STANDARDS FOR AUTOLOGOUS HAEMATOPOIETIC STEM CELL TRANSPLANTATION

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Health Policies and Standards Department

Health Regulation Sector (2021)

INTRODUCTION

Health Regulation Sector (HRS) plays an essential role in regulating the health sector and is mandated by the Dubai Health Authority Law No. (6) of 2018 to undertake several functions:

- Developing regulation and standards to improve patient safety, quality and also support the growth and development of the Dubai health sector;
- Licensure and inspection of health facilities and healthcare professionals;
- Managing patient complaints and upholding patient rights;
- Regulating the use of narcotics, controlled and semi-controlled medications;
- Strengthening health tourism and assuring ongoing growth; and
- Assuring the management of e-health and innovation.

The Standard for Autologous Hematopoietic Stem Cell Transplantation Stem Cells aims to fulfil several overarching Strategic Objectives and Programs within the Dubai Health Strategy (2016–2021):

- **Objective 1:** Position Dubai as a central medical tourism destination through a comprehensive, integrated, value-based and high-quality service delivery system;
- **Objective 2**: Direct resources to assure a happy, healthy and safe environment for Dubai population; and
- **Objective 4:** Foster innovation throughout the continuum of patient care.

Strategic Program 1: Care Model Innovation, Care Model Innovation Program. The ambition is to promote innovation, efficiency and ensure residents and visitors in Dubai have access to high-quality services; and

- **Strategic Program 10:** Excellence and Quality. The ambition is to promote excellence in healthcare service delivery and enhance patient experience and satisfaction.

ACKNOWLEDGMENT

The Health Policy and Standards Department (HPSD) would like to acknowledge experts in the field for their continued dedication and support to develop the standard and improve patient safety and quality of care in the Emirate of Dubai.

Health Regulation Sector

Dubai Health Authority

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Hematopoietic Stem Cell Transplant (HSCT) or Bone Marrow Transplant (BMT) is a life-saving intervention that has been practiced for over five decades and was historically used to treat bone malignancies. Due to technological advances in medicine, blood cancer treatment has become possible across many blood cancers (hematologic malignancies) and age groups. HSCT has also expanded into the treatment of solid tumour malignancy, hereditary disorders and immune deficiency syndromes. Future indications for HSCT therapy include Stoke, CHD, Diabetes, Neurological and auto-immune diseases.

The purpose of the Standards for Autologous Haematopoietic Stem Cell Transplantation is to maximise quality and patient safety within DHA licensed health facilities. The standard is confined to autologous (same person) treatment with predetermined inclusion and exclusion criteria. The first part of the standard set out the health facility and professional requirements to operationalise an effective AHSCT transplantation unit. The transplant unit shall be led by a Clinical Program Director who has the necessary experience and competencies to supervise the day-to-day operations of the service. The second part of the standard sets out the indications, requirements for the service, stem cell collection, processing, storage and transportation and storage. The final part of the standards set out the service and quality, safety requirements, and the expectations for stem cell preparation, infusion, and post-follow-up care and the requirements for documentation to demonstrate improvement.

DEFINITIONS

Adverse event: Any unintended or unfavourable symptom or condition that is temporary and associated with an intervention that may have a causal relationship with the intervention, medical treatment, or procedure.

Adverse reaction: An unintended response directly or indirectly caused by the administration of cellular therapy.

Apheresis: A medical technology in which blood is separated into parts. The required component is removed, and the remaining components are returned to the donor.

Allogeneic: The biological relationship between genetically distinct individuals of the same species.

Autologous: Derived from an individual and intended for the same individual.

Autologous Hematopoietic Stem Cell Transplant: A clinical procedure where one's healthy stem cells are collected from mobilised peripheral blood, cord blood, or bone marrow then processed and stored. The patient then undergoes chemotherapy and or radiation followed by infusion of the stem cells to treat an array of blood cancers or diseases that affect the bone marrow.

Clinical Program: An integrated medical team housed in a defined location. The program includes a Clinical Program Director who can demonstrate sufficient staff training, adoption of protocols, written Standard Operating Procedures, implementation of quality management systems, clinical outcome analysis, and regular interaction among clinical sites.

Engraftment: Is the process when the transplanted stem cells begin to grow to produce new healthy cells (The reconstitution of recipient haematopoiesis with blood cells and platelets from a donor). It is typical for engraftment to occur between 10-15 days, but there are instances where this may take longer. Engraftment is identified through blood analysis of the white blood cells, neutrophil count, haemoglobin, and platelets.

Graft Versus Host Disease: The condition occurs when donated bone marrow stem cells (the graft) identify the host with healthy tissues as alien and leads to an immune response. Graft-versus-host disease can also occur after an organ transplant or within the first few months of a transplant (acute) or, much later (chronic), damaging human tissue and organs. The signs and symptoms may be severe and life-threatening.

Hematopoietic progenitor cells (HPC): A cellular therapy product that contains self-renewing and/or multipotent stem cells. The cells can mature into hematopoietic lineages, lineage-restricted pluripotent progenitor cells, and committed progenitor cells, regardless of tissue source (bone marrow, umbilical cord blood, peripheral blood, or another tissue source).

ISBT 128: A global standard for identifying, labelling, and transferring human blood, cell, tissue, and organ products.

Preparative (conditioning) regimen: A treatment used to prepare a patient for stem cell transplantation (e.g., chemotherapy, monoclonal antibody therapy, radiation therapy).

Peripheral Blood Stem Transplant: Also known as peripheral stem cell support, in which a procedure is undertaken to replace blood stem cells. Medication is used to move cells out of the

bone marrow, followed by centrifugation and collection of cells for use or storage. It is the most common of two main types of hematopoietic stem cell transplantation.

Standard Operating Procedure (SOP): A written document that describes the process or steps taken to accomplish a specific task.

Stem cell mobilization: A process whereby certain drugs are used to initiate the movement of bone marrow stem cells into the blood.

Transplantation: The administration of cells to provide transient or permanent engraftment in support of therapy of disease.

ABBREVIATIONS

AHSCT: Autologous Hematopoietic Stem Cell Transplant

ASTCT: American Society for Transplantation and Cellular Therapy

BMT: Bone Marrow Transplantation

CIBMTR: The Center for International Blood and Marrow Transplant Research

CMV: Cytomegalovirus

EBMT: European Society for Blood and Marrow Transplantation

FACT JACIE: The Foundation for the Accreditation of Cellular Therapy and The Joint Accreditation Committee of ISCT-EBMT

GCSF: Granulocyte Colony Stimulating Factor

GvHD: Graft Versus Host Disease

HPC: Hematopoietic Progenitor Cells

HSV-1 or 2: Herpes Simplex 1 or 2

ICU: Intensive Care Unit

ISCT: International Society for Cellular and Gene Therapy

PBSCT: Peripheral Blood Stem Transplant

PCP: Pneumocystis Carinii Pneumonia

PPE: Personal Protective Equipment

PTLD: Post-Transplant Lymphoproliferative Disease

QMS: Quality Management System.

BACKGROUND

Hematopoietic Stem Cell Transplant is a therapeutic intervention used to treat several malignant and non-malignant disorders. There are two categories of stem cells, allogeneic stem cells and autologous stem cells. Allogenic stem cells involve cells from a matching donor, which typically involves a member of the family. Autologous stem cells are extracted from the individual, purified then administered back to the same individual. Autologous stem cell transplantation accounts for the majority of global stem cell transplantation. Autologous Hematopoietic Stem Cell Transplantation (AHSCT)/Bone Marrow Transplantation (BMT) offers life-saving treatment for many haematological malignancies. Hematopoietic stem cells are capable of destroying tumour cells and forming new cells. Hematopoietic stem cell extraction is achieved from two sources: the bone marrow to produce functional cells (after engraftment) to replace diseased cells, or by priming the blood with granulocyte colony-stimulating factor generate new stem cells known as Peripheral Blood Stem Transplant (PBSCT). Once priming is complete, the extraction of stem cells is performed, followed by chemotherapy and or radiotherapy to destroy blood-forming cells. New cells are infused back into the body intravenously. There are several advantages for Peripheral Blood Stem Cell Transplant (PBSCTs), including rapid engraftment rate, lower infection rate and lower haemorrhagic morbidity and mortality. Due to the possible indications for stem cells, practice is based on the published case series and clinical consensus.

1. PURPOSE

1.1. To maximise the quality and patient safety for Autologous Haematopoietic Stem Cell Transplantation services in DHA licensed health facilities.

2. SCOPE

2.1. Autologous Haematopoietic Stem Cell Transplantation (AHSCT) services.

2.2. Autologous Haematopoietic Stem Cell Transplantation (AHSCT) Cell Banking Facilities.

3. APPLICABILITY

3.1. DHA licensed health facilities and professionals providing Autologous Haematopoietic Stem Cell Transplantation (AHSCT) services.

4. STANDARD ONE: HEALTH FACILITY REQUIREMENTS

4.1. All hospitals opting to provide AHSCT services shall apply to the Health Regulation Sector (HRS) https://www.dha.gov.ae for inspection and licensure.

4.1.1. AHSCT services shall only be performed in a hospital setting that fulfils the requirements set out in the Standard.

a. Institutions providing AHSCT treatment should be affiliated with a clinical trial approved by the Dubai Health Authority Ethics Committee 12-18 months from service commencement.

4.1.2. Comply with DHA Facility Design and administrative provisions for inspection and licensure of clinical labs.

a. Ensure designated inpatient unit with adequate space that minimises airborne microbial contamination (isolated-positive pressure room).

i. A high-efficiency HEPA filter is required for procedures involving immune-compromised patients.

b. There is a written plan for monitoring electrical and mechanical equipment for safety, with monthly visual inspections for apparent defects.

c. The lighting and utilities are adequate, including temperature controls, water taps, medical gases, sinks and drains, lighting, electrical outlets, and communications.

4.1.3. The unit should only use the equipment required to provide the AHSCT services following the manufacturer's specifications.

4.1.4. The health facility should ensure easy access to the health facility and treatment areas for all patient groups.

4.1.5. The health facility design should provide assurance of patient and staff health and safety.

4.1.6. The health facility should have the appropriate equipment and trained healthcare professionals to manage critical and emergency cases.

4.1.7. To establish an autologous stem cell transplant service, the health facility should have a clear and defined clinical program that includes protocols for stem

cell collection, processing, storage, and transportation before the commencement of AHSCT services.

4.2. Scope of Services

4.2.1. Written AHSCT scope of services shall be in place, including but not limited to:

a. Donor identification, evaluation, selection, eligibility determination and management;

b. Stem Cell Collection and Apheresis;

c. Stem Cell Mobilisation;

d. Administration of the preparative regimen;

e. Administration of blood products;

f. Central venous access insertion and device care;

g. Administration of HPC as well as other cellular therapy products, such as products under exceptional release;

h. Management of cytokine release syndrome and toxicities of the central nervous system;

i. Transfusion blood products and monitoring of blood counts;

j. Infection Control and Sterilisation for AHSCT;

k. Communicable disease testing and management;

l. Monitoring infections and use of antimicrobials;

m. Disposal of medical and biohazard waste;

n. Cellular Therapy Product Storage;

o. Safe administration of cellular therapy products

p. Monitoring organ dysfunction or failure and institution of treatment;

q. Monitoring graft failure and institution of treatment;

r. Management of side effects such as vomiting, nausea, pain, and other discomforts;

s. Post-Transplant clinic follow-ups;

t. Patient Education (pre-and post-op procedure and graft failure);

u. Medication Management;

v. Clinical laboratory services;

w. Nutrition Management;

x. Medical equipment management and maintenance;

y. Patient Safety for Radiology and Chemotherapy;

z. Long-term follow-up, treatment, and plans of care;

aa. Palliative Care;

bb. Rehabilitation;

cc. Patient Transportation and Emergency management; and

dd. Morbidity and Mortality Management.

4.3. Laws and Regulations

4.3.1. Compliance with Laws and Regulations including but limited to:

4.3.2. Comply with DHA Requirements (Regulations, Policy, Standards and Guidelines) and Federal Laws:

4.3.3. Federal Law No. (14) O 2014 - Concerning the Prevention of Communicable Diseases;

4.3.4. Federal Decree-Law No. (5) Of 2016 - On the Regulation of Human Organs and Tissues Transplantation;

4.3.5. Cabinet Resolution No. (33) Of 2016 - The Executive Regulations of The UAE Federal Law No. 14/2014 - On Combating Communicable Diseases;

4.3.6. Cabinet Resolution No. (67) of 2020 - On Concerning the Implementing Regulation of Federal Law No. (5) of 2019 - On the Practice of Human Medicine Profession;

4.3.7. Council of Ministers' Decision No. (6) Of the Year 2020 - On the Endorsement of the Regulations for Cord Blood and Stem Cells Storage Centers;

4.3.8. Cabinet Resolution No. (25) 2020 - On Regulation for Human Organs and Tissue Transplantation;

4.3.9. Cabinet Resolution No. (28) 2020 - On the National Cancer Registry; and

4.3.10. Data and the register must not be held outside the UAE as per ICT Law No 2. of 2019, except in cases mentioned in Article no. (2) of the Ministerial Decision no. (51) of 2021; and

4.3.11. Compliance with the Ministry of Health and Prevention for medical devices, consumables, medication, and medical advertisements.

4.4. Accreditation

4.4.1. The hospital must be accredited as per DHA Policy for Hospital accreditation before the commencement of the service.

4.4.2. The hospital lab must be accredited as per DHA Policy for Clinical Lab before the commencement of service.

4.4.3. The health facility should have a Quality Management System (QMS) as 'an organization's comprehensive quality assessment, assurance, control, and improvement system'.

a. An action plan for improvement shall be submitted to DHA for review before the commencement of service.

4.4.4. *The service shall achieve and comply with FACT-JACIE International Standards for Cellular Therapy, Product Collection, Processing and Administration, Storage and Collection accreditation 24 months from licensure activation.*

a. Center for International Blood and Marrow Transplant Research (CIBMTR), FACT clinical inspectors should audit the Clinical Programs.

b. Adhere to FACT-JACIE for personnel, quality management, policies and SoPs, equipment supplier, reagents, coding, and labelling of cellular therapy, process controls, cellular therapy product storage, transportation, shipping, distribution and recipient, disposal.

4.5. In house Lab Setup and Diagnostics

4.5.1. Equipment and supplies for a stem cell processing lab are set out in **Appendices 1 and 2.**

a. Storage of cells in sealed vials, cryo-bags, or cryopreserved containers for hematopoietic progenitor cells shall meet UAE Ministry of Health and Prevention (MoHaP) requirements.

b. Backup equipment shall be identified where there is only one device is in use.

c. All essential equipment shall be connected with an uninterruptible emergency power supply.

d. All product contact reagents should be sterile and infusion-grade, and disposable.

e. Reagents should be dispensed into single-use containers before use to minimize waste.

f. All reagents and supplies must be inspected, and lot numbers recorded before use and stored in a controlled environment, separate from non-clinical, potentially harmful research reagents.

4.5.2. Tests, diagnostics, and procedures required for AHSCT include but are not limited to:

a. Tissues culture.

b. Immunophenotyping.

c. Special stains to evaluate iron storage in the marrow for abnormal erythroid (RBC) precursor with iron particles surrounding the nucleus, chromosomal analysis, and fluorescence in situ hybridization analysis.

d. Necessary molecular and cytogenetic tests as per international guidelines such as T-cell receptor gene rearrangement, B-cell immunoglobulin gene rearrangement, JAK2 mutation, BCR-ABL, PML-RARA).

e. Routine blood tests.

f. Bone Marrow Aspirate and Biopsy.

g. Blood transfusion.

h. Apheresis.

i. Bronchoscopy.

j. CT scan, MRI scan, X-ray and ultrasound.

k. Electrocardiogram (ECG) and Echocardiogram

l. Endoscopy.

m. Hickman® Line Insertion.

n. Liver Biopsy.

o. Lumbar Puncture.

p. Pulmonary Function Test.

q. Urine Test.

r. Positron Emission Tomography Scan

s. Sperm and ova banking (if not done previously).

4.6. There should be a mechanical freezer capable of storing a liquid nitrogen tank equipped with an audible alarm.

4.6.1. Self-pressurising dewars should be in place for a regular supply of liquid nitrogen from the main storage tank.

4.6.2. The space containing the liquid nitrogen storage tanks and supply dewars should be separate from the processing laboratory needs.

4.6.3. The tanks should have sufficient air handling capacity to maintain safe oxygen levels when the Liquid Nitrogen2 tanks are filled.

4.6.4. An oxygen sensor alarm to indicate when oxygen levels are dangerously low.

4.6.5. A temperature sensor should be fitted to track and temperature at least twice a day.

4.6.6. Adequate backup liquid (or vapour) nitrogen storage capacity should be in place.

5. **STANDARD TWO:** HEALTHCARE PROFESSIONAL REQUIREMENTS

5.1. The Privileging Committee and Medical Director of the health facility shall privilege clinical staff in line with his/her education, experience, training, and competencies.

5.1.1. The privileges shall be granted or removed as per DHA Policy for Clinical Privileging.

5.2. Only a DHA licensed consultant trained to provide AHSCT shall lead the AHSCT service as the Clinical Program Director.

5.2.1. The Consultant shall be in trained in Haematology, Immunology or Medical

Oncology with specialty training in Autologous Hematopoietic Stem Cell Transplant (AHSCT):

a. The training program should include a minimum of ten (10) successfully completed cases during training.

5.2.2. A consultant with specialty training shall have documented evidence and experience in the field of Hematopoietic Stem Cell Transplantation (HPC) transplantation for a minimum of (5) years post-training.

a. The Clinical Program Director must submit evidence of a minimum of ten (10) successful completed cases per year.

5.2.3. The Clinical Program Director must submit evidence of forty (40) CME credits for Autologous Hematopoietic Stem Cell Transplant (AHSCT) per year as per UAE PQR requirements for Consultants.

5.3. The Clinical Program Director shall take responsibility for the direct clinical management of HPC transplant patients in inpatient and outpatient settings.

5.4. The Clinical Program Director shall take responsibility for the design, service, and elements of the clinical program. This includes quality management, the selection and care of recipients and donors, and cell collection and processing, whether internal or contracted services including:

5.4.1. All technical procedures;

5.4.2. Performance of the marrow collection procedure;

5.4.3. Supervision of staff;

5.4.4. Administrative operations;

5.4.5. The medical care of autologous donors undergoing marrow collection;

5.4.6. Pre-collection evaluation of or autologous donors at the time of donation;

5.4.7. Care of complications resulting from the collection procedure;

5.4.8. The Quality Management Program, including compliance with federal and local regulations; and

5.4.9. Evaluations of competence shall be performed before the independent performance of assigned activities and at specified intervals.

5.5. The Clinical Program Director will be responsible for the clinical supervision of physicians and nursing staff and ensure they have a valid and up to date certification and training to fulfil the service, including the minimum CME requirements as per UAE Prequalification Requirement in the past 12 months.

5.6. The Clinical Program Director will ensure all attending physicians:

5.6.1. Have a minimum, one year of supervised training. The training shall include the management of transplant patients in both inpatient and outpatient settings.

5.6.2. Clinical training and competency should include the management of autologous transplant recipients.

5.6.3. Evaluations of competence shall be performed for independent performance of assigned activities and at specified intervals.

5.7. The Clinical Program Director shall ensure all AHSCT staff hold written evidence that they have met the service's expected training and competency requirements (**Appendix 3**).

5.8. Nurses shall be trained on:

5.8.1. Haematology/oncology patient care and cellular therapy process;

5.8.2. Administration of preparative regimens;

5.8.3. Administration of growth factors, blood products, cellular therapy products, and other supportive therapies;

5.8.4. Care interventions to manage cellular therapy complications. This includes and may not be limited to respiratory distress, cardiac dysfunction, tumour lysis syndrome, cytokine release syndrome, neurologic toxicity, macrophage activation syndrome, hepatic and renal failure, disseminated intravascular coagulation, anaphylaxis, neutropenic fever, infectious and non-infectious processes, mucositis, pain management and nausea and vomiting;

5.8.5. Recognition of emergencies and cellular therapy complications requiring rapid notification of the transplant team; and

5.8.6. Palliative and end of life care.

5.9. There shall be written Standard Operating Nursing Procedure procedures, including but not limited to:

5.9.1. Care of immunocompromised recipients;

5.9.2. Age-specific considerations;

5.9.3. Administration of preparative regimens;

5.9.4. Administration of cellular therapy products;

5.9.5. Administration of blood products;

5.9.6. Central venous access device care; and

5.9.7. Detection and management of immune effect or cellular therapy complications.

5.9.8. Trained to operate the apheresis Machine and collection of stem cells and storage.

5.10. Pharmacists shall be trained on:

5.10.1. Haematology and oncology patient care, including the process of cellular Therapy.

5.10.2. Adverse events including neurological toxicities and cytokine release Syndrome.

5.10.3. Therapeutic drug monitoring shall include but not be limited to anti -infective agents, immunosuppressive agents, anti-seizure medications, and anticoagulants.

5.10.4. Monitoring and recognition of drug/drug and drug and food interactions and necessary dose modifications.

5.10.5. Recognition of medications that require amendment for organ dysfunction.

5.10.6. Conditioning regimens (chemotherapy, monoclonal antibody therapy, and radiation to the entire body.

5.11. *AHSCT services shall have the minimum number of healthcare professionals for set up of the service detailed below*:

5.11.1. A Clinical Program Director;

5.11.2. Facility Medical Director;

5.11.3. Attending Physician (Consultant and specialists in Hematology, Immunology, Oncology or Genetics);

5.11.4. Multidisciplinary support team;

5.11.5. A case manager;

5.11.6. An Administrator;

5.11.7. Two registered nurses;

5.11.8. Two lab technicians/technologists;

5.11.9. A Clinical Pharmacist;

5.11.10. A ward manager;

5.11.11. Nurse Patient Care Coordinator;

5.11.12. Health educator.

5.11.13. A Quality Assurance Manager; and

5.11.14. Infection control lead.

5.12. Other medical consultants and specialists for a Multidisciplinary Team shall be available as per patient need: Critical Care, Surgery, Haematology, Oncology, Radiology, Gastroenterology and Histopathology, Pathology, Transfusion Medicine, Dermatology, Dentistry, Internal Medicine, Endocrinology, Nephrology,

Cardiology, Pulmonology, Reproductive Medicine, Infectious Diseases, Dietetics, Occupational Therapy, Psychology, Psychiatry and Palliative Care.

6. STANDARD THREE: PERMITTED INDICATIONS FOR AUTOLOGOUS HSCT

6.1. Inclusions

6.1.1. Autologous transplant patients for indications within the 'Standard of Care' and 'Clinical Option' as per established clinical practice such as American Society for Transplantation and Cellular Therapy (ASTCT) guidelines on Indications for Hematopoietic Cell Transplantation and Immune Effector Cell Therapy, The European Group for Blood and Marrow Transplantation (EBMT) and the British Society of Blood and Marrow Transplantation (BSBMT).

6.1.2. Patient health status and overall benefit versus harm should be considered for:

a. Repeat transplant patients for failure to engraft.

b. Repeat autologous transplants for relapsed disease.

6.1.3. Non-Urgent Cases.

6.1.4. Patients aged 18 years or above.

6.1.5. Planned tandem transplants (sequential or double transplant) following patient risk score assessment, functional status and prognosis on using chemotherapies such as bortezomib, lenalidomide and thalidomide and approval by the Clinical Program Director.

6.2. Exclusions

6.2.1. Allogeneic transplants.

6.2.2. Transplants for indications within the category of 'Developmental' and 'Generally Not Recommended'.

6.2.3. Patients under the age of 18 years.

6.2.4. Emergency cases.

6.3. Use of non-Autologous Hematopoietic Stem Cells.

6.4. Use of double or multiple umbilical cord cells that are not from the same individual.

6.5. Sale, storage or use of autologous stem cells for any other person(s) who is not the same patient/individual' is not permitted.

6.6. Transfer of Autologous Hematopoietic Stem Cell in or out of the health facility or Dubai is not permitted. Written approval shall be sought by the competent regulator (DHA or MoHaP).

7. **STANDARD FOUR:** AUTOLOGOUS HSCT SERVICE REQUIREMENTS

7.1. The service shall adhere to the following:

7.1.1. Written scope of service that is kept up to date.

7.1.2. Documented roles and responsibilities of all staff.

7.1.3. Adherence to ISBT128 standards terminology, identification, coding and labelling (https://www.iccbba.org/home) or Eurocode.

7.1.4. Ensure there is a register for Autologous Hematopoietic Stem Cell Transplantation that is maintained.

7.1.5. Commencement of a Clinical Trial within 12-24 months.

7.1.6. Minimum expected number of procedures per year for the quality and safety of the AHSCT Clinical Program:

a. Five (5) procedures in year one (1);

b. Five (5) procedures in year two (2); and

c. Ten (10) procedures in year three (3) and thereon.

7.2. Data management and record keeping.

7.2.1. There shall be policies and procedures for all critical electronic record systems to assure the accuracy, integrity, security and confidentiality of all records.

7.2.2. The Clinical Program shall collect all the data necessary to complete the Transplant Essential Data Forms as per the standards set by the Center for International Blood and Marrow Transplant Research (CIBMTR) or the Minimum Essential Data-A requirements of the European Society for Blood and Marrow Transplantation (EBMT).

7.2.3. The Clinical Program shall have in place records for facility maintenance, facility management, complaints, or other general facility issues, quality control, personnel training, and competency.

7.2.4. Patient records, including, but not limited to consent and records of care, should be maintained confidentially as per UAE Law.

7.3. The service should have policy and procedures supported by documentation for the following:

7.3.1. Patient acceptance criteria;

7.3.2. Investigational treatment protocols;

7.3.3. Patient assessment and admission;

7.3.4. Pregnancy testing;

7.3.5. Patient education and informed consent (**Appendix 4**);

7.3.6. Patient health record;

7.3.7. Pre and Post collection care;

7.3.8. Cell collection, processing storage, transportation and banking.

7.3.9. Conditions and duration of cellular therapy product storage as well as the indications for disposal;

7.3.10. Good Tissue Manufacturing Practice and Cell Processing;

7.3.11. Use of Equipment, Supplies and Reagents;

7.3.12. Coding, Labelling, Verification and Tracing of Cellular Therapy Products;

7.3.13. Available therapies and treatment protocols;

7.3.14. Medication management;

7.3.15. Incident reporting;

7.3.16. Patient privacy;

7.3.17. Post-transplant vaccination schedules and indications

7.3.18. Emergency action plan;

7.3.19. Patient discharge/Post Op Care/transfer;

7.3.20. Transfer of critical/complicated cases when required.

7.3.21. Quality Improvement and Control (including outcome at 100 days, one year and five years);

7.3.22. Cellular therapy emergency and disaster plan, and the Clinical Program response;

7.3.23. Patient Complaint Management;

7.3.24. Sentinel, adverse events, and adverse reaction reporting; and

7.3.25. Disposal of biological and medical waste as per Dubai Municipality (DM) requirements;

7.4. Infection control program for monitoring and managing infectious processes, including immune-deficiencies and opportunistic infections, central venous catheter infection and potential patient infections. The program shall assure:

7.4.1. Monitoring of infections and use of antimicrobials.

7.4.2. Blood samples for testing for evidence of clinically relevant infection shall be drawn, tested and reported within timeframes required by local and federal regulations.

7.4.3. Implement Post-procedure infection control measures.

7.4.4. Document infection control measures and hazardous waste management;

7.4.5. Compliance with hygiene and use of attire for personal protective equipment.

7.5. The service should maintain the Charter of Patient Rights and Responsibilities at the facility entrances in two languages (Arabic and English).

7.5.1. Patients have the right to know the percentage of viable cells in the collected samples and estimated success rate over the short and long term basis.

8. **STANDARD FIVE:** STEM CELL COLLECTION, PROCESSING, STORAGE, TRANSPORTATION AND BANKING

8.1. Stem cells shall be collected in a sterile environment.

8.1.1. Infection control measures should include but not be limited to:

a. Processing in clean areas and thorough microbiologic monitoring of all stages of the stem cell preservation procedure as per best practice.

b. Screening for microbiologic contamination before cell collection and infusion.

c. There should be separate or protected cellular storage to avoid cross-contamination where an infectious graft has been detected.

8.2. Processing of cells should be undertaken within 48 hours at a controlled temperature as per the latest evidence-based practice.

8.2.1. Centrifugation shall be used to achieve the minimum number of cells required for the patient.

8.2.2. Cells shall be counted (CD34+ cell count), assessed for viability and sterility, and preliminary stored continuously in the recommended controlled temperature (initially -4°C).

8.3. The sample can be frozen in a controlled manner down to the target temperature of −156°C (vapour phase) to −196°C (liquid phase) for longer-term storage.

8.3.1. Cells should be cryopreserved by methods and reagents detailed in FACT JACIE International using reagents approved for human use in the UAE.

8.3.2. Assessment of the frozen cells should be performed after 72 hours.

8.3.3. The sample can be thawed in a 37°C water bath.

8.3.4. After thawing, cryopreservatives should be washed using a two-step approach through centrifugation to reduce the toxicity of reagents.

8.3.5. Reassessment of cell viability should be performed to ensure its integrity before stem cell infusion.

8.4. Cell collection, processing, and administration should fulfil the FACT-JACIE International Standards for Hematopoietic Cellular Therapy Product Collection, Processing, and Administration requirements.

8.5. Cells that require transportation shall:

8.5.1. Have an agreement and clear process between the sender and receiver.

a. A person (courier) shall be available to accompany the stem cells between the sender and receiver.

b. The courier shall be trained for stem cells transportation and verified by the sender or receiver.

i. The cell must not be placed in cargo for transportation and should be transported as hand luggage.

c. Stem cells must not be exposed to x-ray machines or metal detectors.

d. Cells must be placed in the best practice optimal medium to maintain cell viability and ensure cell characteristics are not altered.

8.5.2. Have in place a courier tracking mechanism to determine the status of the cells being transported.

8.5.3. Ensure cells are placed in a credo-box that is prepared to 4 °C.

a. The credo box should be checked prior for integrity to maintain a controlled temperature of 2-8°C for 100 hours.

b. There should be two temperature loggers, and temperature readings should be taken every 15mins.

c. The credo box shall be sealed to prevent tampering during transportation.

d. Have in place a tracking mechanism to determine the status and position of the cells being transported.

e. The credo box shall include labels identifying the product being transported.

8.5.4. Cell transportation should not exceed 72-hours to prevent an adverse event.

8.5.5. Transported cells must be documented and coded at both the sending and receiving sites and confirmed by both sites before infusion.

8.6. For stem cell banking, the health facility shall adhere to best practices such as the FACT-JACIE international standards for hematopoietic cellular therapy product collection, processing and administration and NetCord-FACT International Standards for Cord Blood Collection, Banking, and Release for Administration.

8.6.1. The cell banking system should have written documentation for:

a. Cell banking procedures to include reagents, temperature controls and maintenance of medical equipment and devices.

b. Cell types and sizes are being managed.

c. Containers, vessels and closure system used.

d. Methods of cell preparation, cryopreservation technique.

e. Safe use of reagents and protectants.

f. Cell storage and thawing technique.

g. Transportation and disposal of medical waste.

h. Procedures used to prevent microbiological contamination and cross-contamination and tracing.

i. Documentation and labelling procedures.

j. Back up and business continuity and recovery from catastrophic events.

k. Cell testing technique.

l. Testing for mycoplasma and sterility before the transfer of cells into the facility.

   i. Bacteriostasis and fungistasis testing should be performed before sterility testing to assess the sample matrix for inhibition.

m. Testing program and the schedule should include but not be limited to testing for:

   i. Species-specific virus (2 weeks).

ii. Sterility (2.5 weeks).

iii. Mycoplasma testing (3.5 weeks).

iv. Retroviruses and animal viruses (5 weeks).

v. Adventitious virus (6 weeks).

vi. Antibody production (7 weeks).

8.7. The cell banking facility shall ensure:

8.7.1. Patient consent is obtained, and patients are informed of all costs and timelines to reaffirm consent.

8.7.2. Patients are informed of the cell quality controls, validation, viability, sterility, count and cell typing when cells are needed.

8.7.3. Patients are informed of the site for storing stem cells and any third party agreements.

8.7.4. Patients are informed of protocols to ensure data confidentiality and privacy.

9. **STANDARD SIX:** SAFETY AND QUALITY REQUIREMENTS

To assure quality and patient safety, the service shall ensure the following:

9.1. A multidisciplinary team is available to manage the patient needs.

9.2. Patient escort and access to emergency services.

9.3. Supply of immunosuppressants is available for the duration of planned therapy.

9.4. Intensive Care Unit (ICU) beds and isolation room is available for patients undergoing AHSCT Transplantation.

9.5. Written agreements with suppliers, blood banks and tertiary hospitals to ensure patient safety and quality of care are not compromised.

9.5.1. Twenty-four-hour availability of appropriate and irradiated blood products needed to care for cellular therapy recipients.

9.5.2. Irradiated blood products for patients should be given (if needed) 7 days before transplant and up to 3 months after (unless there are other reasons to continue).

9.5.3. Patients should be given written information and alert card (if available), and the Dubai Blood Bank should be informed.

9.6. Chemotherapy and radiation are managed in line with the minimum international thresholds to assure reduced-intensity transplantation.

9.7. Infection control measures are robust and monitored regularly.

9.8. Patients and their close family members should take the PCR test 72hr before admission.

9.9. Patients and their close family members should take the Covid-19 vaccine (or booster) post auto graft.

9.10. *Patients undergoing autologous transplant should be vaccinated but live vaccines should not be given. Vaccination schedule (doses and months between doses) should be followed as per the latest international guidance: (CDC/WHO):*

9.10.1. Influenza A and B inactivated seasonal vaccine.

i. Recipients aged 65 years and over should receive the adjuvented trivalent influenza vaccine (aTIV).

ii. The live attenuated influenza vaccine (Fluenz Tetra®) must NOT be given to transplant recipients. Household members should also receive an inactivated influenza vaccine as there is theoretical potential for transmission of live attenuated influenza virus in Fluenz Tetra® to immunocompromised contacts for one to two weeks following the vaccination 2.

9.10.2. Diptheria/Tetanus/Pertussis/ Inactivated Polio/Haemophilus Influenzae type b/Hepatitis B (DTaP/IPV/Hib/HepB) hexavalent vaccine.

9.10.3. Meningococcal Group B (Men B) multicomponent protein vaccine.

9.10.4. Meningococcal Groups A, C, W & Y (Men ACWY) quadrivalent conjugate vaccine.

9.10.5. Pneumococcal (Streptococcus pneumoniae) Prevenar 13®, 13 valent conjugate vaccine (PCV13) and for the subsequent dose Pneumovax II®, 23-valent, polysaccharide vaccine (PPSV23).

9.10.6. Measles/Mumps/Rubella (MMR) live-attenuated vaccine should not be given to autologous transplant recipients.

9.11. Appropriate sedation is provided for iliac crest bone marrow harvest and to manage post-transplant complications.

9.12. Medications to manage symptoms subject to patient profile and risk.

9.13. Growth factors for neutrophils should be used to prevent infection and fungus during the low count and engraftment phase and early and late convalescence.

9.14. Adequate anticoagulants should be in place to avoid cell aggregation for storage and transportation for long periods (24–72h).

9.15. Cellular processing and storage/cryopreservation is controlled in the laboratory does not compromise the quality, quantity and efficacy of AHSCT.

9.15.1. Cryopreservation initial temperature –4°C.

9.15.2. –156°C when stored in the vapour phase.

9.15.3. –196°C when stored in the liquid phase, depending on where the specimen is stored in the container.

9.16. Cell typing is confirmed before infusion.

9.17. Pre-care, treatment and aftercare program is comprehensively aligned to best practice to meet patient needs.

10. **STANDARD SEVEN:** PRE-TRANSPLANT PERIOD

The pre-transplant period forms an essential part of identifying suitability for patients to benefit from ASHCT. Pre-transplant workup will include assessing eligibility for transplantation, tissue investigations, and assessing the patient's fitness (**Appendices 5 and 6**).

10.1. A detailed medical history of the patient and testing should be taken for all patients indicated for AHSCT, and the European Medical Blood and Marrow Transplant (EMBT)

scoring system should be adopted to inform clinical decisions and protocol for treatment. The findings from EBMT should be discussed with the transplant team and recorded in the patient's medical file.

10.2. The test should include but not be limited to:

10.2.1. The patient's age, fitness status, previous and current disease status, therapies, relapse, drug intake and prior surgical procedures should be taken.

10.2.2. Patient profile and suitability for AHSCT should be considered as per the available evidence base and consensus.

10.2.3. Disease criteria for bone marrow transplant should be met as per clinical best practice.

a. Screening for infectious disease shall be undertaken as per the health facility infectious disease protocols.

10.2.4. The intensity of treatment required and stem cell source.

10.2.5. Contraindication and their absence should be considered.

10.3. The patient should undergo several pre-diagnostic tests before admission, including but not limited to a dental exam, cardio pulmonary exam, thyroid, dietary changes. Computed Tomography (CT) scan and gynaecological exam should be done where indicated.

10.4. Blood work and urine tests should be performed to assess the blood cells' status, infectious disease status, liver and kidney function.

10.5. Referral to reproductive medicine (for storage of ova or sperm) should be done as chemotherapy and radiation may affect family planning.

10.6. Counselling and psychological services should be offered to the patient to prepare the patient and manage emotional stress.

10.7. Treatment options and duration should be discussed with the patient (and next of kin where available), including risks and recorded in the patient's medical file.

10.8. Care coordination and the medical care plan should be discussed and agreed upon with the transplant team and approved by the Clinical Program Director.

10.9. Preparation for stem cell collection should be undertaken once CD34 levels have been achieved.

10.10. Use of a central line or Hickman line insertion for Peripheral Blood Stem Cell Collection/Harvesting should be done before chemotherapy and/or irradiation.

10.10.1. Patients should be managed for toxicities, symptoms and side effects.

10.11. The conditioning regimen should be done for four days with Grannis Colony Stimulating Factor (GICSF).

10.11.1. Apheresis machine should be utilised for stem cell collection only, and the volume should align with the patients' weight calculation (750ml -1,000ml). The buffy coat with white cells (hematopoietic stem cells) should be separated and placed into a collection bag.

a. The plasma and red blood cells should be counted (CD34+ cell count) for a viable transplant and returned to the patient to minimise blood loss.

10.12. Peripheral blood stem cells in the collection bag shall be labelled, processed (typing, nucleic sub count, culture), weighed, processed and cryopreserved.

10.13. If bone marrow harvest is pursued, it should be prepared and conditioned for Transplantation as per best practice protocols (immunosuppression, growth factors and myeloablation).

10.13.1. Sedation and aseptic techniques must be met for bone marrow harvest.

10.13.2. Use of anticoagulation should be administered to prevent clotting.

10.13.3. Bone marrow harvest (iliac crest aspiration) should align to weight calculations and required stem cell volume (10-20ml/kg).

10.13.4. Disposable needles should be used for the punch biopsy.

10.13.5. Imaging should be used to guide the biopsy needle.

10.14. All bone marrow stem cells that are collected from the patient shall be maintained in a collection bag, labelled, weighed, processed (typing, nucleic sub count, culture) and labelled in a laboratory according to clinical need within five (5) to ten (10) day turnaround for all patients.

10.15. Media such as Normasal-R (electrolytes and glucose) should be used to maintain cell metabolism.

11. STANDARD EIGHT: TRANSPLANT PERIOD (INFUSION)

11.1. Stem cells should be thawed at the bedside in a water bath and intravenously infused to transplant and engraft the stem cells.

11.1.1. Stem cell infusion should be done slowly to minimise reactions.

a. Side effects such as vomiting, abdominal cramp, nausea, chills, chest pain and passing red urine should be managed and documented.

11.1.2. Patients should be monitored during the recovery period to ensure sufficient neutrophils are in place to minimise the risk of infection.

11.1.3. An aftercare program should be developed with the patient and their Primary Care Practitioner should be updated on the treatment and aftercare plan.

11.1.4. Patients and/or next of kin should be updated regularly and provided with the required aftercare information.

12. STANDARD NINE: POST-TRANSPLANT PERIOD

Engraftment is expected 10-15 days post-transplant and may vary according to the transplant, patient, complications, and late effects. The transplant team should ensure:

12.1. The timeframes for anticipated engraftment and follow up are documented.

12.2. There is a dedicated Registered Nurse in the transplant inpatient and outpatient areas trained (knowledgeable and skilled) to monitor vital signs, fluid and electrolyte balance and implement the treating physicians' instructions to manage potential complications Moreover, side effects related to infection, drugs or stem cell transplantation.

12.2.1. The nurse should monitor the patients' health status and follow emergency procedures issued by the treating physician.

12.3. Blood tests are undertaken to verify engraftment and graft versus host disease status.

12.4. Patient discharge is done once written approval is issued by the treating physician and clinical director.

12.4.1. Patients who have been approved for discharge should be issued with a discharge plan in a non-technical manner, supported by verbal explanation to assist the patient and their nominated caregiver in understanding the care plan, and the availability of outpatient services to meet the patients' needs.

12.4.2. The discharge plan should include:

a. Drug management to manage potential complications.

b. Key contact numbers to seek advice on symptoms or side effects.

c. Precautionary measures and advice to prevent community infections should be issued by the treating physician and infection control lead for common infections:

i. Month 1 - Herpes Simplex (HSV1/2), bacterial and fungal infections.

ii. Months 2-3 - Cytomegalovirus (CMV), fungal infection, Pneumocystis and Carini Pneumonia ((PCP).

iii. Months 0-12 - Varicella-Zoster Virus (VZV) infection.

iv. Months 3-6 Home infection control measures, e.g. replacing air condition filters, removing plants, hand hygiene, dental hygiene, healthy lifestyles, Personal Protective Equipment (PPE), and avoidance of public places.

d. Advice on vaccines and use of over the counter medications.

e. Follow up appointments at regular intervals to assess:

i. The efficacy of the treatment and relapse;

ii. Potential second malignancies such as organ dysfunction or myelodysplastic syndrome;

iii. Post AHSCT vaccination protocol (including close family vaccination); and

iv. Long-term post-AHSCT complication follow-up.

13. STANDARD TEN: KEY PERFORMANCE INDICATORS

13.1. The health facility should capture performance measures for each patient and for the AHSCT program (**Tables 1 -3**).

13.2. Performance measures should be readily available upon request

13.2.1. The provider is required to report on any additional performance requirements or measures issued by DHA.

13.3. Reports should reflect outcomes achieved in the previous quarter.

13.4. The Clinical Director should ensure that all treating physicians maintain an up to

date log of treatment and patient outcomes using validated tools.

13.4.1. The service should follow up with patients at frequent intervals to determine patient outcomes and success rates, and remission status (1 and 5 years)

13.4.2. Follow up of patient outcomes and reporting should be done as soon as patient complications have been resolved.

13.4.3. Adverse and sentinel events should be logged and reported to the Medical Director.

Table 1. Baseline Assessment

Patient ID	**Diagnosis**	**Date of intervention**	**Tool for Assessment** (e.g. pain score, biological testing, cardiology, pulmonology and renal physicians and tests including echo, pulmonary function tests and renal function tests, ADL, patient experience)	**Baseline Assessment**	**Treatment Method, dosage and start date** Transplant protocol for intravenous infusions of chemotherapy and stem cells)	**Primary outcome measure**

Name and signature of Treating Physician:

Name and signature of Clinical Program Director:

Table 2. Post Intervention Assessment

Patient ID	**One-month outcome**	**Adverse Event at one month** (No, if yes provide details)	**Three-month outcome**	**Adverse Event at three months** (No, if yes provide details)	**Six-month outcome**	**Adverse Event at six months** (no, if yes provide details)	**12-month outcome**	**Adverse Event at 12 months** (no, if yes provide details)

Name and signature of Treating Physician:

Name and signature of Clinical Program Director:

Table 3. Service Performance Measures for AHSCT Program, adopted from Aljurf et al (2021) and NHS (2017). Specialised Services Quality Dashboards – Blood and Infection metric definitions for 2017/18.

- **Clinical Program:**
  - Clinical indicator Collection indicator Processing indicator
  - Number of SCT-certified physicians
  - Number of SCT-certified nurses
  - Number of oncology certified nurses
  - Number of publications
  - Cancellations
  - Incidents reports.
  - Number of medication errors
  - Patient volume
  - Bed capacity
  - Outpatient clinic capacity
  - The average length of hospital stay for inpatient transplants.
  - Indication of AHSCT
  - Overall survival and mortality
    - Survival rate at day 100
    - Survival rate at 1 year
    - Survival rate at 5 years
    - Treatment-related (non-relapse mortality)
  - Engraftment outcome
    - Engraftment by type of HCT and source of stem cells, ANC and platelet count
    - Median time to engraftment
    - Graft failure outcome
  - Infections:
    - Central venous catheter site infections
    - Percentage of microbial contaminations
  - Outcome Readmission rate

- Number of HCT patient ED visits
- Staff satisfaction
- Patient satisfaction

- **Stem cell collection Program**
  - Number of trained stem cell collection & apheresis staff
  - Number of autologous products
  - Number of stem cell infusion
  - HCT Complications during the collection procedure
- **Processing Laboratory Program**
  - Number of trained cell processing staff
  - Quality of collected product (CD34 quantitation)
  - SC processing turnaround time
  - Number of acceptable HPC viability cells post-cryopreservation
  - Number of available SC processing reagents

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APPENDICES

APPENDIX 1 - Equipment Needed to Start A Cell-Processing Lab, adopted from Leemhuis et al., (2014). Essential requirements for setting-up a stem cell processing laboratory. *Bone Marrow Transplant* 49, 1098–1105.

Required equipment:		
Biosafety cabinet (or equivalent)	Refrigerator	Balance (Scale)
Water bath	Centrifuge (with carriers to hold 600 mL blood bags)	Freezer (⩽−70 °C)
Plasma extractor	Tubing sealer	Tubing stripper
Cryo-transporter (−80 °C) or liquid nitrogen dry shipper	Micropipettes (100 µL and 1000 µL)	Reference thermometer
Pipette aid	Hemostats	
Desired equipment:		
Sterile connecting device	Controlled rate freezer	LN_2 storage freezer
Label printer	CO_2 incubator	Hemocytometer
Microscope	Personal computer	
Shared equipment:		
Flow cytometer	Automated instrument for cell processing	Microbiology lab for bacterial and fungal culture
Hematology analyzer		

Abbreviation: LN_2=liquid nitrogen.

APPENDIX 2 - Essential requirements for setting up a stem cell processing laboratory, adopted from Leemhuis et al., (2014). Essential requirements for setting-up a stem cell processing laboratory. *Bone Marrow Transplant* 49, 1098–1105.

Miscellaneous laboratory supplies		
Cryobags (for example: 50; 250; 500 mL)	Transfer packs (300; 600 mL)	Syringes (1, 3, 10, 30, 60 mL)
Safety needles; couplers	Spike to needle, spike to spike adapters; stopcocks	Alcohol swabs, iodine swabs, syringe caps, sterile swabs
Labels, laminating tags; zip ties	15, 50, 175 mL conical tubes	Pipettes (1–50 mL)
Biohazard sample bags	Tube racks	Pipette tips
Cryovials, microtubes	Biohazard bags; sharp containers; garbage bags; trash can	Dry ice
Sterile overwrap bags		
Sample reagent list (will vary depending on products and services offered)		
DMSO	Plasmalyte (or equivalent)	ACD-A
Human serum albumin	Hetastarch	Heparin
70% IPA; bleach; bactericidal and fungicidal detergent	Flow cytometry reagents	Trypan blue

Abbreviations: ACD-A=acid citrate dextrose solution A; DMSO=dimethyl sulfoxide; IPA=isopropyl alcohol.

APPENDIX 3 - Training for Clinical Program Directors and Attending Physicians, adopted from BSBMT (2012).

Knowledge	**Skills**
Indications for • Autologous transplant • Allogeneic transplant	• Understands the use of indication tables (S, CO, D, GNR) • Understand the outcome of alternative treatment strategies
Patient selection and pre-transplant assessment • Co-morbidity • Choice of conditioning regimens	• Understands how to assess co-morbidities and how they affect TRM and overall outcome • Understands the factors implicated in deciding between FI/RIC • Knowledge of organ assessment methods and interpretation of results
Conditioning regimens • Full intensity • Reduced-intensity	• Understands the side-effects of specific chemo/radiotherapy • Understands the long-term effects of specific chemo/radiotherapy • Competent at prescribing conditioning chemo/radiotherapy
Administration of high-dose therapy • Radiotherapy	• Knowledgeable about the principles of TBI • Recognises acute toxicities • Knowledge of long term toxicities (screening and treatment)
Administration of high-dose therapy • Chemotherapy	• Understands the mechanism of action of chemotherapy conditioning • Understands the use of prophylactic agents (e.g. mesna)
Stem cell mobilisation (PBSC - autologous) • Cytokine alone • Chemo/cytokine • Target cell doses	• Understand the indications, benefits and side-effects of different harvesting regimens • Knowledgeable about the principles and practice of apheresis procedures • Competent at prescribing GCSF (or another mobilising agent) and understands side-effects

	• Knowledge of cell dose targets and pre-collection CD34 counts • Competent at prescribing chemotherapy for stem cell mobilisation
Stem cell harvest (BM-autologous)	• Competent at bone marrow harvesting
Identification and selection of HPC source • Sibling • Haploidentical/another relative • UD/cord	• Understands selection algorithms and is knowledgeable of risks and benefits associated with different sources
Identification and selection of UD/cord	• Competence in requesting an unrelated donor/cord blood search, including understands of donor registries • Competence in donor selection and suitability • Understands the methodology and implications of HLA typing
Donor issues	• Competence in taking informed consent from donors, including the safety of GCSF • Understands the implications of different donation methods (BM/PBSC) • Knowledgeable about infectious diseases testing
Stem cell processing/lab	Knowledgeable about the principles and practice of: • Stem cell processing, including cell counts and cryopreservation • Basic knowledge of techniques to determine CD34+ cell counts • Positive and negative selection of CD34 positive cells, red cell depletion and plasma depletion
Stem cell infusion	• Competent at requesting/prescribing cells (stem cells or DLI) from donor registries

	• Competent at prescribing cells (and pre-medication) for infusion • Proficient in HPCP infusion (including cryopreserved products)
Post transfusion, non-hemolytic complications like TRALI, TACO, GvHD.	
Use of post-transplant growth factors	
Management of early transplant-related toxicity	Able to recognise and treat: • Neutropenic sepsis • Nausea and vomiting • Pain and mucositis • Veno-occlusive disease (SOS) • TTP • Haemorrhagic cystitis • Bleeding • Pulmonary toxicity • Multi-organ failure • Renal impairment
Blood product support	• Knowledge on the safe and appropriate use of blood products, including granulocytes • Understands the implications of ABO incompatibility (patient/donor) and group switching
Graft failure	• Understand the risk, cause and outcome of graft failure • Knowledge of strategies to manage graft failure • Understands of methods and interpretation of chimerism analysis
Infections in the transplant setting • Prophylaxis	Competent in:

• Treatment	• Diagnosis, prevention and management of fungal disease • Diagnosis and management of viral disease • Diagnosis and management of viral reactivations, including CMV and EBV • Diagnosis and management of PTLD
Graft Versus Host Disease (GvHD) • Acute and chronic	• Competent in the diagnosis and management of acute and chronic GvHD, including novel therapies (e.g. mesenchyma cells, Tregs, ECP)
Disease relapse post-transplant	• Understands the risks, management and outcomes of relapse post-transplant • Knowledgeable about the utility of second transplants of donor leukocyte infusions • Knowledgeable about methods to monitor patients at risk of relapse (e.g. MRD monitoring)
Late-effects of transplant	• Understands the long-term effects of chemo/radiotherapy, including screening for secondary malignancies • Knowledge of the diagnosis and management of post-transplant immuno-deficiencies and organ toxicity • Knowledge about the long-term anti-infective prophylaxis and vaccination • Recognises the need for a multidisciplinary approach, especially in patients with chronic GvHD
Psychological issues	• Competence in breaking bad news • Understands the management of terminal care patients and referral to palliative care professionals
Ethical issues	• Understands the importance of ethics in all aspects of patient care, including • Donor Rights and care • Cord blood donation and banking • Advanced directives

	• Research • Minority group issues
Quality/governance	• Knowledge of the regulatory bodies pertinent to transplantation and legal requirements • Knowledge of the national and international societies and their roles • Understands the importance of a quality management plan • Understands the function and importance of the MDT
Funding/commissioning	• Understands the funding streams within the NHS, including tariffs
Data collection	• Knowledgeable about data submission (e.g. Med-A and Med-B), • Understands the principles and use of the Promise database • Knowledgeable about data protection
Research	• Understands the importance of research in the transplant environment • Understands GCP • Understands documentation and reporting for patients on investigational protocols

APPENDIX 4 - Minimum Requirements for Consent

Patient Declaration: The approval of the treatment does not mean it has been evaluated by DHA. I voluntarily request (**insert physician names**) as my physician(s), and such associated deemed necessary, to diagnose and treat my condition, which has been explained to my satisfaction in a non-technical language. I (**insert patient name)** know the potential benefits and risks of this (**insert procedure name)** and have talked to my treating physician(s) before participating. I understand clearly that the evidence for Autologous Hematopoietic Stem Cell Transplant (AHSCT) is limited. There is no guarantee that the procedure will be successful. I understand that a positive infectious disease status may render the possibility for AHSCT transplantation. I have also consented to the appropriate treatment to be administered to carry out the procedure. The specific risks for this (**insert procedure name)** treatment have been explained to me and include (**list all risks**):

Patient Name and Signature: Date: Time:

The legal guardian of the patient

if unable of consent (name and signature) Date: Time:

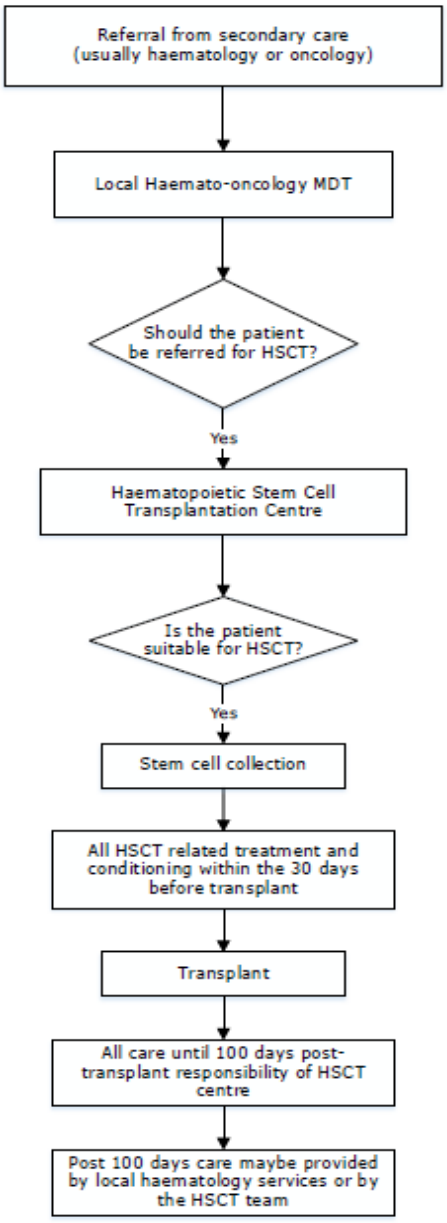
Treating Physician(s) Declaration: I (**insert names)** have explained the diagnosis, prognosis, alternative options, and the stem cell procedure (**insert name of procedure and site**) to be performed and the pertinent contents to the patient. I have answered all the questions from the patient to the best of my knowledge, and the patient has been adequately informed of the potential benefits and risks, complications, and the patient has consented to the (**insert name of procedure and site)**. I have explained to the patient that the success of the treatment can vary from case to case. I have explained how anaesthesia/sedation will be administered and the associated risks. I will adhere to best practices and have ensured compliance with the health facilities written protocols for this treatment and agree to assess the treatment's progress and advise the patient accordingly.

Physician(s) name (s) and Signature: Date: Time:

Witness Name and Signature: Date: Time:

Relationship and/or Designation:

APPENDIX 5 - Patient Pathway for Hematopoietic Stem Cell Transplantation, adopted from Welsh Health Specialised Services Committee (2019).



APPENDIX 6 - Steps for Hematopoietic Stem Cell Transplantation (AHSCT), adopted from Research Australia (2021).