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NURSING BEST PRACTICE GUIDE

Myelosuppression

This document is one of the Myeloma Academy Nursing Best Practice Guides for the Management of Myeloma series. The purpose of this Guide is to enhance knowledge and inform nursing practice when caring for myeloma patients with myelosuppression.

After reading this, you should be able to:

- Define myelosuppression
- Understand the causes, symptoms and consequences of myelosuppression in myeloma patients
- Be aware of the clinical testing and assessment tools for myelosuppression
- Understand the treatment for and management of myelosuppression
- Understand the nurse's role in the assessment, intervention and management of myelosuppression and in the patient education of this complication

The information contained within this Guide should be used in conjunction with local policies, protocols and best practice guidelines in oncology.

Background

Myelosuppression is the term used to describe a condition in which bone marrow activity is decreased, resulting in the reduced production of red blood cells, white blood cells and platelets (cytopenia).

In myeloma, myelosuppression may be caused by active suppression of haematopoiesis by myeloma cells[1, 2]. It is also a common and expected side-effect of many treatments for myeloma including thalidomide, Velcade®, Revlimid®, cyclophosphamide and Melphalan[3-5].

KEY FACTS

- Myelosuppression is a serious and potentially life-threatening complication of myeloma and also a common side-effect of many anti-myeloma treatments
- Anaemia, neutropenia and/or thrombocytopenia as a result of myelosuppression can interrupt treatment and reduce quality of life
- Early intervention and appropriate management of myelosuppression and its consequences are important in improving patient outcomes, overall outlook and survival

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The clinical consequences of myelosuppression are:

- Anaemia – a decrease in red blood cells resulting in fatigue, shortness of breath and malaise
- Leukopenia – a decrease in total white blood cells with neutrophils most commonly affected (neutropenia), increasing the risk of bacterial, viral and fungal infection
- Thrombocytopenia – a decrease in platelets increasing the risk of bruising and bleeding

Anaemia is present in approximately 75% of patients at diagnosis while neutropenia is seen in 20% and thrombocytopenia is present in 5% of patients at diagnosis[6].

Of these, neutropenia is potentially the most serious with bacterial infection being a major contributing factor to the high rate of morbidity and mortality amongst newly diagnosed patients[7].

Improvements can be made with anti-myeloma treatment together with appropriate supportive care. However, most anti-myeloma treatments themselves have the potential to cause some degree of myelosuppression. This can often limit the choice, dose and/or duration of treatment depending on the toxicity to the bone marrow.

Myelosuppression undoubtedly represents a significant complication in myeloma but if identified, treated and managed effectively has minimal impact on optimum treatment options and patients' quality of life.

The following describes the medical approach to the treatment of myelosuppression and provides guidance on nursing interventions and nursing management of myeloma patients with myelosuppression.

GENERAL RECOMMENDATIONS:

- All patients should have their full blood counts assessed and monitored on a regular basis
- Regular assessment of vital signs is important to help identify anaemia, neutropenia and thrombocytopenia as early as possible
- Signs and symptoms of anaemia, neutropenia and/or thrombocytopenia should be recognised so that the appropriate intervention can be instigated
- Signs of febrile neutropenia should be recognised as a medical emergency and managed immediately to prevent sepsis

NURSING RECOMMENDATIONS:

- Patients and their families should be informed about the importance of early detection and reporting of symptoms related to anaemia, infection and thrombocytopenia
- The impact of anaemia, neutropenia and thrombocytopenia on the patient's daily activities and quality of life should be assessed and monitored on a continual basis
- Patients and their families should be educated on effective preventative measures particularly against infection

Medical Approach

The treatment and management of myelosuppression in myeloma patients depends on the underlying cause and the type of blood cell that is affected. The following describes the general medical approach taken to manage myeloma patients with myelosuppression.

Assessment

A full blood count (FBC) provides a good indication of myelosuppression and identifies the blood cell type(s) that are affected. These are determined by the following parameters:

- Red blood cell count
- Haemoglobin level
- Total white blood cell count
- Differential neutrophil, lymphocyte, monocyte, eosinophil and basophil counts
- Platelet count

Assessment of anaemia

Anaemia is defined as a decrease in the number of red blood cells in a given volume of blood or a reduction in the concentration of haemoglobin, below the normal range. In general, haemoglobin concentrations are more widely used to assess anaemia.

The normal level of haemoglobin is different in males and females. For men, anaemia is typically defined as haemoglobin levels <130 g/L and in women as haemoglobin levels <120 g/L. These definitions may vary slightly depending on the laboratory references used.

The severity of anaemia can be graded based on the haemoglobin value (see Table 1) as mild, moderate or severe.

Table 1: Grading of anaemia

Grade	Haemoglobin levels
1 Mild	Hb 100 – 120 g/L
2 Moderate	Hb 80 – 100 g/L
3 Severe	Hb 65 – 80 g/L
4 Life-threatening or disabling	Hb <65 g/L

However, intervention and management should also take into account any associated symptoms of anaemia because of the variation in normal haemoglobin levels amongst individuals and their ability to cope with its reduction.

Patients should therefore be assessed for the following symptoms:

- Fatigue
- Shortness of breath (dyspnoea)
- Pallor
- Light-headedness
- Hypotension
- Tachycardia
- Loss of libido
- Reduced cognitive function
- Emotional distress

Further assessments should be made where appropriate if the patient presents with any of the above symptoms:

- Vital signs including temperature, blood pressure (BP), pulse, respiratory rate and oxygen saturation
- Full patient/family history to exclude other possible causes of anaemia
- Areas of bleeding
- Nutritional status to exclude iron, folate and vitamin B12 deficiency
- Psychological assessment

Assessment of neutropenia

Neutropenia is defined as a decrease in circulating neutrophils in peripheral blood below the lower limit of normal of 4.0 x 10^9/L. The severity of neutropenia can be graded as described in Table 2.:

Neutropenia itself does not cause any symptoms but if a patient has an infection, they may present with one or more of the following symptoms depending on the cause of the infection:

- Fever/pyrexia (>38˚C)
- Chills/sweating
- Change in cough or new cough
- Sore mouth or new mouth sore
- Nasal congestion
- Burning or pain with urination
- Dysuria
- Diarrhoea
- Nausea/vomiting
- Redness, swelling, or soreness in any area
- Unusual vaginal discharge or irritation
- Pain in the abdomen
- New onset of pain
- Changes in mental status
- Rash

Further investigation where appropriate should be performed if any of the above symptoms are present:

- Vital signs including temperature, BP, pulse, respiratory rate and oxygen saturation
- Peripheral and central line blood cultures
- Urinalysis
- Bacterial and viral swabbing of possible infection sites
- Samples of sputum and stool
- Infection markers e.g. c-reactive protein (CRP)
- Chest X-ray
- Oral assessment, such as the Oral Assessment Guide[8]

Table 2: Grading of neutropenia

Grade	Neutrophil count
1 Mild	1.5 – 4.0 × 10^9/L
2 Moderate	1.0 – 1.5 × 10^9/L
3 Severe	0.5 – 1.0 × 10^9/L
4 Life-threatening or disabling	<0.5 × 10^9/L

Assessment of thrombocytopenia

Thrombocytopenia is defined as a platelet count in peripheral blood less than 150 x 10^9/L. Grading of the severity of thrombocytopenia is described in Table 3

:

If thrombocytopenia is suspected, patients are likely to present with one or more of the following symptoms:

- Bruising
- Petechiae/purpura
- Mucosal membrane bleeding/ bruising
- Blood in stool, urine or vomit
- Bleeding from body orifices
- Bleeding from central or peripheral lines/ urinary catheters

Any of these symptoms should be followed-up with the appropriate investigations:

- Full patient/family history for other possible causes of thrombocytopenia
- Vital signs including temperature, BP, pulse, respiratory rate and oxygen saturation
- Physical examination
- Coagulation screen where indicated (e.g. prothrombin time, partial thromboplastin time)
- Red blood cell count for anaemia
- Nutritional status

Table 3: Thrombocytopenia grading

Grade	Platelet count
1 Mild	100 – 150 × 10^9/L
2 Moderate	50 – 75 × 10^9/L
3 Severe	25 – 50 × 10^9/L
4 Life-threatening or disabling	<25 × 10^9/L

- Urinalysis

Treatment

The treatment and management of anaemia, neutropenia or thrombocytopenia is largely dictated by the underlying cause and severity of each condition as described below:

Treatment for anaemia

Myeloma-related anaemia

Anaemia as a result of the myeloma itself where patients are symptomatic or asymptomatic may improve as the myeloma is controlled by treatment. These patients should be observed initially.

If symptoms are reducing quality of life, then blood transfusions may help to correct moderate to severe anaemia in the short-term.

Alternatively, a course of erythropoiesis-stimulating agents (ESA) may help to increase red blood cell production and improve the anaemia. The recommended course of ESA treatment with a target haemoglobin concentration of 120g/L is:

- Darbepoetin – 6.25 μg/kg body weight once every three weeks
  or
- Epoetin alpha – 450 units/kg body weight once weekly, or
- Epoetin beta – 450 units/kg body weight once weekly

Treatment-induced anaemia

The National Institute for Health and Care Excellence (NICE) has approved ESAs for any patient who is receiving chemotherapy for any form of cancer and develops anaemia[9]. An initial trial of ESA is a reasonable option for any patient who has treatment-induced anaemia, and may avoid the need for drug dose-reduction. Anaemia as a result of treatment may be improved or corrected by reducing the drug dose or temporarily stopping treatment, if ESAs are ineffective. If symptoms continue, patients should undergo blood transfusions.

Treatment for neutropenia

Neutropenia as a result of the myeloma may improve with anti-myeloma treatment but those with treatment-related neutropenia should be dose-reduced in the first instance and given granulocyte-colony stimulating factor (G-CSF) if infection is recurrent.

Neutropenic patients are at a greater risk of infection with *Streptococcus pneumonia*, *Haemophilus influenzae* and gram negative bacilli the most frequent causes of infection in myeloma patients[7].

Infection causing a febrile episode is regarded as an emergency situation and prompt intravenous (IV) treatment with broad spectrum antibiotics that cover the above mentioned is essential to prevent sepsis from occurring.

Treatment should continue until the neutrophil count has recovered and fever has abated. IV hydration and antipyretics should also be considered where necessary. Aminoglycosides should be used with caution even in patients with normal renal function.

Although antibiotic prophylaxis may have a role in reducing infection rates, routine prophylactic use is recommended for patients only in the stem cell transplant setting. General use has the potential for increasing *Clostridium difficile* infection and inducing antibiotic resistance and is therefore not recommended in any other setting.

Prophylactic IV immunoglobulin may have some benefit in reducing infection rates in patients in plateau phase[10, 11] and a dose of IV immunoglobulin of 500 mg/kg administered every month for up to six months may benefit patients who have severe recurring infections.

Anti-viral prophylaxis with acyclovir 200 mg po tds is recommended for those receiving Velcade treatment, following autologous stem cell transplantation (for three months post-transplant) or those with recurrent herpetic infection.

Vaccination against influenza, *Streptococcus pneumonia* and *Haemophilus influenza* is recommended even though efficacy is not always guaranteed[12].

Treatment for thrombocytopenia

As with myeloma-related anaemia and neutropenia, myeloma-related thrombocytopenia may improve with anti-myeloma treatment.

Transient thrombocytopenia is common with anti-myeloma treatment particularly with Velcade during the dosing period between days 1 – 11. Platelet levels normally return to baseline during the resting period[13] but patients should be closely observed.

If platelet counts fall below 25 x 10^9/L, treatment should be withheld until platelet

Nursing interventions and management

Nurses play a key role in implementing supportive care to myeloma patients with myelosuppression.

The following provides best practice guidance for nursing interventions related to the assessment, treatment and monitoring of myelosuppression and nursing management involving a more holistic approach to care and in educating patients and their families about myelosuppression and its consequences.

Interventions

- Make sure that complete blood count values are taken at regular intervals dependent on treatment and stage of myeloma
- Make sure that the results of other relevant tests are available e.g. blood cultures to determine source of infection, oxygen saturation to determine severity of anaemia etc.
- Be vigilant for signs and symptoms of anaemia, neutropenia and/or thrombocytopenia and report them to the haematologist
- Ask patients questions to assess their performance status, psychological wellbeing and quality of life on a regular basis
- If patients are receiving an erythrocyte stimulating agent (ESA), make sure baseline erythropoietin level is measured beforehand and appropriate thromboprophylaxis is given

Management

- Provide written information to help patients understand about myelosuppression
- Discuss with patients the importance of blood count monitoring and outline the normal range of values
- Inform patients of the potential consequences of myelosuppression
- Educate patients and their families about the signs, symptoms and implications of anaemia, infection and thrombocytopenia
- Ensure that the patient has a working thermometer and they are able to take their own temperature
- Ensure patients understand the importance of reporting symptoms early and that they know who to report to, providing them with emergency contact numbers if necessary
- Discuss the risks and benefits associated with the different interventions for anaemia, neutropenia and thrombocytopenia

- Advise patients and their families about patient safety and fall precautions particularly those who are anaemic or thrombocytopenic
- Encourage patients to combat fatigue by taking regular gentle exercise. Coordinate referral to a physiotherapist if necessary
- Identify any issues which may have an impact on the patient's quality of life, ability to work and emotional wellbeing. Coordinate referral to other healthcare professionals where appropriate
- Educate patients and their families on preventative measures to reduce the risk of infection. This should include the importance of:
  - Regular effective hand-washing and overall personal hygiene to reduce contact exposures
  - Adequate skin care with lotion to keep skin moist to reduce the risk of skin breaks and wounds
  - Avoiding crowds and people with obvious signs of infection
  - Maintaining good oral hygiene and using antimicrobial mouth rinses if necessary
  - Eat only fruits and vegetables that can be washed, peeled or cooked
  - Eat only meat that is fully cooked
  - Practising good kitchen hygiene, i.e. chilling foods, separating raw and cooked meats, eating food that is in date and using separate chopping boards for food preparation
  - Avoid drinking unpasteurised milk or other unpasteurised beverages and eating raw or undercooked eggs
  - Avoid activities that increase the risk of exposure to infection such as damp environments, gardening, handling pet litter etc
- Educate patients and their families on preventative measures to reduce the risk of bleeding such as:
  - Avoiding the use of non-steroidal anti-inflammatory drugs which have an anti-platelet effect such as aspirin, ibuprofen and naproxen unless instructed otherwise
  - Avoiding activities that can result in bruising or bleeding e.g. contact sports, body piercing, tattooing, anal sex etc.
  - Exercising gentle oral care to avoid bleeding of the gums e.g. using a soft toothbrush, taking care when flossing
  - Using prophylactic stool softeners where indicated to avoid constipation
  - Being careful not to cause cuts, wounds to the skin or blunt trauma to the body
- Promote interdisciplinary communication between colleagues to ensure successful management of each patient
- Stay current with new developments in preventing, treating and managing myelosuppression and be aware of novel treatments that may cause myelosuppression

Summary

Myelosuppression is a recognised complication of myeloma and an expected side-effect of several of its treatments. The consequences of myelosuppression can be debilitating and even life-threatening but, if identified early, can be managed effectively through careful monitoring, dose reduction, appropriate treatment and prevention.

Nurses are at the forefront of providing comprehensive supportive care for myeloma patients with myelosuppression. Through timely assessment and management, they can make a significant improvement in quality of life and patient outcomes.

Abbreviations

- **BP** Blood pressure
- **CRP** C-reactive protein
- **CTCAE** Common terminology criteria for adverse events
- **ESA** Erythropoiesis-stimulating agent
- **FBC** Full blood count
- **G-CSF** Granulocyte-colony stimulating factor
- **g/L** Grams per litre
- **Hb** Haemoglobin
- **IV** Intravenous
- **µg/kg** Micrograms per kilo
- **mg** Milligram
- **NICE** National Institute for Health and Care Excellence
- **NSAID** Non-steroidal anti-inflammatory drug
- **po** Orally (per os)
- **tds** Three times daily

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ABOUT THE NURSING BEST PRACTICE GUIDES

The Nursing Best Practice Guides have been developed by Myeloma UK and an expert nursing advisory group, with input from relevant specialist healthcare professionals. They have been developed to enhance nurse knowledge, inform nursing practice and support nurses in the delivery of high quality treatment and care to myeloma patients and families.

Nursing Best Practice Guide series:

- ★ Complementary therapies
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ABOUT THE MYELOMA ACADEMY

The Myeloma Academy provides healthcare professionals involved in the treatment and care of myeloma patients with access to comprehensive accredited learning resources and tools in an innovative online environment and through educational events.

It supports the education and continual professional development of myeloma healthcare professionals so they can provide optimum patient-centred treatment and care within the current UK health and policy environment.

For more information visit:
www.myeloma-academy.org.uk or by email **academy@myeloma.org.uk**

ABOUT MYELOMA UK

Myeloma UK is the only organisation in the UK dealing exclusively with myeloma.

Our mission is to provide information and support to people affected by myeloma and to improve standards of treatment and care through research, education, campaigning and raising awareness.

For more information about Myeloma UK and what we do, please visit **www.myeloma.org.uk** or contact us at **myelomauk@myeloma.org.uk** or **+44 (0)131 557 3332.**

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