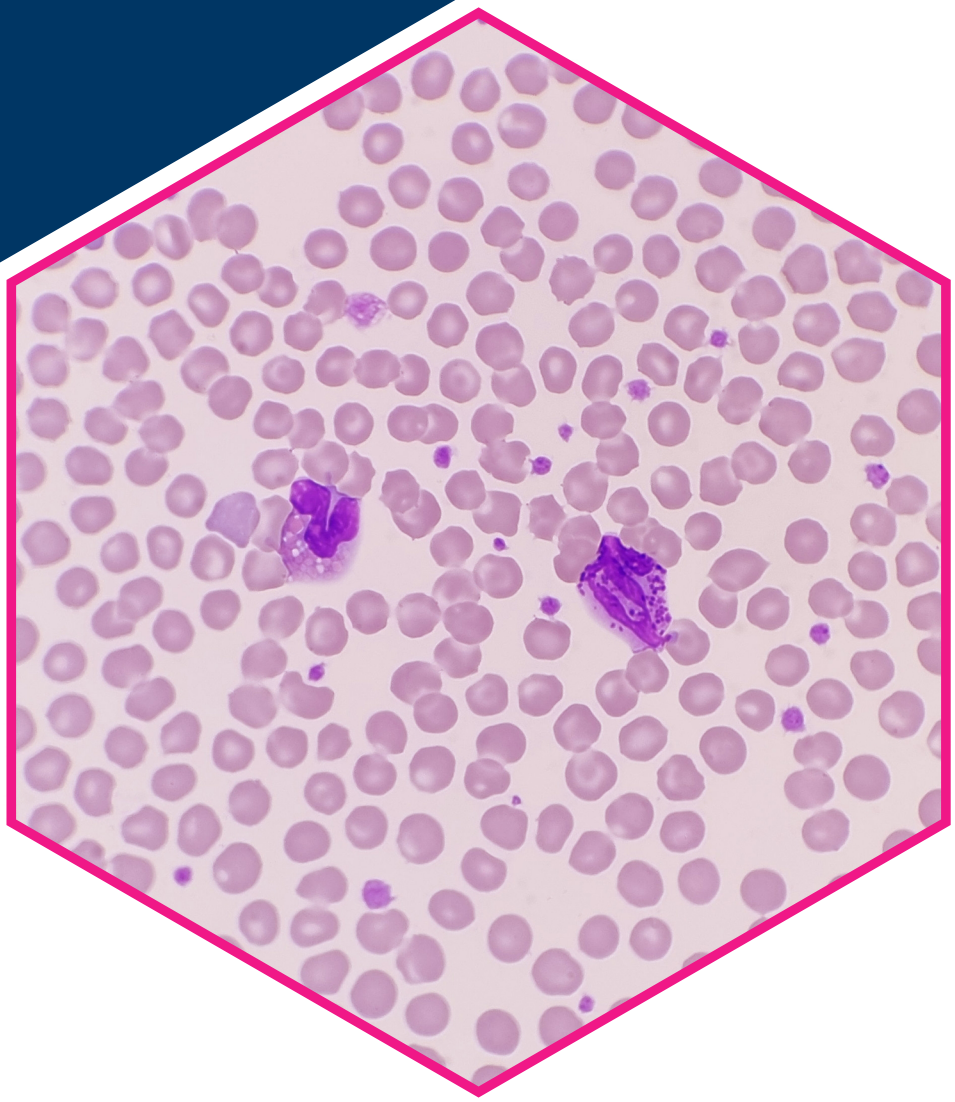
HAEMATOLOGY WITH TRANSFUSION PRACTICE DIGITAL SPECIALIST PORTFOLIO



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Haematology Modules

- Quality Module (see separate module booklet)
- Diagnostic Haematology
- Peripheral Blood Film Morphology
- Blood Borne Parasites- Malarial and Non-Malarial Infestations
- Routine Haemostasis
- Haemostasis Abnormalities
- Classification of Haematological Malignancies
- Investigation and Diagnosis of Haematological Malignancies
- Iron Deficiency Anaemia and Iron Overload
- B12 and Folate Deficiency and Anaemia of Chronic Disease
- Haemoglobinopathy
- Inherited and Acquired Haemolytic Anaemia

If the candidates selects Haematology with Hospital Transfusion Practice the following modules will also be included as part of the Specialist Diploma

Hospital Transfusion Practice Modules

- Good Manufacturing Practice (GMP) Awareness in Transfusion
- Donor Selection and Testing
- ABO and D typing
- Antibody Screening and Identification
- Resolving Samples Requiring Further Antibody Investigation
- Patient Blood Management (PBM) and appropriate use of blood
- Red cell phenotyping
- Compatibility Testing
- Selection of blood components and products

- Release of blood components and products
- Blood stock management and emergency planning
- Antenatal Screening and Haemolytic Disease of the Foetus and Newborn
- Investigation of serious adverse reactions and events
- Investigation of ABO and D anomalies

Please note:

All learning outcomes (LOs) are met through two pieces of evidence, Q&A as agreed with a training officer and an additional piece of work as selected by the candidate. A statement of work and reflective statement on each module will be required which will include sign off by the trainer stating that the candidate works in accordance with laboratory procedures, the competence for which should be evidenced in-house and is not part of the portfolio submission.

Indicative Content outlines background knowledge that may be required to meet the LOs and/or knowledge and competences expected to be demonstrated across multiple modules. Knowledge of areas highlighted in the indicative content may be examined during the viva.

Module Title	Diagnostic Haematology
Module code	7350
Rationale/ Aims	The candidate will be able to review the results of a full blood count, and understand the principles behind each of the results including haemoglobin measurement, red cell parameters, white blood cell (WBC) differential, platelet and reticulocyte counting. They will understand the principles and methodology behind erythrocyte sedimentation rate (ESR), plasma viscosity (PV), Infectious Mononucleosis and sickle cell testing. Candidates will gain an understanding of the principles of autovalidation and contingency processes in their local practice. This module underpins basic diagnostic haematology in a routine laboratory and is the basis on which specialist haematology practice is built.
Learning outcomes	1. Explain the principles of cell counting analysers, including the measurement of haemoglobin, red cell parameters, WBC differential, NRBC, platelet and reticulocyte counting. 2. Explain the principles and limitations of ESR and PV testing and recognise the factors which may affect the results. 3. Explain the principle behind Infectious Mononucleosis investigations, discuss the limitations of this test and provide from the candidates practice an example of interpreting test results. 4. Explain the principle and use of sickle solubility test and discuss its role in confirmation testing for heterogenicity and other haemoglobin variants. 5. Recognise, and act upon, abnormalities from routine diagnostic tests and suggest further testing which may need to be performed. 6. Demonstrate 6-10 examples of full blood count parameters that require immediate action including those where local action critical limit criteria have been triggered. 7. Discuss, with examples from candidates practice, the effect of pre-analytical variables that affect FBC, -ESR/PV and IM testing. 8. Discuss the principles of autovalidation and give examples from practice of how these are applied. 9. Discuss your local contingency process, include examples of IT failure and analyser failure and discuss your limits of practice in these processes.
Indicative Content	Candidates require knowledge and understanding of: The principles behind blood cell counting analysers. The significance of FBC results, and be able to demonstrate when further testing may be required. The principles behind ESR and PV testing, and the limitations of each of these methods.

	The principles of testing for Infectious Mononucleosis, and the limitations of these. The principles and limitations of sickle solubility tests. Further testing and results seen in an Infectious Mononucleosis infection; including but not limited to; FBC results, Blood Film morphology. Calibration of the blood cell counting analysers, Internal Quality Control (IQC) and External Quality Assurance (EQA). The impact of pre-analytical variables on FBC, ESR/PV and IM results. How information is passed between the laboratory LIMS system and the analysers and the use of middleware software Contingency plans in place in the laboratory. Candidates must be able to: Calculate where required haemoglobin and red cells parameters. Troubleshoot the analyser, passing issues onto a senior colleague when required.

Module Title	Peripheral Blood Film Morphology
Module code	7355
Rationale/ Aims	Morphology is integral to identifying haematological disorders by providing confirmation of changes in blood cell morphology and recognising changes in cell maturation and development. This module will enable the candidate to gain the skills and knowledge necessary to investigate full blood count (FBC) results and indicate further testing to identify haematological disorders. The candidate will gain skills to identify all features of normal and abnormal blood cells using light microscopy and digital morphology where applicable to practice. The candidate will develop autonomous working skills, competence and confidence to report on patient's blood films.
Learning outcomes	1. Demonstrate competence in setting up a light microscope, identifying the various parts and their function. Discuss the use of correct objective lenses for scanning and diagnostic purposes and the principle of Kohler illumination. 2. Explain the principle of staining by Romanowsky and Wright stain by automated and manual methods as well as the ability to identify and resolve quality control issues relating to these staining protocols. 3. Discuss issues that can impact on the quality of blood films for morphological analysis by manual and automated methods as relevant to your practice. 4. Discuss the use of automated and semi-automated platforms for the preparation and staining of blood films. 5. Explain the principle of use and operation of digital morphology systems including limitations, compare and contrast digital images with light microscopy as relevant to your practice. 6. Discuss quality control methods, interpret external quality assurance results and analyse performance of your laboratory in comparison to other participants and troubleshoot as required. 7. Demonstrate the reporting of red cell morphological changes, linking their relationships to the red cell indices and clinical significance. 8. Demonstrate the reporting of normal and abnormal features of the myeloid and lymphoid series of white blood cells, and platelets including dysplastic features, key features of blast cells and link their clinical significance on the blood film to patient management. 9. Discuss the criticality and urgency of morphological changes on disease diagnosis and progression linking to clinical significance and normal reference ranges. 10. Discuss the need for further testing based on morphological findings to establish diagnosis.

Indicative Content	Candidate should have knowledge and understanding of: Normal and abnormal processes of haemopoiesis and be able to refer abnormal blood films for clinical interpretation and diagnosis as per the local protocol. The quality assurance processes involved in the examination of blood films for light and digital morphology. The business continuity processes in case of reagent shortage, analyser breakdown, environmental issues, staffing resources and IT issues in relation blood film morphology.

Module Title	Blood borne parasites – Malaria and Non-Malarial Infestations
Module code	7351
Rationale/ Aims	The candidate will be able to diagnose and report on malarial parasite infection, speciate and perform parasitaemia. Recognise non- malarial infections and report concisely to ensure effective treatment, patient care and management. The candidate will have the ability to evaluate and apply the use of the various diagnostic techniques used in the identification of Malaria parasite, make referrals where appropriate and understand results returned.
Learning outcomes	1. Demonstrate your ability to use the correct microscopic objectives for scanning and diagnostic purposes as relevant to your practice and discuss the rationale behind the objectives used relevant to this module. 2. Assess the risks associated with the handling of samples from patients with suspected infection due to viral haemorrhagic fever (VHF) prior to testing for Malaria. 3. Compare and contrast the difference in staining procedure and stain quality for Giemsa & Fields stains for malarial parasite. Explain the theory and staining principles of these stains, with focus on quality assurance for each process. 4. Evaluate the different techniques and principles employed in the screening methods of samples for malaria parasites with focus on quality assurance. 5. Discuss and describe uses of qualitative buffy coat (QBC) analysis and PCR and LAMP methods as relevant to your practice. 6. Demonstrate reporting on the identification and speciation of malaria parasite and perform estimation of parasitaemia when required. 7. Review the referral for confirmation and discuss the importance of reporting to a reference laboratory. 8. Evaluate the effect of drug treatment on the detection of malarial parasite infection and its clinical significance in the diagnosis and management of patient. 9. Demonstrate the identification of non-malaria parasites and discuss the clinical significance of the infection and prognosis for patient management. 10. Recognise and resolve quality control issues associated with malarial parasite identification.
Indicative Content	Candidates require knowledge and understanding of: The geographical prevalence of each malaria species, the lifecycle and its impact on the patient and the testing process. Knowledge of non-malaria species • Babesia • Filaria

	• Trypanosomes Quality processes involved in malaria parasite testing. Referral processes within their laboratory and the significance of results returned to the laboratory.

Module Title	Routine Haemostasis
Module code	7353
Rationale/ Aims	This module will enable candidates to gain an in-depth understanding of screening for bleeding disorders, and other causes of abnormal results. Understand the effects of anticoagulants on haemostasis, and tests used to measure or monitor anticoagulation. Candidates will gain knowledge and understanding of IQC, EQA, reference ranges, and variables that may affect the accuracy or quality of results.
Learning outcomes	1.Describe the principle and automated detection methods of PT, APTT, fibrinogen and thrombin time tests, and their role in the detection of a bleeding disorder. Explain the relationship between fibrinogen assay, thrombin time and reptilase time (RT). 2. Describe pre-analytical variables and discuss how these affect screening tests. 3. Discuss clinical conditions, other than bleeding disorders, that affect PT and APTT. 4.Discuss quality control measures that ensure accuracy of screening tests. 5. Describe the principle of the D-Dimer (DD) test, and its use in diagnosis of disseminated intravascular coagulation (DIC) and predicting Venous Thrombo-Embolism (VTE). 6. Detail the use of reference ranges and cut-off values and using examples from your practice, discuss their value in result interpretation. 7. Describe the use of the INR in monitoring vitamin K antagonist (VKA) therapy. Explain the calculation of the INR, including the role of international sensitivity index (ISI) and mean normal PT (MNPT). 8. Discuss other anticoagulants that are used (e.g. heparin, LWMH, DOACs) and the tests used to measure or monitor these drugs. 9. Describe the effects of anticoagulant drugs on screening tests. 10. Demonstrate setting up, quality managing and running routine coagulation assays, including troubleshooting and authorising results as appropriate to practice include details of autovalidation.
Indicative Content	Candidates require knowledge and understanding of: The principles and practice of the routine clotting screen tests, including PT, APTT, TT, RT, FIB and DD. The effects of anticoagulant therapy on PT and APTT measurement. Fibrinogen, Fibrinolysis, and DIC. Anticoagulant Therapy – use of VKA, heparins, direct thrombin and Xa inhibitors. Screening tests and clotting techniques.

Module Title	Haemostasis Abnormalities
Module code	7352
Rationale/ Aims	Candidates will gain an in depth understanding of role of the specialist laboratory in diagnosing both bleeding and thrombotic disorders, including, but not exclusively, Haemophilia, Von Willebrand Disease (VWD), antiphospholipid syndrome (APS) and thrombotic disorders. Understanding of calibration, IQC, EQA reference ranges, and variables that may affect the accuracy or quality of results.
Learning outcomes	1. Describe, with an example from your practice, the principle and process for testing for a clotting factor deficiency, and how to perform the assays including assay calibration. 2. Discuss the interpretation of clotting factor assay results, including classification of the bleeding disorder. 3. Discuss how inhibitors of coagulation may manifest in your screening tests and factor assays, and explain the principle of an inhibitor assay. 4. Describe the principle of tests for VWF and discuss how they are used to differentiate the varying types of VWD. 5. Describe the principles of investigations for heritable platelet disorders, including number, size and function. 6. Describe, with an example from your practice, the principle and process for testing for a heritable thrombophilia, and how to perform the assays. 7. Discuss the process and interpretation of lupus screening tests, and their relationship with anticardiolipin antibodies. 8. Discuss how preanalytical variables may impact accurate result delivery.
Indicative Content	Candidates require knowledge and understanding of: Bleeding disorders, including causes and how they may manifest in routine coagulation assays, including (but not exclusively) Haemophilia A, B & C, Inhibitors and Von Willebrand Disease Thrombotic disorders and the guidelines dictating testing Lupus anticoagulant, and the variance in interpretation Sample Preparation, Pre-analytical Variables & QC affect assay results in the specialist lab Basic platelet testing, techniques for counting and characterisation of platelets including methodological limitations

Module Title	Classification of Haematological Malignancies
Module code	7354
Rationale/ Aims	This module will enable candidates to acquire a comprehensive understanding of the classifications of haematological malignancies. This specialist knowledge will underpin candidates regular specialist work and allow them to critically assess results they see for patients with haematological disorders with the appropriate context applied, ensuring they provide a quality service to patients. This module develops and builds on the learning gained in the Investigation and Diagnosis of Haematological Malignancies module.
Learning outcomes	1. Describe normal haemopoietic cell pathways and discuss the consequences of abnormalities and subsequent development of haematological disorders. Provide specific examples for each pathway. 2. Describe the classification of myeloid and lymphoid haematological malignancies including WHO classification/ICC classification and discuss their role in patient diagnosis and management. 3. Describe the classical immunophenotype profiles associated with APL, AML, ALL, CLL. 4. Discuss the significance of cytogenetic testing in the diagnosis and management of haematological disorders using specific examples e.g. t(15;17)(q22;q12), hyperdiploidy, chromosome loss. 5. Discuss the significance of molecular testing in the diagnosis and management of haematological disorders for example *BCR::ABL1* , JAK2, *PML::RARA* , TP53. 6. Discuss the sample requirements for the investigation of haematological malignancies and the principle of the SHIMDS pathway. 7. Discuss the treatment pathways and options employed for the following malignancies and how this impacts interpretive assessment: • AML • ALL • CLL • PV • CML • MDS • Myeloma 8. Discuss the role of genomic medicine and personalised treatment plans in the treatment and management of patients with haematological malignancies e.g. gene therapy, targeted therapy, NGS panels.
Indicative Content	Candidates require knowledge and understanding of: Haemopoietic cell lineage pathways affected in haematological disorders.

	Pathophysiology and development of haematological malignancies e.g. cell cycle, apoptosis, haematopoietic stem cells and differentiation, genetic mutations, drivers of disease development including environmental and inherited. Multi-disciplinary aspect of the diagnosis and management of haematological disorders. Full blood count results and associated morphology. Disease progression and transformations, e.g. Richter's Transformation, PV to AML/Myelofibrosis, MDS/MPD to AML. Bone marrow aspirate/trephine Immunophenotyping e.g. expected disease immunophenotyping profiles A range of genomic techniques utilised. WHO and ICC Classification systems utilised in haematological malignancies **Classification of Leukaemia** Acute Myeloid Leukaemia Acute lymphoblastic leukaemia/lymphoma Mature B cell and T cell malignancies **Myeloproliferative Neoplasms** Polycythaemia (Primary and Secondary) Essential Thrombocythaemia Chronic Myeloid Leukaemia Primary Myelofibrosis **Myeloproliferative/Myelodysplastic Malignancies** Chronic Myelomonocytic Leukaemia (CMML) Myelodysplastic Syndromes classifications including TP53 biallelic mutations, SF3B mutations and 5q- syndrome. **Pre- malignant clonal conditions:** Idiopathic cytopenia of unknown significance (ICUS) Clonal cytopenia of undetermined significance (CCUS) Clonal haematopoiesis of indeterminate (clinical) potential (CHIP) Clonal monocytosis of undetermined significance (CMUS) Clonal cytopenia and monocytosis of undetermined significance (CCMUS) Monoclonal gammopathy of unknown significance (MGUS) Monoclonal B-cell lymphocytosis (MBL)

Module Title	Investigation and Diagnosis of Haematological Malignancies
Module code	7349
Rationale/ Aims	This module will enable candidates to recognise full blood count and morphological features of haematological disorders. They will understand the clinical importance and urgency of recognising and escalating these disorders on patient outcomes. Candidates will gain understanding of the effect of treatment on full blood count indices and morphology which they may see on a regular basis in practice. They will understand the multi-disciplinary nature of laboratory investigations and the importance of multi-disciplinary team working in the diagnosis and management of haematological disorders. This module provides key skills required of specialist autonomous biomedical scientists in their regular practice either when in a team or working out of routine hours.
Learning outcomes	1.Demonstrate understanding of the changes in full blood count results associated with the diagnosis and on-going treatment of haematological disorders including: erythrocytosis/anaemia, leucocytosis/leucopoenia, thrombocytosis/thrombocytopenia. 2. Demonstrate the urgency and prioritisation of suspected haematological disorders, ensure the clinical impact and outcome is described. 3. Discuss the investigation, diagnosis, treatment and management of polycythaemia. 4. Discuss the principles and applications of bone marrow aspirate/trephine investigations in the investigation and treatment of myeloid and lymphoid haematological malignancies. 5. Describe the principle of immunophenotyping and discuss the different investigative pathways that may be followed in the investigation of chronic lymphocytosis and suspected acute leukaemia. 6.Describe the principles of cytogenetic analysis and discuss chromosomal abnormalities that could assist diagnosis and prognosis of haematological disorders, providing specific examples seen in haematological disorders. 7. Discuss the principles of molecular testing methodologies used in haematological disorders such as PCR, FISH. 8. Describe measurable residual disease (MRD) methodologies in the context of haematological disorders. 9. Demonstrate, with an example from practice, the investigation and management of a haematological disorder ensuring the multi-disciplinary laboratory investigations and interactions are described. Include details of treatment and clinical outcome for the example selected.

Indicative Content	Candidates require knowledge and understanding of: Laboratory and clinical differences in acute and chronic haematological disorders and the clinical impact for patients. Clinical priority for haematological disorders including full blood count and morphological aspects using local policies and protocols. Disease progression and transformations, e.g. Richter's Transformation, PV to AML/Myelofibrosis, MDS/MPD to AML. Full blood count results and associated morphology. Bone marrow aspirate/trephine Immunophenotyping identification and classification of abnormal cells (useful in leukaemia and lymphoma diagnosis). Role of immunophenotyping panels and pathways. Overview of Molecular Biology Techniques Multi-disciplinary aspect of the diagnosis and management of haematological disorders.

Module Title	Iron Deficiency Anaemia and Iron Overload
Module code	7357
Rationale/ Aims	This module enables candidates to gain knowledge and understanding of the effects of iron deficiency and overload on red cell indices and how these states can be investigated and determined through interpretation of laboratory results. Candidates will gain knowledge of the clinical conditions that cause these states and be able to determine the significance of results and if further action is required. The candidate will understand the methods used in the determination of iron deficiency/overload.
Learning outcomes	1. Discuss, with examples from practice, the effect of iron deficiency on red cell indices, including reticulocyte parameters and red cell morphology. 2. Discuss, with examples, the effect of iron overload on red cell indices. 3. Discuss clinical causes of iron deficiency, functional iron deficiency and iron overload, include the pathophysiology of the iron pathways. 4. Discuss how a variety of laboratory tests are involved in assessment of iron status, include serum ferritin, serum transferrin, serum iron, zinc protoporphyrin. 5. Discuss pre-analytical variables that could affect tests mentioned and actions taken to resolve the issue. 6. Describe the methodology and principles of serum ferritin analysis. 7. Demonstrate with examples from candidates practice identification of results that have clinical significance and require further action or investigations, and explain why the action or further investigations are required.
Indicative Content	Candidates require knowledge of reference ranges, samples suitable for analysis and the significance of abnormal results. Candidates require familiarity with: Normal/abnormal iron metabolism Clinical causes of iron deficiency /overload Iron deficiency and methods of measurement and iron stains

Module Title	B12 and Folate Deficiency and Anaemia of Chronic Disease
Module code	7358
Rationale/ Aims	This module enables candidates to gain knowledge and understanding of the effects of B12 and folate deficiency and anaemia of chronic disease on red cell indices and how these states can be investigated and determined through interpretation of laboratory results. Candidates will gain knowledge of the clinical conditions that cause these states and be able to determine the significance of results and if further action is required. The candidate will understand the methods used in the determination of megaloblastic anaemia and anaemia of chronic disease.
Learning outcomes	1. Discuss, with examples from practice, the effect of B12 and folate deficiency -and anaemia of chronic disease on full blood count indices, including reticulocyte parameters and cell morphology. 2. Discuss clinical causes of B12 and folate deficiency, include the pathophysiology of the B12 and folate pathways. 3. Describe the methodology and principles of B12 and folate testing, including total B12 and active B12. 4. Discuss the role of further testing used in the investigation of indeterminate or abnormal B12 and folate results, such as methylmalonic acid (MMA), homocysteine and transcobalamin. 5. Discuss the physiology and clinical manifestations of Pernicious Anaemia, and include the testing principles and methodologies utilised in investigation. 6. Discuss other clinical conditions that could affect tests mentioned and actions taken to resolve the issue. 7. Demonstrate with examples from candidates practice identification of results that have clinical significance and require further action or investigations and explain why the action or further investigations are required. 8. Discuss the physiology and clinical manifestations of anaemia of chronic disease. 9. Discuss the investigative testing pathway utilised in the differential diagnosis of anaemia of chronic disease.
Indicative Content	Candidate require knowledge and understanding of: Reference ranges, samples suitable for analysis and the significance of abnormal results. Normal/abnormal B12/Folate metabolism Clinical causes of B12/Folate deficiency Principles of testing methodology for: B12 (total and active) Folate Methylmalonic Acid (MMA)

	Transcobalamin. Intrinsic Factor Antibodies Gastric Parietal Cell Antibodies Macrocytic anaemia investigation pathways. Pernicious Anaemia Anaemia of Chronic Disease

Module Title	Haemoglobinopathy
Module code	7356
Rationale/ Aims	This module enables the candidate to demonstrate knowledge of haemoglobinopathy, application of science to patient results with correct interpretation and diagnosis. The candidate will be able to perform investigation, diagnosis and report concisely on haemoglobinopathy results to ensure effective treatment, patient care and management. The candidate will have the ability to evaluate and demonstrate the use of the various analytical techniques used in the screening and confirmation of haemoglobinopathy, make referrals where appropriate and understand results returned.
Learning outcomes	1. Discuss the use and operation of analytical platforms and manual techniques used in the diagnosis and investigation of haemoglobinopathies (including thalassaemia), with reference to screening and confirmation testing. 2. Demonstrate, using results from HPLC and/or capillary electrophoresis an example of a thalassemia and a haemoglobin variant in conjunction with FBC, haematinics, blood transfusion, geography, ethnicity and family history, and suggest diagnosis or further testing as appropriate to your practice. 3. Identify results requiring external referral and confirmation of diagnosis and discuss the importance of onward referral to reference laboratories as relevant to your practice. 4. Discuss the risks associated with the handling of samples from patients with suspected regular blood transfusion, BMT, conception via egg or sperm donation and gene therapy treatment. 5. Discuss the effect of drug treatment on the detection of elevated HbF, HbA2 and HbS and its clinical significance in the diagnosis and management of patient. 6. Discuss heterogeneity and classification of sickle cell disease and thalassaemia. 7. Discuss the interference of haemoglobin modifying drugs e.g. Voxelotor on HbS reporting and discuss its clinical significance and impact on patient management. 8. Discuss the diagnosis of unstable and high affinity haemoglobins and discuss the prognosis and treatment of these conditions as appropriate to your practice. 9. Discuss the use of blood transfusion and haemoglobin modifying drugs together with hydroxyurea and iron chelation therapy in the management of haemoglobinopathies. 10. Discuss the use of mass spectrophotometry and DNA chain analysis methods in the diagnosis of haemoglobinopathies.

Indicative Content	Candidate should have knowledge and understanding of: Structure of haemoglobin and the erythropoietic pathway. Pathophysiology of haemoglobinopathies and thalassemia. The geographical prevalence of haemoglobinopathy and its impact on the patient and the testing process. The quality processes involved in haemoglobinopathy testing. The referral processes within their laboratory and the significance of results returned to the laboratory.

Module Title	Inherited and Acquired Haemolytic Anaemia
Module code	7359
Rationale/ Aims	The candidate will be able to demonstrate broad scientific underpinning knowledge of haemolytic anaemias, application of science to real patient results with correct interpretation and diagnosis. The candidate will gain an understanding of investigations, diagnosis and reporting of haemolytic anaemias to ensure effective treatment, patient care and management. The candidate will be able to evaluate and demonstrate the use of the various analytical techniques used in the investigation and confirmation of haemolytic anaemias, make referrals where appropriate and understand results returned.
Learning outcomes	1. Discuss the use and operation of manual and automated techniques used in the investigation and diagnosis of haemolytic anaemia with reference to screening and molecular testing. 2. Discuss the classification of haemolytic anaemias. 3. Discuss the internal and external mechanisms of intravascular and extravascular haemolysis including the mechanisms of reduced red cell survival with reference to enzymopathies. 4. Demonstrate and discuss results from practice in conjunction with clinical presentation, full blood count, reticulocytes, blood film, biochemical parameters, haematinics, blood transfusion test results, ethnicity and family history and suggest diagnosis or further testing. 5. Discuss the limitations of local laboratory practice in the context of national referral centres in relation to definitive diagnosis. 6. Discuss the effect of drug treatment on the detection of haemolytic anaemia investigation and its clinical significance in the diagnosis and management. 7. Explain the use of anti-haemolytic drugs in the treatment of haemolytic anaemia and discuss their significance in patient management. 8. Discuss the potential uses of mass spectrophotometry and flow cytometry methods in the investigation and diagnosis of haemolytic anaemias. 9. Discuss the clinical relevance between enzymopathies, geographical locations and parasitic infections with an example from your practice.
Indicative content	Candidate should have knowledge of the geographical prevalence of haemolytic anaemias and its impact on the patient and the testing process. Evaluate the risks associated with the handling of samples from patients with suspected blood transfusion.

	The candidate should have knowledge of the referral processes within their laboratory and understand the significance of results returned to the laboratory.

Module Title	Good Manufacturing Practice (GMP) awareness in transfusion
Module code	Allocated on Brightspace
Rationale/ Aims	The candidate will recognise and apply the Good Manufacturing Practice guidelines as part of their fitness to practice and as a requirement of the Blood Safety and Quality Regulations, as enforced by Medicines and Healthcare products Regulatory Agency (MHRA).
Learning outcomes	On completion of the module, the candidate is expected to be able to: 1. Explain the history of the Blood Safety and Quality Regulations and how they are relevant to Blood Transfusion laboratory practices. 2. Describe the principles and practice of Good Manufacturing Practice (GMP) as detailed in the indicative content shown below. 3. Demonstrate, with examples, the principles and practice of Good Documentation Practice (GDP). 4. Explain the principles of Good Distribution Practice, providing examples of how the cold chain can be maintained and the actions to be taken when the cold chain is breached. 5. Discuss the following requirements and reasons for; • Qualification and validation of equipment • Processes for change control • Risk assessment 6. Demonstrate with examples how the laboratory maintains the ongoing validated state of equipment, consumables and reagents. 7. Discuss the relevance of each of the key reference material shown below to blood transfusion laboratory practice; • MHRA orange guide • European Directorate for the Quality of Medicines and Healthcare (EDQM) • Good Practice Guidelines • British Society of Haematology (BSH) guidelines
Indicative Content	Candidate should understand the principles and practice of GMP relating to: Quality Management Personnel and Organisation Premises and Equipment Documentation Production Quality Control Contract Manufacture and Analysis Complaints and Product Recall Self Inspection Knowledge for the requirements of qualification/validation of equipment/processes and for change control including: Validation of blood component storage environment Validation of the ‘cold chain’ Validation of testing equipment Validation of IT systems Validation and on-going stability of reagents and consumables

Module Title	Donor selection and testing
Module code	Allocated on Brightspace
Rationale/ Aims	The candidate will be able to understand and apply, where relevant, the Donor Selection Guidelines and testing rationale for blood donations, as described in the Guidelines for Blood Transfusion Services in the United Kingdom, and in compliance with the Blood Safety and Quality Regulations (BSQR) 2005. The candidate will be able to describe the use of additional tests for specific patient cohorts and understand both the availability of and issues surrounding screening tests for current and future infectious agents. This module also aims to enhance the candidate's knowledge of 'look back' procedures following a suspected transfusion transmitted infection.
Learning outcomes	1. Describe the criteria for blood donor selection, and when donors may be excluded 2. Describe the process of whole blood collection and blood component collection, for example by apheresis 3. Explain the rationale for both mandatory and additional screening tests 4. Describe the aetiology and pathophysiology of transfusion transmitted infections including viral, parasitic, bacterial or prion. 5. Identify the tests required for both new and repeat donors giving examples of test methodologies, including: • Immunohaematology tests eg: ABO/D typing, phenotyping • Microbiology screening • Virology tests 6. Describe the use of additional tests for transfusion in specific patient cohorts e.g., paediatric patients, sickle cell patients 7. Describe the actions required following the discovery of an anomalous test result eg: weak/D variant 8. Explain the principle and practice of a 'look back' when a transfusion transmitted infection is suspected 9. Discuss the issues surrounding current screening tests, including the risk of emerging infectious diseases
	Candidates should understand and apply the following where relevant: Understand Donor Selection Guidelines, including the Donor Health Check, it's purpose and content Knowledge of collection practices of whole blood and component donations. Requirements for mandatory and additional screening tests. Aetiology and pathophysiology of all transfusion transmitted infections. Tests and testing methodologies on new and repeat donors. Product recall when a transfusion transmitted infection is suspected.

Module Title	ABO and D typing
Module code	7066
Rationale/ Aims	The candidate will gain the underpinning knowledge and skills required for blood transfusion staff involved in the transfusion process within the laboratory. The candidate will be able to perform blood grouping tests and interpret results for the safe transfusion of compatible blood components.
Learning outcomes	On completion of the module, the candidate is expected to be able to: 1. Explain the basis of the ABO and D blood group systems – genes, antigens and antibodies and their clinical significance in transfusion medicine. 2. Describe factors affecting antigen-antibody reactions in vitro. 3. Discuss national and local sample acceptance criteria, actions to be taken when the criteria has not been met and the associated risks. 4. Describe how to interpret reaction strengths in ABO/D typing (both in forward and reverse grouping). 5. Discuss the principles of serological tests used in manual and automated blood grouping, their appropriate use, and potential sources of error. 6. Discuss the application of quality controls required for blood grouping and provide an example of when a quality control has failed and what further actions were required. 7. Discuss the increased security afforded by the electronic transfer of ABO/D results from automation to the laboratory information management system (LIMS). 8. Demonstrate, using examples from your practice how to interpret patient blood groups (both full group and confirmatory) using manual and automated methods. 9. Discuss the minimum specifications for blood grouping in emergency situations, prior to the issue of group compatible blood and explain the rationale behind the two-sample rule according to BSH guidance.
Indicative Content	Candidates should understand the following as relating to ABO and D typing: Major blood group systems Antigen and antibody reactions Principles of manual and automated blood grouping Sample acceptance criteria Internal quality control and external quality assurance procedures Provision of blood components in emergency situations

Module Title	Antibody Screening and Identification
Module code	7063
Rationale/ Aims	The candidate will be able to demonstrate a working understanding of the mechanisms of antigen: antibody reactions and the significance of red cell antibodies. They will be able to perform antibody screening and subsequent antibody identification by employing various techniques and reagents. They will acquire the skills to systematically exclude and confirm the presence of an antibody(s). The candidate will be able to demonstrate their knowledge of how to request/perform further testing and investigations when an antibody cannot be identified locally or when dealing with multiple or complex antibodies.
Learning outcomes	1. Describe the major blood group systems and the characteristics of red cell antigens within each system. 2. Describe the mechanisms of antigen: antibody reactions and their role in *in vivo* red cell destruction. 3. Explain the clinical significance of red cell antibodies in pre-transfusion testing and antenatal scenarios. 4. Describe the principles of the indirect antiglobulin test (IAT and the importance of grading reactions. 5. Discuss the specifications of reagents for patient antibody screening and identification, the rationale behind their selection depending on the testing system and methods used. 6. Demonstrate with examples how to positively identify and systematically exclude antibody specificities using British Society for Haematology (BSH) guidance on inclusion/exclusion. Include both IAT and enzyme techniques. 7. Explain the relevance of dosage reactivity of red blood cell antibodies in relation to homozygous/heterozygous antigen expression. 8. Explain the relevance of red cell phenotyping in antibody identification. 9. Demonstrate with examples how to interpret results, and recognise and describe when samples require further investigations
Indicative Content	Candidates will have knowledge of the following : Techniques for performing an antibody screen and identification. Interpretation of results and next steps. Identify samples requiring additional testing and possible referral and/ or clinical advice. Employ a range of further tests to elucidate alloantibody mixtures. Identify whether there are any underlying clinically significant alloantibodies in cases with autoantibodies.

Module Title	Resolving Samples Requiring Further Antibody Investigation
Module code	7062
Rationale / Aims	The candidate will recognise local limitations for antibody identification and understand the process for referral to a specialised laboratory. The candidate will understand the principles and practice of various techniques used in further/complex antibody investigations together with the interpretation and management of the results reported. Candidates will gain knowledge in the provision of red cells for patients with complex or unresolved antibodies.
Learning outcomes	1. Discuss your local procedure for referral to a specialised laboratory for follow-up testing when scope of practice is reached. 2. Discuss the inclusion of an auto control to aid in the investigation of an antibody. 3. Describe the application of the underlying principles and practice of follow up / complex antibody identification testing techniques including the following; • Direct antiglobulin test (DAT) (including poly and monospecific antiglobulin reagents) • Allo / auto adsorption processes • Elution techniques • Modified versions of routine techniques (eg: IAT, enzyme etc) • Neutralisation (e.g., Chido/Rogers) • Inhibition (e.g., Knopps) • Rare cell panel (including the storage, validation and testing of reagents) • Donath Landsteiner Test • Dithiothreitol treatment (DTT) (eg: monoclonal antibody therapy) • Red cell genotyping 4. Demonstrate with an example from your practice your involvement with one of the techniques listed above and explain how this impacted patient treatment 5. Discuss the requirements for providing blood for a patient with an unresolved pan-reactive antibody. 6. Describe the requirements for regulation, assessment and audit of follow-up specialised tests to ensure compliance with MHRA and UKAS. 7. Discuss the challenges for maintaining staff competence when performing non-routine complex identifications. 8. Discuss, using a report and results provided following a referral to a specialised laboratory, how you would ensure the patient receives appropriate blood in the future.
Indicative Content	Candidates should have knowledge of the following testing techniques and surrounding processes: DAT (including monospecific) Allo / auto adsorption processes Elution techniques Modified versions of routine techniques (IAT, enzyme etc) Neutralisation (e.g., Ch/Rg) Inhibition (e.g., KNIR)

	Rare cells (High and low incidence / storage / validation / testing) Other tests (e.g., Donath Landsteiner Test Genotyping QC EQA Audit Guidelines External Regulation Training / competency Reagent use / storage Referral of samples

Module Title	Patient Blood Management (PBM) and appropriate use of blood
Module Core	Allocated on Brightspace
Rationale/ Aims	The candidate will be able to demonstrate a working understanding of the principles of PBM including its role in consent, appropriate use, and blood conservation strategies. The candidate will be able to discuss how a multidisciplinary approach involving education and patient involvement supports best practice and improves patient outcomes and experiences.
Learning outcomes	On completion of the module, the candidate is expected to be able to: 1. Describe the 3 pillars of PBM and discuss the benefits to patient safety and outcome. 2. Discuss the diagnosis and treatment of anaemia in the following clinical situations. • Obstetric patients • Perioperative • Chronic illness 3. Discuss the use alternatives to transfusion, providing examples of when and how they would be appropriate. 4. Discuss the importance of consent in patients requiring a transfusion by considering the following: • Shared decision making • Legal requirements, recommendations, and guidance • Ethics 5. Define and discuss appropriate use of components e.g., include the use of transfusion triggers and/or indication codes. 6. Discuss the requirement to authorise (prescribe) a transfusion. 7. Demonstrate or provide an example of when patient blood management may be used in laboratory practice.
Indicative Content	Candidate will need to understand the following: Patient Blood Management as a concept Core PBM initiatives and clinical approaches Principles of shared decision making and consent The relationship between transfusion, PBM, and patient safety The benefits of PBM to patients care and the healthcare system

Module Title	Red cell phenotyping
Module code	7061
Rationale/ Aims	The candidate will gain the underpinning knowledge of the principles, practice and application of red cell phenotyping. The candidate will be able to perform red cell phenotyping by various techniques and interpret the results. The candidate will gain knowledge in the frequencies of red cell antigens and how this can influence the availability of donated blood and subsequent patient care.
Learning outcomes	1. Describe the underlying principles of various phenotyping techniques that can be employed. 2. Explain the following types of phenotyping, providing examples: • Single • Extended (Rh/K) • Full 3. Describe situations where Rh/K and extended phenotyping and/or genotyping may be employed, for the following; • Donor/donation testing • Pre-transfusion compatibility testing • Antenatal testing • Haemoglobinopathy patients • Other patients requiring long-term transfusion support 4. Explain the reasons why patients' red cells may produce a 'mixed field' phenotyping result. 5. Demonstrate with an example a situation where further referral to a specialist laboratory may be required when considering phenotyping / genotyping. 6. Discuss, following a referral, how would you capture the results to ensure the patient receives phenotyped red cells in the future. 7. Explain the term 'antithetical' in relation to phenotyping and subsequent transfusion support. 8. Discuss the frequencies of red cell antigens and how this can influence the availability of donated blood.
Indicative Content	Candidates should have knowledge of the following and how it applies to their practice: Automated v manual phenotyping testing Occasions where phenotyping is inappropriate Donor v patient phenotyping IgM v IgG antisera used in phenotyping Gel card v tube phenotyping Reporting of incomplete / unresolved testing Genotyping technology used in your laboratory or a referral laboratory Selection of 'clinically significant' phenotyping testing QC EQA Audit Guidelines External Regulation Training / competency Reagent use / storage

Module Title	Compatibility Testing
Module code	7070
Rationale/ Aims	The candidate will be able to perform essential pre-transfusion checks, compatibility testing and interpretation of the results to provide safe, compatible/suitable blood components to patients. The candidate will also gain knowledge in the principles, practice and criteria for electronic and remote issue and the role IT has in the safe delivery of blood components. The candidate will understand the importance of concessionary release when routine compatibility testing has not been completed and a delay in blood provision must be avoided.
Learning outcomes	On completion of the module, the candidate is expected to be able to: 1. Explain the importance of historical records in pre-transfusion procedures. 2. Explain the reasons behind suitable sample timings including recent transfusions and obstetric history. 3. Discuss the role that IT and automation has in providing safe, secure and accurate results in all pre-transfusion and compatibility testing. 4. Describe the principles and practice of serological compatibility testing including the investigation of an incompatible unit. 5. Describe the principles, practice and criteria for 'electronic' and 'remote' issue of blood components. 6. Discuss the limitations and effects of sample storage and why samples should be stored appropriately. 7. Describe scenarios where 'group compatible' red blood cells would be issued via a concessionary release procedure without the completion of routine compatibility testing.
Indicative Content	Candidates should understand how the following are applied in compatibility testing: Sample integrity and demographic checks. Patient history. Determining suitability for electronic issue. Additional testing and investigation when required. Concessionary release procedures and national guidelines.

Module Title	Selection of blood components and products
Module code	7071
Rationale/ Aims	The candidate will understand the difference between a blood component and product and how they are used therapeutically. The candidate will be able to demonstrate the selection criteria for blood components based on the urgency and type of request and patient cohort, including those with special requirements. The candidate will have the ability to evaluate and apply local trust/service policies for the selection and issue of blood components and demonstrate knowledge of other disciplines test results in a clinical context (e.g. haematology and coagulation).
Learning outcomes	1. Describe how the tests and result interpretation from other areas/disciplines of pathology (e.g., Haematology and Coagulation), in a clinical context, can determine the transfusion requirements for a patient using examples from your practice. 2. Explain the importance of communication with all staff groups involved in effective provision of transfusion support in routine and emergency situations. 3. Describe how the appropriate selection of red cells is important regarding the urgency of request and unit expiry. 4. Describe the criteria and provide examples for the selection of blood components for patients with clinical conditions, giving rise to special requirements. 5. Discuss the consequences of not providing specific requirements to a patient. How would this be captured and reported? 6. Describe how national guidelines relating to the provision of specialised components have been implemented within your local service/trust. 7. Discuss the selection of blood components for patients with regards to major haemorrhage. 8. Define the term 'blood product' and explain how it is different from a blood component. 9. Describe with examples the therapeutic uses of blood products.
Indicative Content	Candidates should understand and be able to apply the following where appropriate: Tests and result interpretation in clinical context which influence the transfusion decisions for a patient e.g. Full blood count Prothrombin time Activated Partial Thromboplastin Time (APTT) Fibrinogen Platelet function test Selection and provision of blood components in an emergency Red cell specification for emergency use Fresh Frozen Plasma (FFP) specification for emergency use Platelet specification for emergency use

	Transfusion support during a major haemorrhage Pretransfusion testing Blood component provision Effective communication Selection criteria for red cells and components in different patient groups such as Haematopoeitic stem cell transplantation (HSCT) Intrauterine transfusion Exchange transfusion Neonates Autoimmune Haemolytic Anaemia Solid organ transplants Haematology Patients Red cell antibodies Rationale for the provision of specialist components in different patient groups Cytomegalovirus (CMV) negative Irradiated components Phenotyped red cells HbS negative red cells K negative red cells Alternatives to allogeneic transfusion such as: Cell salvage (intraoperative and post operative) Erythropoiesis stimulating agents such as Erythropoietin, Iron, Tranexamic acid

Module Title	Release of blood components and products
Module code	7072
Rationale/ Aims	The candidate will be able to demonstrate the safe issue and release of blood components and products with regards to labelling and integrity checks. They will be able to discuss the rationale and governance behind traceability, including procedures for issuing components during laboratory information management system (LIMS) 'downtime'. Candidates will be able to describe the recall process and prompt actions required to avoid the transfusion of an unsuitable unit.
Learning outcomes	On completion of the module, the candidate is expected to be able to: 1. Describe the procedures for safe issue and secure labelling of blood components and products for patient use. 2. Discuss the minimum labelling requirements for compatibility labels, attached to an issued component. 3. Explain the rationale for visually inspecting blood components prior to release and describe any actions that you would take upon a compromised unit. 4. Describe the importance of 'line clearance' in accordance with Good Manufacturing Practice. 5. Define the term "traceability" with regards to regulatory bodies who oversee blood transfusion and describe your local procedure for achieving 100% traceability. 6. Discuss how a laboratory safely issues blood components during laboratory information management system (LIMS) 'downtime' and subsequently fulfils the traceability requirements. 7. Discuss the rationale for changing the expiry time on post thawed plasma components. 8. Discuss the reasons, both internal and external, why a component might be recalled, and the prompt actions required to avoid transfusion of an unsuitable unit. 9. Demonstrate, using examples from your practice, how to manage a component recall appropriately.
Indicative Content	Candidates should understand and be able to apply the following where appropriate: Storage requirements, expiry times and transport criteria for blood and blood components, prior to and after issue. Administration of blood and blood components. Procedures for traceability, restocking and disposal of blood and blood components in order to ensure full audit trails. Internal and external recall procedures of blood components. Local policies and national guidance regarding issuing and management of blood and blood components.

Module Title	Blood stock management and emergency planning
Module code	6875
Rationale/ Aims	The candidate will be able to demonstrate good inventory management practice, ensuring efficient rotation and selection of components to reduce wastage and conserve blood. The candidate will be able to identify the role of the Blood Stock Management Scheme or other inventory data management systems and evaluate the data analysis provided. The candidate will be able to demonstrate an understanding of the importance of national policies available for blood shortages and emergency planning as well as be able to evaluate their local emergency blood management plans.
Learning outcomes	1. Discuss the risks associated with inappropriate care and handling of blood components and products, with respect to their storage, rotation, and selection. 2. Describe how to achieve good stock management to reduce wastage, using examples from practice where relevant. 3. Describe how and why you would perform a stock level review and discuss how overstocking contributes toward wastage. 4. Describe the role of the Blood Stocks Management Scheme and discuss how data can drive improvement. 5. Demonstrate, using an example from your practice, the submission of data to the Blood Stocks Management Scheme (or local reporting system) to help identify trends and improve wastage. 6. Discuss the importance of highlighting close to expiring stock and the methods available to achieve this. 7. Discuss the importance of emergency blood management plans for all components. 8. Discuss the actions blood transfusion laboratories can take to contribute towards blood conservation during normal periods and during a potential shortage situation.Discuss your local policies and national guidance for managing stocks during a shortage.
Indicative Content	Candidates should have an understanding of the following: Blood stock management scheme and its function The impact of laboratory practice on national stock The effectiveness of stock rotation and appropriate selection to support patient care and reduce wastage. Emergency Planning and conservation of the blood supply chain. Location of national guidance and resources available for emergency blood management planning during a shortage or threat to the blood supply.

Module Title	Antenatal Screening and Haemolytic Disease of the Fetus and Newborn
Module code	7137
Rationale/ Aims	The candidate will be able to demonstrate an understanding of the transfusion care pathway for antenatal patients with regards to blood grouping, antibody screening, antibody identification, and quantification/titration. The candidate will gain knowledge of the current guidance for monitoring the patient as well as the techniques available to reduce the risk of haemolytic disease of the fetus and newborn.
Learning outcomes	1. Describe the transfusion care pathway for antenatal patients with regards to sampling requirements, pre and postnatal. 2. Explain the clinical significance of red cell antibodies and discuss how the patient and fetus are monitored and follow up samples are managed according to national guidance. 3. Describe the importance of differentiating between prophylactic and immune anti-D. 4. Describe the process for referral or analysis of samples requiring titration or quantification, interpret the results and communicate them effectively to the wider team. 5. Discuss the aetiology of haemolytic disease of the fetus and newborn (HDFN) and describe the principles and benefits of the following techniques available to reduce the risk of HDFN • Cell free fetal DNA screening • Paternal testing • Fetal genotyping • Routine antenatal anti-D prophylaxis (RAADP) 6. Explain the principles of acid-elution/staining and flow cytometric methods for measuring fetal maternal haemorrhage (FMH) and interpret the results. 7. Discuss how to determine the correct dose of anti-D immunoglobulin following a potentially sensitizing event and describe how this advice would be delivered according to your laboratory's procedure. 8. Describe routine post-natal testing required for the mother and infant and discuss how a potential case of HDFN would be recognised. 9. Discuss the criteria for the selection of red cells for intrauterine transfusion (IUT), exchange and top-up transfusions for the fetus/infant in cases of HDFN due to red cell antibodies. 10. Discuss the criteria for the selection of red cells for the mother during and after pregnancy.
Indicative Content	Candidates require knowledge and understanding of: Routine antenatal testing including booking bloods, follow up and postnatal samples. Recognition of red cells antibodies in the context of haemolytic disease of the fetus and newborn (HDFN) and appropriate follow up tests. Differentiation between immune and prophylactic anti-D The aetiology of haemolytic disease of the fetus and newborn (HDFN). Perform/discuss how to investigate a case of suspected HDFN Applying the criteria for the selection of blood for intrauterine transfusion (IUT), exchange and top-up transfusions

	Compatibility testing for mother and infant when required to provide appropriate, safe blood components Eluate on a cord blood sample and interpreting the results

Module Title	Investigation of serious adverse reactions and events
Module code	7073
Rationale/ Aims	The candidate will be able to demonstrate an understanding of adverse reactions and events, how they happen, how to recognise them and how to complete appropriate laboratory investigations. The candidate will be able to identify the role of haemovigilance and discuss the importance of reporting such reactions/events both locally and externally.
Learning outcomes	On completion of the module, the candidate is expected to be able to: 1. Describe the classification and characteristics of serious adverse reactions and serious adverse events in transfusion. 2. Describe how you would respond to a suspected adverse reaction/event in accordance with your local procedures. 3. Discuss the rationale for performing repeat tests on pre- and post-transfusion samples in a case of a suspected haemolytic transfusion reaction. 4. Explain the laboratory investigations required for a suspected transfusion reaction, including sample types and details of any further testing to be performed. 5. Discuss the principles of root cause analysis and how they are applied when completing an incident report. 6. Explain the importance of haemovigilance and assess the need to report to Serious Hazards of Transfusion (SHOT) and / or Serious Adverse Blood Reactions and Events (SABRE). 7. Explain how the recommendations from the current British Society for Haematology (BSH) guidance on the investigation of acute transfusion reactions can be included in your laboratory's standard operating procedure.
Indicative Content	Candidates will understand the following and their importance in laboratory practice: Classification and characteristics of adverse reactions and events, to include both non-infectious and infectious hazards. Laboratory transfusion reaction investigations. Haemovigilance. Internal and external recall procedures. Local quality procedures and root cause. SHOT and SABRE reporting schemes. BSH guidance on the investigation of acute transfusion reactions

Module Title	Investigation of ABO and D anomalies
Module code	7069
Rationale/ Aims	The candidate will be able to demonstrate how they interpret blood groups and recognise anomalous results. They will be able to describe both the laboratory and clinical factors that may lead to anomalous results and why it is significant to the patient's treatment. Candidates will be able to discuss the importance of grading reactions as well as the management of a suspected ABO subgroup or weak/variant D. They will gain an understanding of the further actions required to obtain a result and how to safely select blood components following the identification of an anomalous result.
Learning outcomes	1. Demonstrate with examples laboratory factors that may lead to anomalous results of ABO and D typing including; • Sample integrity • Potential 'wrong blood in tube' • Reagents • Equipment • Manual techniques 2. Discuss the investigation of blood group anomalies in specific patient groups including: • Paediatrics/neonates • Elderly patients • Immunosuppressed patients • Post haemopoietic stem cell transplantation • Patients on monoclonal antibody therapies • Post transfusion 3. Explain the scientific basis and clinical significance of ABO subgroups and weak/D variants in both donors and patients. 4. Discuss the importance of grading reactions with regards to a weak/variant D type. 5. Discuss the rationale for further testing or referral before a blood group can be assigned. 6. Discuss how a blood group would be assigned to a patient following the identification of a blood grouping anomaly. 7. Describe how the safe and appropriate selection of components can be carried out following the identification of an anomalous result.
Indicative Content	Candidates should understand the following and how they related to the investigation of ABO and D anomalies: Major blood group systems Antigen and antibody reactions Principles of manual and automated blood grouping Sample acceptance criteria Internal quality control and external quality assurance procedures Provision of blood components in emergency situations

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