Disseminated Intravascular Coagulopathy DIC

Brief overview

DIC is a condition in which both clotting and bleeding occur simultaneously. It is an oncological emergency.

Procoagulants are released as a result of:

- Trauma
- Sepsis
- Solid cancers
- Leukaemia
- Obstetric complications

This results in blood clots forming and blocking small blood vessels. The lungs, liver, kidneys and spleen are affected and organ failure can occur.

Platelets and clotting factors are consumed as more clots form. This causes excessive bleeding.

Key Learning: Clotting and Bleeding occur at the same time

Key Learning: DIC is always secondary to some underlying condition e.g. Acute Promyelocytic Leukaemia (APML) and Sepsis

References:

Jakel, P. (2021) 'Oncological Emergencies', Seminars in Oncology Nursing, 37 (2)

Smith, L. (2021) 'Disseminated Intravascular Coagulation', Seminars in Oncology Nursing, 37 (2)

More information on next page

Disseminated Intravascular Coagulopathy DIC

Brief overview

Nursing Assessment

Assess for Bleeding:

Bleeding may occur from multiple sites simultaneously:

- Nostrils
- Intravenous and central line sites
- Vagina
- Rectum
- Oral Cavity
- Skin: petechial rash
- Intra-abdominal
- Urinary tract

Assess for Clotting:

- Chest Pain
- Shortness of breath
- Abdominal pain
- Swelling/ Tenderness/ Pain/ Warmth/ Redness
- Intracranial assess mental status

Nursing Management

- Identify patients at risk and monitor closely
- Perform ABCDE assessment
- Escalate to medical team as required who will treat underlying cause
- Stop active bleeding
- IV fluid resuscitation may be required to support blood pressure
- Administer oxygen to maintain Sats >94%
- Take Bloods as ordered by medical team:
  - FBC
  - RLB
  - Coag
    Prolonged PT
    Prolonged APTT
    Low fibrinogen
    Raised D dimer
  - Group and Hold
  - Maintain Platelets >50 x 10^9/l and Fibrinogen >1.0 -1.5g/l
- Administer blood products as prescribed:
  - Red blood cells
  - Platelets
  - Fresh Frozen Plasma
  - Fibrinogen

Engraftment Syndrome

Brief overview

Engraftment Syndrome (ES) also referred to as capillary leak syndrome and peri-engraftment respiratory distress syndrome (PERDS) may occur post HSCT at time of engraftment.

Engraftment occurs when the number of neutrophils in the patient's bloods rises to absolute neutrophil count (ANC) >/= 0.5 x 10^9/l

Key Learning: Peri- engraftment may occur 5 days before engraftment is achieved

Key Learning: Engraftment syndrome can be fatal and requires prompt escalation of care

It is more common in:

- Autologous HSCT
- Allogeneic Reduced Intensity Conditioning (RIC)
- Cord HSCT

Signs and Symptoms include

- Pyrexia 37.5 degrees celsius or above
- Skin rash (assist with skin biopsy as required)
- Pulmonary Oedema (obtain CXR as prescribed)
- Weight gain
- Liver dysfunction
- Renal dysfunction
- Confusion
- Diarrhoea

More information on next page

Nursing Management includes

- Vital signs/ NEWS
- Monitor weight
- Monitor intake and output
- Skin assessment
- Stool assessment
- Bloods
- Monitor mental status
- Patient education and information
- Administer medication as prescribed i.e. Corticosteroids

Reference: *Wallhult, E., Kenyon, M. and Quinn, B. (2023) 'Early and Acute complications and the principals of HSCT Nursing Care', in Kenyon, M. and Babic, A. (eds) The European Blood and Marrow transplantation textbook for nurses. Switzerland: Springer, pp. 185-216.*

Febrile Neutropenia - Always Think Sepsis

Brief overview

Temperature
A patient is Febrile when they have a temperature of

- 37.6 C (axilla)
- 37.5 C (axilla) on 2 occasions, taken 1 hour apart
- below 36.0 C (axilla)

Neutropenia
A Neutrophil count less than 0.5 x 10^9 or less than 0.1 x 10^9 and expected to drop

Signs and symptoms may include

- Tachycardia
- Tachypnoea
- Hypotension
- Rigors
- Decreased capillary refill
- Cyanosis/mottled skin
- Poor urinary output
- Altered mental status

Nursing Management
Key Learning

- Be aware the immunocompromised patient can rapidly deteriorate requiring ICU support.
- Consider that paracetamol and steroids mask signs of infection. If your neutropenic patient develops a temperature **urgent intervention and escalation of care is required.**

If patient is clinically stable obtain blood cultures and administer antibiotics within 1 hour

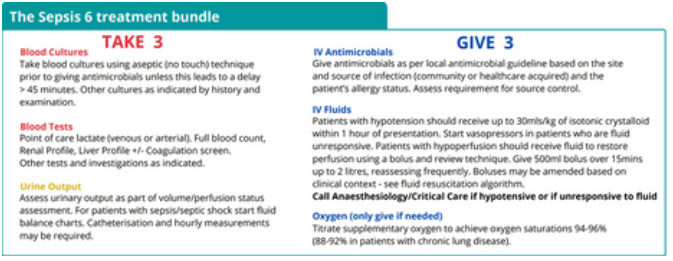
More information on next page

Febrile Neutropenia - Always Think Sepsis Brief overview

If Patients show signs of systemic compromise such as:

- Hypotension
- Hypoxia
- Confusion

Activate Sepsis Protocol: Key points outlined below



Reference: *Department of Health (2021) 'Sepsis Management for Adults (including maternity), National Clinical Guideline No. 26', Dublin: Stationery Office.*

Available at: https://www.hse.ie/eng/about/who/cspd/ncps/sepsis/resources/national-clinical-guideline-no-26-sepsis-management-for-adults-including-maternity-2021.pdf (Accessed 18 May 2023).

Haemorrhagic Cystitis

Definition

Haemorrhagic Cystitis (HC) is defined as bleeding from the urinary tract following chemotherapy or radiotherapy, including in the context of HSCT. Viruses such as BK virus can also cause Haemorrhagic Cystitis

Signs and symptoms can include

- urgency and frequency
- mild haematuria
- dysuria
- spasm/pain
- bleeding/clots
- acute renal failure

Nursing care

- Encourage oral fluids
- IV fluids as prescribed
- Diuretics
- Urinalysis
- MSU for BK virus
- If clots present – consider bladder irrigation with 3- way catheter
- Keep platelets greater than 50 or as per medical team
- Administer Analgesia as prescribed
- Administer IV /Intravesical Cidofovir as prescribed
- Medical team will consider immunosuppression wean and check CD4 count (immune response level)
- Tranexamic acid contraindicated

Haemorrhagic Cystitis and BK Virus in Stem Cell Transplant (SCT) Recipients Diagnosis and Management SJH:HOPe 055

Hepatic Failure: VOD/SOS

Brief overview

Hepatic Veno-occlusive Disease VOD/ Sinusoidal Obstructive Syndrome SOS is the most serious hepatic complication. It usually occurs within the first 20 days' post-transplant.

Endothelial damage occurs due to the use of intensive conditioning regimens.This results in hepatic venule damage leading to liver congestion.

Key Learning: HSCT conditioning that contains Busulfan is high risk for VOD

Risk factors

- Underlying liver disease, especially hepatitis
- HSCT Conditioning/ Medications i.e. High dose Busulphan, Gemtuzumab ozogamicin (mylotarg) Inotuzumab, oestrogen and progesterone
- HLA mismatch
- CMV positive serology

Signs and symptoms

- Weight gain
- Jaundice
- Abdominal tenderness (Right Upper Quadrant)
- Hepatomegaly
- Ascites
- Peripheral oedema
- Thrombocytopenia
- Encephalopathy
- Multi-organ failure

Key Learning:
Ursodeoxycholic acid (Urosfalk) used from time of conditioning to day 100 to protect the liver

Diagnosis

- Liver Ultrasound/ CT
- Rising Bilirubin
- Coagulation Test

More information on next page

Hepatic Failure: VOD/SOS Brief overview

Nursing Management

- Comfortable positioning
- Psychological support
- Monitor Weight
- Daily bloods
- Fluid intake and output
- Fluid restriction
- Electrolyte replacement
- Abdominal girth measurement
- Assessment of all sites for bleeding
- Pain assessment
- Avoid hepatotoxic drugs

Medications as prescribed i.e.

- Defibrotide
- Diuretics
- Analgesia

Transfuse platelets as prescribed

Key Learning: Patient may deteriorate rapidly and may require escalation of care/ ICU

Reference: *Wallhult, E., Kenyon, M. and Quinn, B. (2023) 'Early and Acute complications and the principals of HSCT Nursing Care', in Kenyon, M. and Babic, A. (eds) The European Blood and Marrow transplantation textbook for nurses. Switzerland: Springer, pp. 185-216.*

HLH Haemophagocytic Lymphohistiocytosis

Brief overview

A rare, potentially fatal condition in which certain white blood cells build up and damage organs such as the spleen, the brain, the bone marrow, the liver and can also destroy other blood cells. HLH may be EBV driven and may occur post CAR T cell infusion. Macrophage activation syndrome (MAS) is the name of HLH when it is associated with an autoimmune disease.

Presentation

- Fever
- Malaise
- Hepatosplenomegaly
- Jaundice
- General lymphadenopathy
- Cytopenia
- Skin rash

Nursing Management

- Monitor Bloods- assess for Low fibrinogen, High bilirubin, High ferritin, High LDH, High liver enzymes
- Assist in Bone marrow biopsy
- Administer treatment as prescribed

Key Learning: Ferritin is the marker for HLH

Key Learning: This is a rare disorder that will be diagnosed by the medical team however as this is potentially a life-threatening condition, it is vital the nursing team are aware of the requirements to escalate care as required

Reference: *Flava, G. N. et al. (2013) "Haemophagocytic lymphohistiocytisos", American Journal of Clinical Pathology, 139, pp.713-727*

ST JAMES'S HOSPITAL

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Infection in HSCT

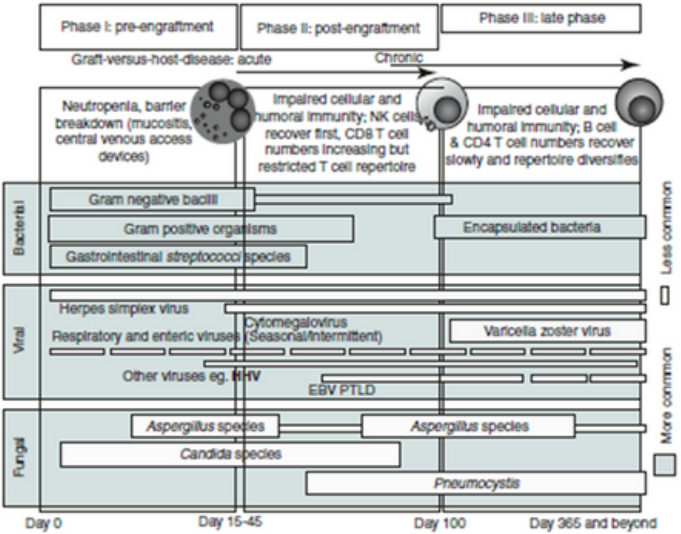
Brief overview

Infection is a major cause of mortality and morbidity in HSCT

The image below outlines a timeline where most common infections occur.

It is divided into three phases:

- Pre-engraftment
- Post- engraftment
- Late Phase



Key Learning: This list is not exhaustive and although there are timelines outlined above these infections can occur at any stage.

More information on next page

Key Learning: Immunocompromised patients remain susceptible to bacterial, viral, fungal and parasitic infections for a prolonged period post HSCT

Key Learning: Toxoplasmosis infection can occur through all phases in HSCT recovery and clinical suspicion of same should be investigated. SJH monitor toxoplasmosis PCR.

Reference: Murray, J. et al. (2023) 'BMT settings, Infection and Infection control', in Kenyon, M. and Babic, A. (eds) The European Blood and Marrow transplantation textbook for nurses. Switzerland: Springer, pp. 123-153

Infectious and Non-Infectious causes of Acute Respiratory Failure (ARF) in HSCT

Brief overview

Infectious Respiratory Failure

Bacterial pneumonia

- Pseudomonas aeruginosa
- Klebiella pneunoniae
- Streptococcus pneumonia
- Pneumocystis Jirovecii Pneumonia (PJP)

Viral Pneumonia

- Herpes Simplex Virus (HSV) pneumonia
- Cytomegalovirus (CMV) pneumonia
- Influenza A + B
- Parainfluenza
- Respiratory Syncytial Virus (RSV)
- Adenovirus
- Rhinovirus
- Enterovirus
- Coronavirus
- Human Metapneumovirus (HMPV)

Fungal Pneumonia

- Pulmonary Aspergillosis

Non Infectious Respiratory Failure

- Peri-engraftment Respiratory Distress Syndrome (PERDS)
- Pulmonary Engraftment Syndrome
- Diffuse Alveolar Haemorrhage (DAH)
- Idiopathic Pneumonia Syndrome (IPS)
- Pulmonary VOD
- Cryptogenic Organizing Pneumonia(COP) previously known as BOOP
- Post Transplant Lymphoproliferative Disorder (PTLD)- rare malignancy secondary to EBV virus

More information on next page

Infectious and Non-Infectious causes of Acute Respiratory Failure (ARF) in HSCT Brief overview

Nursing Assessment

Assessment ABCDE

- Shortness of breath
- Tachypnoea
- Hypoxia
- Cough
- Wheeze
- Rapid or Irregular heartbeat, palpitations
- Weakness/ Fatigue
- Temperature
- Anxiety

Nursing Management includes

- Patient positioning
- Continuous monitoring of vital signs, EWS
- Escalate care as appropriate
- Administer oxygen as indicated
- Consider Venous Blood Gas (VBG) and/ or Arterial Blood Gas (ABG)

Key Learning: Platelet count needs to be above 50 for ABG

- CXR/CT
- Full respiratory viral panel
- Sputum for culture and sensitivity and fungal growth
- Medical team will consider referral to respiratory team/ physiotherapist
- Administer medication as prescribed

Key Learning: Be aware that the nursing management of these respiratory complications are usually the same despite the underlying cause.

Mucositis

Brief overview

Mucositis occurs after HSCT resulting in inflammation of the mucosal membrane.

It is characterised by ulceration and can result in pain, swallowing difficulties and impaired ability to talk.

Mucosal damage can occur in the oral cavity and throughout the full gastro-intestinal tract.

In HSCT mucositis is common and may be very severe.

Good oral hygiene is very important to limit complications associated with mucositis.

Nursing Assessment:

- Assess oral cavity- minimum of once per shift using the WHO grading system
- Assess for Pain
- Assess dietary/ fluid intake
- Assess oral medication
- Inspect for:
  - Erythema
  - Ulcers
  - Infection (HSV and candida)
  - Bleeding

Mucositis WHO Grading System	
Grade 0	**No mucositis.** The mouth is pink and healthy, no lesions. Patient is eating normal diet and fluids.
Grade 1	**Soreness +/_ erythema**. Irritation of the oral mucosa with pain; no overt ulceration and **patient is able to eat a normal diet**
Grade 2	**Ulcers, erythema**. Patient can swallow **normal diet and fluids.**
Grade 3	Ulcers, extensive erythema. Patient **cannot swallow solid diet but can tolerate liquids.**
Grade 4	Mucositis to the extent that alimentation is not possible. Patients are **not able to swallow solids or liquids.** Total parenteral nutrition or tube feeding is necessary.

More information on next page

Nursing Management:

- Wash teeth twice daily with soft toothbrush
- Mouthwashes used 4 times daily after brushing teeth or when required to moisten mucosa as per SJH protocol i.e. Sodium Chloride/ NaCL 0.9% solutions is the first line use for mouth care.
- If mucositis is greater than grade 2 an antimicrobial mouthwash will be prescribed
- Nystatin is required QDS for all HSCT patients
- Administer analgesia (may require subcutaneous infusion of opioids)
- Consider P.O. to I.V. medication/ fluids switch if clinically indicated
- Consider dietitian review and parenteral nutrition if required

Key Learning:

- When the mucousal membrane breaks down bacteria, viruses and fungi can spread into the bloodstream putting the severely immunocompromised patient in the HSCT setting at risk of sepsis and septicaemia.
- HSV occurs frequently in HSCT patients. Viral swab will be required.
- If bleeding occurs switch to mouthwashes and educate patient
- Nystatin medication is used in all immunocompromised patients. This medication **must be swallowed**.
- Mucositis can affect the whole gastro- intestinal tract resulting in pain and inflammation. Diarrhoea is a key consideration.
- Cryotherapy is used to prevent mucositis when using certain conditioning drugs i.e. melphalan.
- Cryotherapy reduces blood flow to the oral cavity by vasoconstriction
- Patients are asked to suck on ice cubes/ ice pops immediately before during and after melphalan is administered

Wallhult, E., Kenyon, M. and Quinn, B. (2023) 'Early and Acute complications and the principals of HSCT Nursing Care', in Kenyon, M. and Babic, A. (eds) *The European Blood and Marrow transplantation textbook for nurses.* Switzerland: Springer, pp. 185-216.

Nausea and Vomiting

Brief overview

Systemic Anti-Cancer Therapy (SACT) induced nausea and vomiting is one of the most frequent side effects experienced by patients undergoing SACT. High dose SACT and Total body irradiation (TBI) have high emetic potential.

Types

- **Acute** – Occurs within a few minutes to hours after SACT administration
- **Delayed Onset** – Occurs more than 24 hours after SACT administration and may last for up to 7 days
- **Breakthrough** – Occurs despite prophylactic antiemetic medication. PRN antiemetics required
- **Anticipatory** – Occurs before starting SACT. A response to a negative previous experience
- **Refractory** – Persistent nausea and vomiting despite antiemetic medication

Antiemetic Agents:

Emetogenic Risk	Antiemetic Regimen
High (>90% risk of emesis)	NK_1 Receptor Antagonist and 5- HT3 Receptor Antagonist and Corticosteroid and Olanzapine
Moderate (>30-90% risk of emesis)	5-HT_3 Receptor Antagonist and Corticosteroid
Low (10-30% risk of emesis)	5-HT_3 Receptor Antagonist and Corticosteroid
Minimal (<10% risk of emesis)	No routine prophylaxis required

Examples of anti- emetic agents:

- NK1 Receptor Antagonist i.e. Aprepitant (Emend)
- 5-HT3 Receptor Antagonist i.e. Ondansetron (Zofran)
- Corticosteroid i.e. Dexamethasone

More information on next page

Nursing Management

- Provide emesis bowel, privacy and offer support
- Administer antiemetics as per SACT protocol
- Assess patient's oral intake, refer to dietitian
- Switch oral medications to IV if required
- If vomiting is persistent platelet transfusions may be required
- Monitor intake and output
- Replace fluids/electrolytes as prescribed
- Consider Graft versus host disease if appropriate i.e. on or after engraftment

Key Learning: Please refer to NCCP SACT protocols for anti-emetic guidelines https://www.hse.ie/nccpchemoprotocols/

Key Learning: Consider higher platelet threshold i.e. > 20 x 109/litre if vomiting is persistent

Reference: *National Cancer Control Programme (NCCP) (2022) NCCP Classification Document for Systemic Anti- Cancer Therapy (SACT) Induced Nausea and Vomiting, Dublin, Ireland. Available at: Reference: Flava, G. N. et al. (2013) "Haemophagocytic lymphohistiocytisos", American Journal of Clinical Pathology, 139, pp.713-727*

Non- Infectious Processes

Non- infectious Processes is a term used by JACIE to group the following conditions together. Patients post HSCT are at risk of developing a number of non- infectious conditions including the following:

Veno Occlusive Disease (VOD)

Congestive heart failure (CHF)

Engraftment syndrome (ES)

Diffuse Alveolar Haemorrhage (DAH)

Bronchiolitis Obliterans Organising Pneumonia (BOOP)**/** Cryptogenic Organising Pneumonia (COP)

Post Transplant Lymphoproliferative Disorder (PTLD)

Idiopathic pneumonia syndrome (IPS)

Wallhult, E., Kenyon, M. and Quinn, B. (2023) 'Early and Acute complications and the principals of HSCT Nursing Care', in Kenyon, M. and Babic, A. (eds) *The European Blood and Marrow transplantation textbook for nurses.* Switzerland: Springer, pp. 185-216.

Oxygen Therapy

Brief overview

Indications for Oxygen Therapy

- Hypoxia
- Cardiac /respiratory arrest
- Respiratory failure
- Severe anaemia
- Cardiac failure or MI
- Shock
- Severe sepsis, burns
- Post operatively
- Carbon monoxide poisoning

Contraindications for Oxygen Administration

- Caution with COPD
- Atelectasis
- Oxygen toxicity
- Diabetic ketoacidosis

There are many different ways to deliver Oxygen therapy. The delivery system chosen is based on clinical need and patient comfort.

Low flow Oxygen Systems

Nasal prongs

Flow rate 1l/min = 24% FiO_2
Flow rate 2l/min = 28% FiO_2
Flow rate 3l/min = 32% FiO_2
Flow rate 4l/min = 36% FiO_2
Flow rate 5l/min = 40% FiO_2
Flow rate 6l/min = 44% FiO_2

Flow greater than 4l/min requires humidification as it is very drying to mucous membranes

Key Learning: Ensure the reservoir bag is inflated before placing on patient (cover valve to allow the reservoir bag to fill with oxygen.

Simple oxygen Face mask

Delivers 35% - 60% oxygen
Flow rate of 6 – 10 l/min (never below 5l/min as CO_2 rebreathing may occur)
Has vents on sides which allow air to leak in, diluting the source of oxygen

Non Rebreather Mask

- Provides the highest concentration of oxygen 95% - 100% at a flow rate of 6 – 15 l/min.
- When the patient exhales air the one-way valve closes and all the expired air is deposited into the atmosphere not the reservoir bag. Therefore, the patient is not rebreathing expired air.
- The reservoir bag should collapse slightly during inspiration

More information on next page

High Flow Oxygen Systems

High flow oxygen systems deliver a specific oxygen concentration at a flow that equals or exceeds the patients peak inspiratory flow rate i.e. Venturi Mask

Venturi Mask

- A high flow oxygen delivery device
- Oxygen from 40% - 50% at flow rate of 4 – 15 l/min
- The mask is constructed to ensure a constant flow of room air blended with a fixed concentration of oxygen

Colour	FiO_2	O_2 Flow
Blue	24%	2 l/min
White	28%	4 l/min
Yellow	35%	8 l/min
Red	40%	10 l/min
Green	60%	15 l/min

Key Learning: The patient may require a change of therapy to AIRVO- please see AIRVO Crib Card

Reference: Irish Guidelines on the Administration of Oxygen Therapy in the Acute Clinical Setting in Adults (2017) Irish Guidelines on the Administration of Oxygen Therapy in the Acute Clinical Setting in Adults. Available at: https://irishthoracicsociety.com/wp-content/uploads/2017/12/O2-Guidelines-Final.pdf

Pain in HSCT

Brief overview

Pain following HSCT is caused by several factors including:

- GvHD (skin liver and gut)
- VOD
- Mucositis
- Haemorrhagic cystitis
- Haemorrhoids
- Headache
- Muscle cramping
- Cardiac Pain
- Pulmonary Pain

Key Learning: Pain is whatever the patient says it is and requires prompt assessment and management.

Key Learning: Some patients will have additional needs i.e. language barrier, cognitive impairment, altered mental status. Be aware these patients will require additional supports to meet these needs.

Nursing Assessment and Management

- Non–verbal cues need to be included in nursing assessment of pain i.e. guarding, facial expressions
- Use a numerical rating scale 0-10
- Assess location, intensity, duration, aggravation/alleviating factors
- Administer analgesia as prescribed via correct route i.e. oral, sub-cutaneous etc.
- Re- assess pain post analgesia
- Opioids are commonly required (morphine)
- Ensure laxatives are administered simultaneously as prescribed
- Provide a supportive environment
- Liaise with medical team, pain management specialists, occupational therapy, palliative care, psycho-oncology, pastoral care teams as appropriate

PRES Posterior Reversible Encephalopathy Syndrome

Brief overview

May occur in patients receiving Ciclosporin or Tacrolimus immunosuppressant's

Signs and Symptoms may include

- Headache
- Hypertension
- Blurred vision
- Altered mental status
- Seizures

Key Learning: Nurse needs to consider risk of bleeding and think of a need to have a increased platelet count.

Reference: *Sudulagunta, S. et al. (2017) PRES Oxford medical case reports, 4.*
Kenyon, M. and Babic, A. (eds) (2023) The European Blood and Marrow transplantation textbook for nurses. Switzerland: Springer

Nursing Assessment

- Assess ABCDE to include neurological observations
- Escalate to medical team as appropriate

Nursing Management

- Ensure patient safety – One on one nursing special may be required
- Medical team may consider discontinuing Ciclosporin/Tacrolimus
- Medical team may consider Urgent MRI/ Referral to Neurology/ Dialysis
- Patient education on MRI scanning
- Administer medications as prescribed e.g. anti-convulsive therapy, analgesia and anti-hypertensive
- Ensure supportive environment for patient to reduce anxiety
- Close monitoring of patient and escalation of care if required

ST JAMES'S HOSPITAL

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Owner: CSN, Deirdre Byrne, CQM, Maria Gillespie
Approved by: ANP, Carmel Ann Galligan CNM, Fidelma Dowdall

Renal Failure

Brief overview

A condition in which the kidneys stop working and are not able to remove waste and extra water from the body or keep the body's chemicals in balance. In HSCT complex medications are used which cause increased pressure on the kidneys leading to renal impairment.

Causes

- Nephrotoxic medications i.e. aminoglycosides, ciclosporine, ambisome
- Tumour lysis
- VOD/ SOS
- Sepsis

Key Learning: In HSCT renal failure is often multi-factorial. Liaise with medical team for plan of care

Nursing Assessment

- Decreased urinary output
- Renal profile evaluation
- Fluid retention
- Oedema
- Nausea
- Weight gain
- Anxiety
- Hypertension
- Confusion
- General malaise

Key Learning: Monitor Urine Output. Ensure urine output is 0.5ml – 1ml/ kg per hour. Escalate if required. May require catheterisation, renal consult and ICU involvement if dialysis if indicated.

Key Learning: Medications require dose restrictions for renal dosing liaise with Pharmacy. Diuretics are used with caution.

More information on next page

Nursing Management

- 4 hourly vital signs/ NEWS
- Intake and output
- Urinary catheter for hourly monitoring
- Monitor Weight
- Monitor mental status
- Daily bloods
- IV Hydration
- Urinalysis, urine samples as requested

Reference: *Wallhult, E., Kenyon, M. and Quinn, B. (2023) 'Early and Acute complications and the principals of HSCT Nursing Care', in Kenyon, M. and Babic, A. (eds) The European Blood and Marrow transplantation textbook for nurses. Switzerland: Springer, pp. 185-216.*

Respiratory Failure

Brief overview

Respiratory failure in HSCT is common. There are infectious and non- infectious causes.

Possible causes include:

- Pneumonia
- Acute Respiratory Distress Syndrome
- Pulmonary embolism
- Pulmonary oedema
- Pulmonary haemorrhage
- Severe shock
- Opiate overdose
- Obesity

Patients may present with the following:

- Shortness of Breath
- Tachypnoea
- Tachycardia
- Cough
- Wheeze
- Confusion
- Cyanosis of skin, lips, fingernails

There are 2 types of respiratory failure Type 1 and Type 2:

Type 1
Occurs when there is failure of heart and lungs to provide enough oxygen to meet the body's needs.

Type 2
Occurs when there is retention of Carbon dioxide (CO_2) in the lungs.

More information on next page

Key Nursing Assessment and Management

- Assess ABCDE and escalate as required
- Pulse Oximetry (SpO_2 Keep >94%)
- Venous blood gas (to assess CO_2 retention)
- Arterial blood gases

Key Learning: Some patients will have a lower SpO_2 threshold due to underlying medical conditions i.e. COPD

Key Learning: Consider platelet count prior to taking ABG i.e. Platelets greater than 50 x 10^9/l

Key Learning: Be aware patients will frequently require oxygen therapy and escalation of oxygen support.
For further information on Oxygen therapy and AIRVO please see Oxygen Therapy Crib Card and AIRVO Crib Card

Irish Guidelines on the Administration of Oxygen Therapy in the Acute Clinical Setting in Adults (2017) *Irish Guidelines on the Administration of Oxygen Therapy in the Acute Clinical Setting in Adults.* Available at: https://irishthoracicsociety.com/wp-content/uploads/2017/12/O2-Guidelines-Final.pdf

Schedule of Bloods to Day 100 post Allogeneic HSCT

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
FBC	FBC	FBC	FBC	FBC	FBC	FBC
RLB	RLB	RLB	RLB	RLB	RLB	RLB
Mg+	Mg+	Mg+	Mg+	Mg+	Mg+	Mg+
LDH	LDH	LDH	LDH	LDH	LDH	LDH
Galactomannan	**Tacrolimus/Ciclosporin** Do not take Trough level from lumen it is infusing through (Blue)	Posaconazole	Galactomannan	**Tacrolimus/Ciclosporin** Do not take Trough level from lumen it is infusing through (Blue)		
Group and Hold (if blood transfusion required)	**CMV/EBV/Adenovirus PCR** Peri/post engraftment	Voriconazole		**CMV/EBV/Adenovirus PCR** Peri/post engraftment		
2 Beta D glucan (ANC <0.1)	**Weekly toxoplasmosis level:** (If patient Toxoplasmosis +ve or equivalent until on Co-trimoxazole. When patient is on Septrin toxoplasmosis level is then 2 weekly. **Note:** Paper microbiology form from intranet filled with 10 mls EDTA	Isavuconazole	2Beta D glucan (ANC <0.1)			
	Ferritin (Car T patients)			Ferritin (Car T patients)		
	Group and hold			Group and hold		

More information on next page

PRN additional bloods to be taken as required including:

- Random blood glucose- if patient on steroids/ TPN
- Blood cultures if temperature 37.5 degrees celsius or above- CVAD aerobic for each lumen every 24 hours if febrile and peripheral aerobic and anaerobic every 72 hours
- Platelet count 30 minutes post platelet transfusion
- VBG if rapid assessment required for deteriorating patient
- CRP to assess inflammation markers
- BNP to assess for excess fluid
- Troponin to assess cardiac function
- Urate to assess tumour burden
- Coagulation screening
- HLA typing for newly diagnosed patients
- Virology HONC 1 and 2
- Cortisol to assess for adrenal insufficiency
- LH/FSH and oestradiol for ovarian insufficiency
- Antibiotic therapeutic level monitoring as required

Adolescents and Young Adults in Haematology

Brief overview

All Adolescents and Young Adults (AYAs) with cancer in Ireland should be discussed at the National AYA Multi-Disciplinary Meeting (MDM). The purpose of this MDM is to ensure that all AYA cancer patients have equitable access to the following:

- Comprehensive personalised age care
- Developmentally appropriate care
- Psychological oncology services
- Palliative care
- Plan/confirm management of each patient in collaboration with the treating hospital
- A holistic health needs assessment to help guide their management.

Key Learning: What is HEEDSSS see link https://ep.bmj.com/content/103/1/15

Contact & Refer via:

AYA Cancer CNS - Email JLewis@stjames.ie Tel: 087-768-5000

MDM Weekly Tuesdays 1300hrs via Webex

MDM referral proforma available on NCCP website: https://www.hse.ie/eng/services/list/5/cancer/about/nccp-children-adolescent-young-adult-caya-cancer-programme/development-of-a-national-adolescent-and-young-adult-aya-cancer-multi-disciplinary-meeting-mdm-.html

More information on next page

Adolescents and Young Adults in Haematology

Brief overview

Any patient actively on cancer treatment or recently completed cancer treatment aged 16-24 should be referred to AYA Haematology in St James Hospital and the AYA team conduct a HEEDSSS Assessment on all AYA patients.

A HEEDSSS assessment is an interview-style assessment to identify areas which require input.

It follows a simple structure remembered by the acronym: **HEADSSS**

Home

Education & Employment

Activities

Drugs/Drinking

Sex

Self-harm, depression & suicide

Safety (including social media/online)

Anaphylaxis

Brief overview

A severe and life threatening, general or systemic hyper-sensitivity reaction. Affects airway and/or breathing and/or circulation and is usually associated with skin and mucosal changes.

Recognising Anaphylaxis

- Sudden onset
- Life threatening Airway, Breathing, Circulation problems
- Skin or mucosal changes i.e. urticaria, flushing, itch, swollen eyelids, lips, tongue, throat

Assess A B C D E

Airway: Difficulty swallowing, hoarse voice, stridor, treat airway obstruction as emergency

Breathing: Respiratory rate, SOB, wheeze, cyanosis, fatigue, respiratory arrest

Circulation: Signs of shock – tachycardia, hypotension (systolic < 90 mm/Hg), collapse, MI, ECG changes, Cardiac arrest

Disability: Assess for levels of consciousness i.e. confusion secondary to hypoxia

Exposure: Head-to-toe examination - assessing for skin changes

Management

- Remove trigger i.e. stop infusion
- Seek assistance
- IM adrenaline -vial on crash trolley 1mg/ml (1:1000) concentration
- Position patient
- Give oxygen 100% non-rebreather mask
- IV fluid challenge
- Continuous monitoring – vital signs, urinary output, ACVU, ECG
- Secondary medications – piriton, hydrocortisone, salbutamol nebuliser
- ICU review

Key Learning: Repeat IM adrenaline after 5 minutes if no response

Reference: *St James Hospital (2020) Anaphylaxis Management in Adults Guidelines SJH ; Pharma 013, available at https://www.stjames.ie/intranet/ppgs/clinicalsupport/SJHPHARM013.pdf*

ST JAMES'S HOSPITAL

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Arranging Sperm Banking on Denis Burkitt Ward

Brief overview

CNM is responsible for arranging sperm banking. There are 3 steps involving

1. Bloods
2. National Viral Reference Laboratory (NRVL)
3. SIMS (Swords)

NRVL

Phone NRVL 01 7164401 and ask for blood samples to be treated as Urgent, bloods will be placed on emergency list

SIMS

Complete Referral form CF-0190 and email infoswords@sims.ie
Ring SIMS to arrange appointment on 01 8072732

Bloods

- Nurse takes 2 serum and 2 EDTA blood bottles
- Handwrite patient details
- Check details with patient's ID band
- Print and complete the Central Pathology Laboratory Form (Found on intranet: Hospital Forms- Laboratory request forms- Manual ordering- Microbiology forms)
- Blood tests required
    - HIV 1 and 2
    - Hep C Ab
    - Hep B surf Ag
    - Hep B core Ab
    - CMV IgG
- Mark form as URGENT and write "Please send copy to Sims Swords"
- Arrange Taxi to take bloods to:

    National Viral Reference Laboratory,
    University College Dublin,
    Belfield, Dublin 4

- Use taxi voucher in CNM office (taxi number LYNK 01 8727272)
- Blood results available on Medbridge on EPR
- Username hopeuser
- Password hopevir

Cardiac Dysfunction

Brief overview

Common Cardia Problems include:

- Cardiac arrhythmias e.g. Atrial Fibrillation (afib)
- Pericardial effusion/tamponade
- Heart failure
- Cardiac arrest

Causes and Risk factors:

- Older age
- History of cardiotoxic drugs e.g. anthracyclines, high dose cyclophosphamide, tyrosine kinase inhibitors (TKIs) (e.g. sorafenib, ibrutinib)
- Ratiotherapy
- Renal dysfunction
- Cardiac history
- Lower ejection fraction on ECHO
- Changes on ECG
- Graft Vs Host Disease (GvHD)

Diagnosis

- Electrocardiogram ECG
- Echocardiography ECHO
- Cardiac MRI
- Bloods e.g. Troponin and Bnp

NURSING ASSESSMENT

Assessment ABCDE

- ✓ Shortness of breath
- ✓ Cough
- ✓ Wheeze
- ✓ Rapid or Irregular heartbeat, palpitations
- ✓ Weakness / Fatigue
- ✓ Chest / Arm pain
- ✓ Ankle oedema

More information on next page

Nursing management

- 4 hourly vital signs, EWS
- Administer oxygen as indicated
- Administer medications as prescribed e.g. Anti-hypertensive, Beta-blockers, Ace inhibitors
- ECG
- Discussion and referral to cardiology
- Strict intake and output
- Diuretics as prescribed
- Administer analgesia as prescribed
- Supplement electrolytes e.g. consider keeping Magnesium greater than 1.0mmol/l Potassium greater than 4.0mmol/l as prescribed
- Discuss need for increased transfusion threshold e.g. Red cells to be kept greater than Hb 9.0 g/dl
- Telemetry as ordered
- Baseline ECHO pre Anthracyclines, repeat ECHO as clinically indicated
- Emergency care as per heartcode BLS as required

Atas, et al. (2020) 'Cardiac complications in patients who underwent hematopoietic stem cell transplantation', *Journal of Cancer Research and Therapeutics,* 16(1), pp. 53-59

Care of Immunocompromised Patients

Standard precautions

- Hand Hygiene
- Personal Protective Equipment (PPE)

Protective isolation for patients undergoing Haematopoietic Stem Cell Transplant (HSCT)

- Single Room
- Ensuite facilities
- HEPA filtration

Discharge advice

- Discharge adhoc checklist on EPR
- Written Discharge advice information

General Nursing Tips

- Aseptic non touch technique (ANTT)
- Daily cleaning of patient's room
- Bed linen changed daily
- Monitor vital signs 4-hourly. Early Warning Signs (EWS). Be alert for sepsis – Sepsis 6
- Avoid paracetamol which can mask a fever
- Remember steroids can mask a fever
- Daily bloods (FBC, Renal, Liver, Bone, Magnesium, LDH)
- Food Hygiene and Dietary advice as per Safe food guideline
- Visiting restricted to 2 family members/close friends
- Patients encouraged to:
  - Shower daily
  - Use perfume free, alcohol free skin products
  - Perform oral care as per protocol, use soft toothbrush
  - Avoid shaving with a bladed razor
- Caution with IM injections
- Caution with invasive procedures
- Administer Prophylactic medication (antiviral, antifungal, anti – pneumocystis) as prescribed

Reference: Murray, J. et al. (2023) 'BMT settings, Infection and Infection control', in Kenyon, M. and Babic, A. (eds) The European Blood and Marrow transplantation textbook for nurses. Switzerland: Springer, pp. 123-153

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