CHEMOTHERAPY - WHAT'S IN THIS SESSION FOR YOU

- To get an understanding of how chemotherapy works.
- Be familiar with the potential side effects of chemotherapy.
- Explore your role in caring for patients having/post chemotherapy.
- Review complications related to chemotherapy.
WHAT IS CHEMOTHERAPY?

• Cytotoxic chemotherapy agents are used to treat cancers, leukaemia's and lymphomas. There are over 50 such drugs, which can be used as single agents, or in combination, orally, IV and subcutaneously.

• Cytotoxic chemotherapy refers to agents whose mechanisms of action cause cell death or prevent cell growth, generally through inhibiting microtubule function, protein function, or DNA synthesis.

• Cytotoxic chemotherapy mechanisms of action may be cell cycle-dependent—arresting cancer cell growth at specific phases in the cell cycle.

• To fully understand chemotherapy it is important to have an understanding of the cell cycle.
The cell cycle comprises of four stages. The cell must progress through these in order to duplicate its chromosomes and divide.

These are:
- **G0 – Normal functions**
- **G1 phase (Gap 1)** During this phase, the cell is growing and preparing to double its DNA.
- **S phase (DNA synthesis)** This is the phase in which the amount of DNA is doubled.
- **G2 phase (Gap 2)** The cell prepares for mitosis.
- **M phase (mitosis)** Division of the nucleus.
HOW DOES CHEMOTHERAPY KILL CANCER CELLS?

Chemotherapy damages cells as they divide.

In the centre of each living cell is the nucleus, this is the control centre of the cell. It contains chromosomes, which are made up of genes.

These genes have to be copied exactly each time a cell divides into 2 to make new cells.

Chemotherapy damages the genes inside the nucleus of cells.

Some drugs damage cells at the point of splitting. Some damage the cells while they’re making copies of all their genes before they split. Chemotherapy is much less likely to damage cells that are at rest, such as most normal cells.

A combination of chemotherapy drugs is often used. This will include drugs that damage cells at different stages in the process of cell division.
GOALS OF CHEMOTHERAPY

Curative (eradication).

- **Induction**: Given with the intent of inducing complete remission.
- **Consolidation**: Repetition of induction chemotherapy, aim to prevent relapse.
- **Maintenance**: Long term, low dose, single or combination chemotherapy in a patient who has achieved complete remission, again prevent relapse.

Palliative

- Provide comfort
- Improve/prolong quality of life.
SIDE EFFECTS OF CHEMOTHERAPY

The goal of chemotherapy is to destroy cancer cells. Traditional chemotherapies work by killing cells that divide rapidly. But as they wipe out fast-growing cancer cells, they can also damage fast-growing healthy cells.

Damage to healthy blood cells can lead to side effects such as fatigue or infection. Chemotherapy can also damage the cells that line mucous membranes throughout the body, including those inside the mouth, throat and stomach. This can lead to mouth sores, diarrhoea or other issues with the digestive system. And damage to cells at the hair roots, or follicles, can lead to hair loss.
## Side Effects Classifications

<table>
<thead>
<tr>
<th>Onset</th>
<th>Time</th>
<th>Side Effect</th>
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<tbody>
<tr>
<td>Immediate</td>
<td>Occurs within thirty minutes of administration.</td>
<td>Venous pain, Facial/body flushing, Cardiac Arrhythmias, Hypotension, Hypersensitivity, Anaphylaxis, Haemorrhagic cystitis, Abnormal tastes and smells</td>
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<tr>
<td>Short to medium term</td>
<td>Occurs within hours and up to seven days of administration.</td>
<td>Discoloration of urine, <strong>Tumour lysis syndrome</strong>, Nausea and vomiting, mucositis, CNS Toxicity, Anorexia, Fatigue, Constipation, Diarrhoea</td>
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<tr>
<td>Medium to long term</td>
<td>Occurs later than seven days and may be cumulative in nature.</td>
<td><strong>Bone Marrow depression</strong>, Alopecia, Liver dysfunction, Renal toxicity, Cardiac toxicity, Peripheral neuropathy, Pulmonary Fibrosis, Changes in fertility</td>
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CHEMOTHERAPY-INDUCED NAUSEA AND VOMITING (CINV)

When chemotherapy enters the body, sensors in the digestive system and brain detect its presence as a foreign substance. In a complex series of signals among the brain and the mouth, stomach, small intestine and bloodstream, the medication stimulates the “vomiting center” in the brain. Several chemicals, including ones called serotonin and substance P, are released, triggering the nausea and vomiting reflex. This is the body’s effort to get rid of the foreign substance.

Some people experience nausea and vomiting immediately “acute nausea and vomiting.” Other patients develop it during the next few days. This is called “delayed nausea and vomiting.”
TREATING NAUSEA AND VOMITING. MEDICATION (IV, ORAL AND SC).

**Corticosteroids.** Related to the natural hormone cortisol, they are widely used to help prevent CINV. An example is prednisolone.

**Serotonin antagonists.** This type of medication blocks natural substances from sending a signal to the brain that causes vomiting. Ondansetron and granisetron.
Dopamine antagonists. Such as Metoclopramide are often prescribed for “breakthrough” nausea and vomiting.

NK-1 inhibitors. Are the newest class of medicines to prevent CINV.

The NK1 inhibitors work by blocking the binding of substance P and prevents the emetic (nausea) signal from being transmitted. It is Available as a capsule called aprepitant. Which is taken before a chemotherapy session and for two days afterwards. Fosaprepitant is the IV version and is converted to aprepitant in the body.
Anti-anxiety drugs. Medications such as lorazepam and Levomepramazine are used to help block nausea and vomiting. These medications are called H2 receptor antagonists and block the formation of stomach acid. This reduces indigestion and heartburn, which can sometimes lead to nausea and vomiting.
**FATIGUE**

What is fatigue?

Fatigue is not like ‘normal’ tiredness, the tiredness you feel after you have been busy, working hard or exercising. It is extreme tiredness that doesn’t go away when you rest or after a sleep.

Fatigue can be described as a ‘paralysing’ feeling or as ‘being drained of energy’.

A combination of the chemotherapy itself, Stress, low Haemoglobin levels, lack of sleep and the malignancy can cause fatigue, it can be a problem that seriously effects patients physical and mental wellbeing.

Treatment.

Encourage patients to be honest when they are tired and get a good amount of rest, encourage them to keep active but don’t do too much, we have a haematology rehabilitation group run by physiotherapy for patients post harsh transplant conditioning.
TUMOR LYSIS SYNDROME

Tumour lysis syndrome (TLS) is an oncology emergency. It is a serious and potentially life-threatening complication of cancer therapy.

It occurs when cancer treatments cause the destruction (or lysis) of a large number of rapidly dividing cancer cells, overwhelming the body’s ability to excrete the end products of cell death.

As cells die they release potassium, phosphorous and nucleic acids into the systemic circulation. If the volume released exceeds the body’s ability to metabolise and excrete them it can cause electrolyte imbalances.

These place the patient at risk of renal failure and cardiac abnormalities including ventricular tachycardia and cardiac arrest.
SIGNS AND SYMPTOMS OF TUMOUR LYSIS SYNDROME

- High potassium
- High phosphate
- High urea
- Decreased urine output
- Flank pain
- Hypertension
- Tachycardia
- ECG changes
- Cardiac arrhythmia

- Nausea and vomiting
- Diarrhoea
- Abdominal colic
- Muscle weakness
- Muscle cramps
- Twitching
- Confusion
- Delirium
Patients at high risk of developing TLS are often prescribed allopurinol as prophylaxis before commencing their chemotherapy. Intravenous fluids are also often given to optimise urinary output before, during and after chemotherapy administration. The patients urine output and fluid balance must be monitored carefully to ensure a good diuresis has been achieved. Rasburicase is the main treatment.
Bone marrow depression is a temporary cessation of the bone marrow’s ability to produce blood cells.

The three blood cells made in the bone marrow.

- **White blood cells** - fight infection and disease.
- **Red blood cells** - carry oxygen throughout the body.
- **Platelets** - help control bleeding by forming blood clots.

Low levels are called neutropaenia, anaemia, and thrombocytopenia.
NEUTROPAENIA

Neutrophils play a vital role in the body’s defence mechanism against infection, they recognise, attack and kill bacteria by engulfing them through the process of phagocytosis. Patients who have low levels of neutrophils have an increased susceptibility to infections. This can lead to neutropenic sepsis.
Neutropenic sepsis is a potentially life threatening emergency. Patients with a reduced neutrophil count are at high risk of developing sepsis and fast. If this is not treated immediately it can become fatal in a matter of hours.

The usual signs of infection may be absent in neutropenic sepsis as the immune response is inhibited, in some cases the first and only sign of infection may be a raised temperature. Other patients may present with non-specific symptoms such as “feeling generally unwell”.

Any signs of infection in a neutropenic patient requires immediate assessment by experienced haematology staff.

How do we treat neutropenic sepsis?

Patients will be treated with urgent antibiotics and blood cultures. Where appropriate they may be given IV fluids and oxygen. Routine bloods and lactate samples will be obtained.
**THROMBOCYTOPAENIA**

Reduction in platelet count leading to increased risk of bleeding. The drop in platelet count may occur 7 – 10 days after treatment depending on drug dose. The count at which it is considered acceptable to give treatment may vary across specialities and the cancer network.

Patient education is essential so the patient is aware of the need to report early any signs of a reduced platelet count.
THROMBOCYTOPAENIA
SYMPTOMS

- Blood in stools
- Epistaxis
- Bleeding Gums
- Prolonged bleeding after trauma
- Haematuria
- Pain in joints
- Rash (purpura) – bleeding under the skin
- Unexplained Bruising

Patients must urgently report any of the above.
ANAEMIA

Anaemia is the reduction in the red blood cell count. If the anaemia is problematic the patient may require a blood transfusion. In Haematology we usually transfuse if patients HB drops below <80.
SIGNS AND SYMPTOMS OF ANAEMIA

SYMPTOMS
- Fatigue
- Weakness
- Palpitations
- Tinnitus
- Headache
- Cognitive Impairment
- Dizziness
- Apathy

SIGNS
- Pallor
- Tachycardia
- Cardiac failure
MUCOSITIS

Oral mucositis is a common complication of cancer chemotherapy. It begins 5-10 days after the initiation of chemotherapy and lasts 7-14 days. Chemotherapy-induced oral mucositis causes the mucosal lining of the mouth to atrophy and break down, forming ulcers and sores.
# MUCOSITIS

## Signs and symptoms

Patients typically experience the following:

- Oral pain and burning
- Ulcerations
- Difficulty eating, drinking, and speaking
- Difficulty with mouth care regimens

<table>
<thead>
<tr>
<th>Grade 0</th>
<th>Grade 1</th>
<th>Grade 2</th>
<th>Grade 3</th>
<th>Grade 4</th>
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</thead>
<tbody>
<tr>
<td>No change</td>
<td>Soreness/erythema</td>
<td>Erythema, ulcers; can eat solid food</td>
<td>Ulcers; requires liquid diet only</td>
<td>Alimentation (nourishment) not possible</td>
</tr>
</tbody>
</table>
MUCOSITIS TREATMENT

• Good and regular oral hygiene
• Regular mouthwashes (lidocaine, oxetacaine, cocaine, difflam, normal saline)
• Protect lips with moisturiser
• Avoiding acidic foods, alcohol and spicy foods.
• Analgesia (Pecfent, Oxynorm S/C, transdermal patches).
1. How do you personally come in contact with Haematology patients?

2. Discuss what action you would take if a post chemotherapy patient in your care and setting had the below…
   - A temperature
   - Grade 1 mucositis
   - Flank pain and a reduced urine output

3. Discuss if you now feel more prepared to care for haematology patients post chemotherapy? If the answer is no discuss what would make you feel more prepared.

Clerical staff – your opportunity to have a 5 min chin wag.
CONCLUSION

Chemotherapy causes damage to both healthy cells and the cancerous cells we are aiming to destroy, this leads to multiple complications following chemotherapy, these often require medical intervention.

I really hope you have enjoyed the session and feel more confident in caring for haematology patients.
QUESTIONS RECAP?

• What is Tumor Lysis syndrome?

• How do we treat Chemotherapy induced nausea and vomiting?

• Name some symptoms of Anaemia?

• How many grades of Mucositis stages are there?