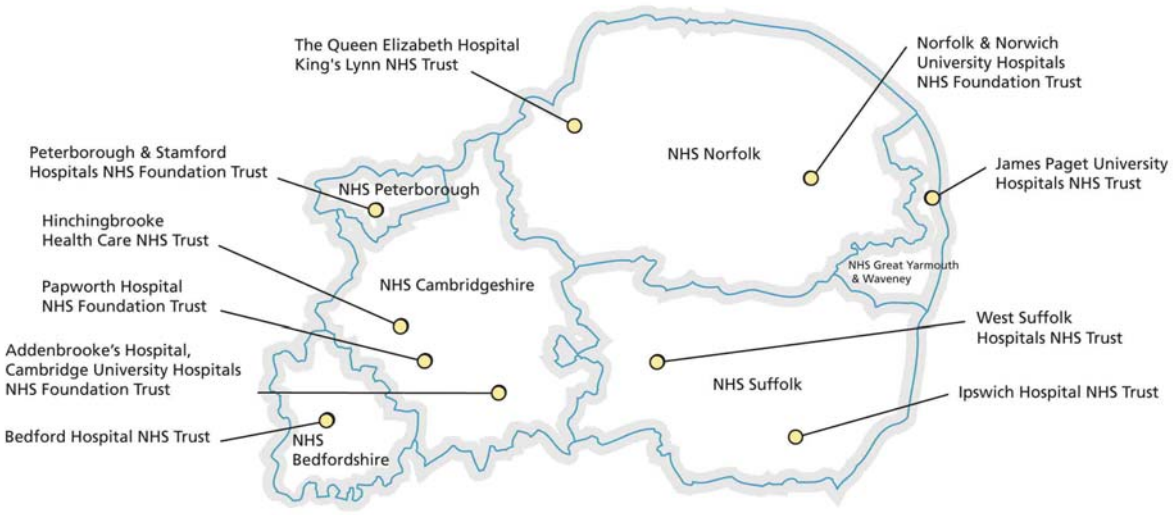

NHS

Anglia Cancer Network

AngCN Chemotherapy Core Education Package

– Part A

The AngCN would like to acknowledge and thank the AngCN Chemotherapy Nurses Group for their efforts in the production and review of this document, with special thanks to Jill Ireland for her considerable support in writing, formatting and reviewing this document.

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Introduction 3
1 Module 1 - Understanding Cancer 8
1.1 Cancer cell biology 8
1.2 Carcinogenesis 8
1.3 Cell Growth Fractions 8
1.4 Cancer Prevention and health education 9
1.5 PATIENT EDUCATION 11
2 Module 2 - Treatment Process 13
2.1 Treatments 13
2.2 Classification and use of chemotherapy 14
2.3 PATIENT ASSESSMENT 17
2.4 KEY WORKER 17
2.5 COMMON SIDE EFFECTS AND TOXICITIES OF CHEMOTHERAPY 19
2.6 SPECIFIC SIDE EFFECTS AND TOXICITIES 27
2.7 MANAGEMENT AND TELEPHONE ENQUIRIES 29
2.8 COMPLICATIONS FOLLOWING CHEMOTHERAPY 29
2.9 MANAGEMENT OF REACTIONS TO SPECIFIC DRUGS 31
2.10 DISCHARGE ADVICE 33
3 Module 3 - Safe Handling and Disposal of Cytotoxic Drugs 36
3.1 INTRODUCTION 36
3.2 OCCUPATIONAL EXPOSURE 36
3.3 OCCUPATIONAL EXPOSURE AND PREGNANCY 36
3.4 EXPOSURE RISKS 37
4 Module 4 - Principles of safe chemotherapy checking 41
4.1 PREPARATION OF THE PATIENT 41
4.2 SAFE CHECKING OF CYTOTOXIC DRUGS FOR ADMINISTRATION 41
5 Module 5 - Venous Access 45
5.1 CANCER PATIENTS ARE AT PARTICULAR RISK OF INFECTION. THEREFORE, ALL POLICIES AIMED AT AVOIDING INFECTION MUST BE FOLLOWED. THE FOCUS FOR INFECTION CAN FREQUENTLY BE A VENOUS ACCESS DEVICE 45
5.2 THE TECHNIQUES OF CANNULATION AND ADMINISTRATION 45
5.3 MAINTAINING VASCULAR INTEGRITY 45
5.4 POSITIONING AND SELECTION OF CANNULAE 46
5.5 CANNULATION 46
5.6 VASCULAR INTEGRITY DURING ADMINISTRATION 47
5.7 cENTRAL VENOUS ACCESS DEVICES 47
5.8 EXTRAVASATION 47
6 Module 6 - Administration of chemotherapy 51
6.1 THE PRACTICAL ASPECTS OF ADMINISTERING CHEMOTHERAPY 51
6.2 SAFE ADMINISTRATION OF ORAL CHEMOTHERAPY 51
6.3 SAFE ADMINISTRATION OF INTRAVENOUS CHEMOTHERAPY 51
7 Module 7 - Intrathecal Chemotherapy 53
7.1 Important 53
8 Evidence of Agreement 55
Appendix A - GP End of Treatment Summary 56

INTRODUCTION

The aim of this education package is to ensure that patients receiving chemotherapy are cared for by knowledgeable, safe and proficient nurses, and that chemotherapy is administered in a safe and competent manner.

Education Package Framework

This package is laid out in modules which can be worked through step by step with worksheets (1-7) for each module. If you are caring for patients receiving chemotherapy then you will need to complete and become competent in modules one to three, and the associated worksheets. If however you are also required to check and administer chemotherapy as part of your role then you are required to become competent in all modules, i.e. 1-7, and their associated worksheets, records of practice and practical assessments.

There are 6 elements of the chemotherapy education package:-

Part A – Core Chemotherapy education package (this document)
Part B – Chemotherapy education worksheets for Modules 1 - 7
Part C – Assessments and Records of Practice
Part D – Accreditation Handbook
Part E - Competency Statement
Part F – Chemotherapy Answer Book

Aims and objectives of the Education Package

Modules 1-3 – An Introduction to the Care and Management of Patients Receiving Chemotherapy

These modules are designed for nurses who have some basic experience in cancer care and wish to develop their knowledge in cytotoxic chemotherapy administration. The modules should be studied in combination with clinical experience and attending the 'Introduction to Chemotherapy' study day. The Learner should use this Workbook with the guidance and support of a named Mentor and Assessor. Practical and theoretical learning should take place simultaneously.

Organisational Aim:

- To develop high quality, evidence based and standardised care for all patients receiving cytotoxic chemotherapy.
- For all nurses at band 5 or above, or Chemotherapy Support Practitioners (Band 4), working in a designated clinical area, where cytotoxic chemotherapy is administered, to have an understanding of the care needs of patients undergoing treatment with cytotoxic chemotherapy.

Learning Objectives for the Individual:

- To understand the action of chemotherapy.
- To have a basic knowledge of the side effects and nursing implications of cytotoxic chemotherapy in terms of preparation, assessment and monitoring of patients.
- To be able to contribute to the assessment of information and support needs of patients and their families.
- To be able to access further information regarding chemotherapy drugs and protocols.
- To assist in maintaining a safe environment when chemotherapy treatment is being given.

Learning outcomes Modules 1-7

Progression to undertake modules 4-7 will only be possible once modules 1-3 have been completed. Modules 4-7 build upon the learning achieved in modules 1-3, and are focused on the safe and competent administration of cytotoxic chemotherapy.

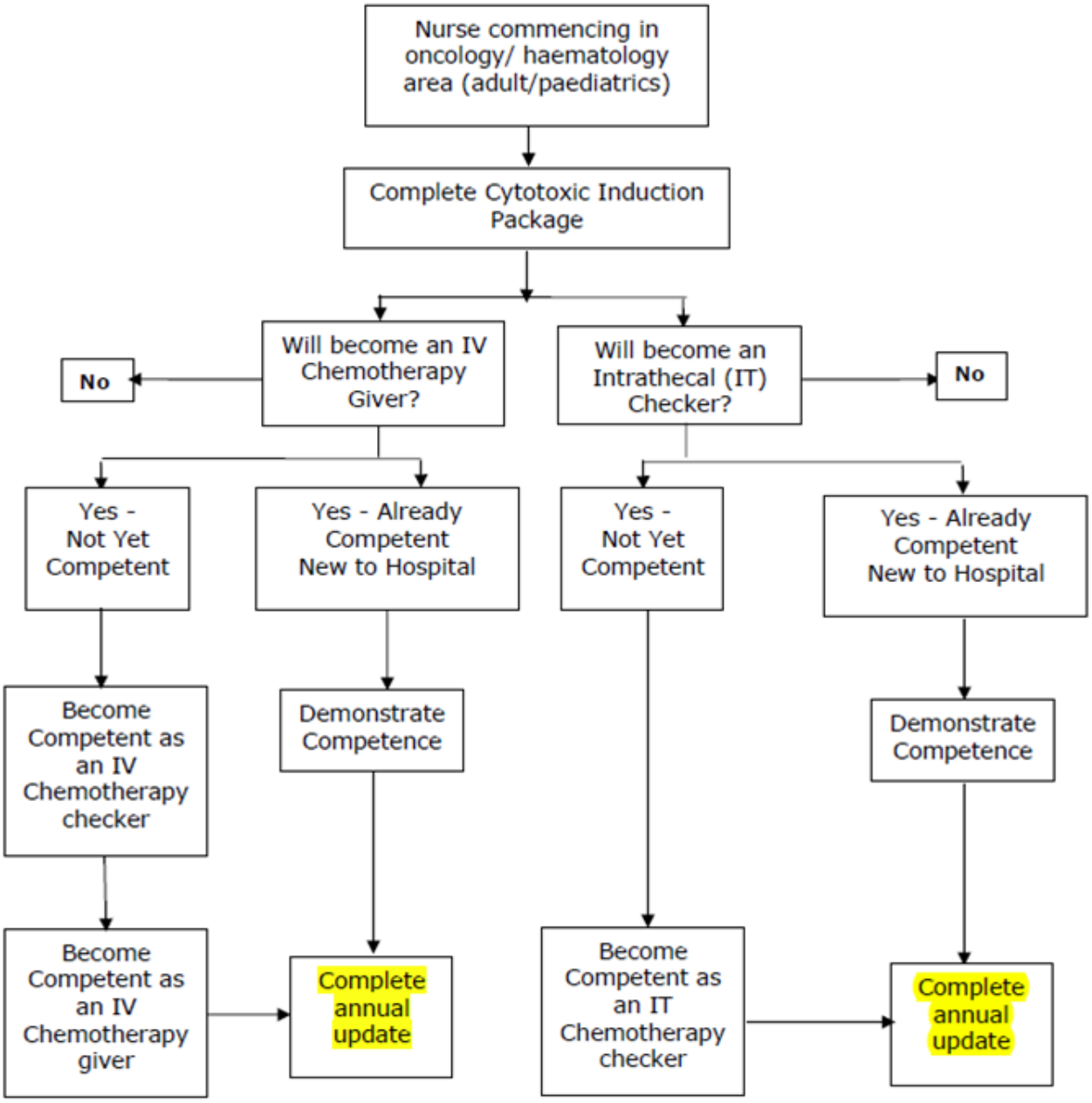
In addition to the learning outcomes for modules 1-3; the further completion of modules 4 -7 will ensure that (in accordance with the manual of cancer services training competencies for chemotherapy administration, (2011)) the theoretical knowledge, and practical aspects of prevention, recognition management and maintenance of chemotherapy delivery and care are relevant and include:

- Intravenous, oral and other routes of administration.
- Knowledge of the NHSE Intrathecal chemotherapy guidance.
- Holistic assessment of patients receiving chemotherapy.

- Peripheral and central venous access devices, including line complications.
- Mechanical pumps, scalp cooling devices and any other mechanical devices used in chemotherapy service.
- Recognition of the signs of myelosuppression: complications of myelosuppression.
- Common side effects of chemotherapy including at least, nausea and vomiting, stomatitis, diarrhoea, phlebitis and alopecia.
- Chemotherapy related oncological emergencies including extravasation, anaphylaxis and neutropenic sepsis.
- Health and safety aspects of chemotherapy administration, including protective clothing, safe handling and waste disposal.
- Knowledge of chemotherapy regimens used in the department, the information associated with a regimen is specified in the measures and local lists of regimens.

The following is a flowchart which describes the steps required in the Nursing Staff Chemotherapy Training Process:

Nursing Staff Chemotherapy Training **DF30**



Guidelines for Learner, Nominating Manager, Assessor and Mentor

The Learner

The learner will have been nominated by a line manger to undertake further study into the safe administration and checking of cytotoxic chemotherapy. The learner must fulfil the following criteria:

- Be a registered nurse.
- Be working in an area where cytotoxic therapy is given on a regular basis, at least weekly.
- Be at least 6 months qualified.
- Have identified an interest and learning need with line manager and Lead Nurse Chemotherapy.
- Have undergone staff development review with line manager.
- Be committed to the safe administration of chemotherapy.
- Be aware of health and safety guidelines in relation to safe handling and disposal of chemotherapy.
- Have an identified mentor and assessor.

The Role and Responsibility of Nominating Managers

By nominating a learner to undertake the cytotoxic training course you are agreeing to support them being able to work with their mentor and have access to an assessor. You are also required to allow time to work in a clinical area where there is regular administration of cytotoxic therapy. If there is insufficient experience in a learner's own ward environment then it would be appropriate to allow a period of secondment to a suitable area where cytotoxic chemotherapy is given frequently.

Mentor and Assessor

Mentorship plays an instrumental part in supporting you through this learning experience. There will be an identified mentor and assessor for you at the time you embark on this new developmental challenge to take on the role of chemotherapy administration. In some circumstances the same nurse may act as a mentor and assessor although this should not be routine practice.

Role Definition - Mentor

A mentor must fulfil the following criteria:

- Be a registered nurse.
- Have a valid certification of competence in the safe administration of chemotherapy.
- Be currently involved in the advance practice of cytotoxic chemotherapy and be up to date with current information.
- Be aware of and adhere to health and safety policies and procedures including COSHH.
- Be aware of and adhere to the Trust policy for cytotoxic chemotherapy administration.
- Have been involved in the advance practice of cytotoxic chemotherapy administration for a minimum of 1 year.
- Spend a minimum of 7.5 hours per week working with a nominated mentor or allocated chemotherapy-trained supervisor, to allow adequate access to mentor and receive adequate exposure to chemotherapy administration.
- Demonstrate a positive commitment to being a mentor.

Role Definition – Assessor

An assessor must fulfil the following criteria:

- Be a registered nurse.
- Have successfully completed a recognised teaching and assessing course.
- Have a valid certification of competence in the safe administration of chemotherapy.
- Be competent in the advanced practice of cytotoxic chemotherapy administration for both bolus and infusional preparations.
- Be employed in a band 6 or above position within the network.
- Be currently involved in the administration of chemotherapy and be up to date with current information.
- Be aware of and adhere to health and safety policies and procedures including COSHH.
- Be aware of and adhere to the Trust policy for cytotoxic chemotherapy administration.
- Be familiar with the content and standards set out in this workbook.
- See also Manual for Cancer Services: Chemotherapy Measures, measure 11-1E-106s

Guidelines on Completing an Assessment

When assessing a learner's competency in chemotherapy administration the assessor should satisfy themselves that the learner can:

Prepare to administer

- Accurately read and check the prescription chart for validity, prescriber, surface
- area, blood result requirements, and consent
- Identify how they will administer the prescription
- Describe any immediate effects of administering the chemotherapy (vesicant etc.)
- Ensure that measures are taken to combat these effects (pre-medication, headcooling
- etc.)
- Assessment of side effects if not first dose administration
- Provide any information on side effects, short medium or long term

Administer

- Selection of appropriate equipment
- Identification of person receiving chemotherapy
- Prepare patient for chemotherapy
- Evaluate patency of IV access, taking appropriate actions if assessing this route
- Perform a timely administration
- Administers drug safely (can accurately describe management of spillage & extravasation)
- For intravenous route assessment must be made of both bolus and infusional Chemotherapy

Post administration

- Safe disposal of equipment
- Promotes patients comfort dignity and self care knowledge
- Give appropriate discharge advice

The assessors should not satisfy themselves on all of this on just one occasion but should instead assess over several occasions, giving appropriate feedback.

The learner should be aware that the process may be ongoing requiring more than one occasion. However it must be apparent to both parties that formal summative assessment is occurring on such occasions.

The learner may be able to work with nurses who are not assessors in order to learn and gain knowledge or practice experience in administration of chemotherapy.

If the learner does not satisfy the criteria on several occasions of formal assessment they should be given feedback on their performance. Then, in conjunction with their manager devise a formal plan for reassessment with another assessor. If they are unable to gain competence at this point then the learner and the manager must review the whole process.

Documentation for Assessment

Adults
Initial assessment Nurses Initial Assessment of chemotherapy competence will be made in conjunction with the Anglia Cancer Network Chemotherapy Education Package. AND Subsequent Assessment Update of competence will be evidenced by an annual update.

There is an expectation from the department that recognised assessors should teach elements of chemotherapy administration on 'in house' and ARU courses. This needs to be completed locally.

Assessment process

Assessment has been defined by Nicklin and Kenworthy, 2000, as a 'Measurement that directly relates to the quality of learning and as such is concerned with student progress and attainment'.

- The Learner and Mentor should meet regularly, ideally twice a month. The Assessor should be available for guidance and support, but need only meet to review workbook on completion.
- Theoretical knowledge and practical experience are gained simultaneously. The aim of this learning package is to introduce you to the nursing issues to be considered when treating patients undergoing cytotoxic chemotherapy treatment, to enable you to plan and implement and evaluate care more effectively and sensitively. The assessment of theoretical knowledge (including completed workbooks) should be carried out by the named Assessor, following attendance at the study day.
- All sections of the workbook should be completed over a minimum period of 2 months if the Learner is starting the workbook with no previous experience of administering intravenous cytotoxic chemotherapy.
- Once the final theoretical assessment has been passed and the record of practice has been completed, the learner will be awarded a certificate for Introduction to Cytotoxic Chemotherapy Administration.
- A copy of the completed workbook may be retained for audit purposes.

Resources

Resources appropriate to the module are listed within each section; In addition there is a list of resources included at the end of this document, which you may find useful. These resource lists are not exhaustive, and you are encouraged to seek out additional sources of information. In addition your mentor, oncology pharmacist, lead nurse are all important resources of information for you and you are encouraged to discuss, and reflect upon your learning needs with them.

Accountability

As a professional you are accountable for your own practice, and this applies to the care of chemotherapy patients and the administration of chemotherapy. You are bound not only from a legal perspective but also by your professional body, for example by the Nursing and Midwifery Council (NMC) who determine the trained nurse guidelines for practice.

Nurses are expected to have the knowledge, skills and competence in any role they undertake. Ultimate responsibility lies with the individual nurse to ensure they have these skills and knowledge before undertaking any task or practice.

To administer chemotherapy within the Anglia Cancer Network you must:

- Be a registered nurse.
- Have completed the training and have been assessed as competent in the following:
- Administration of intravenous drugs
- This chemotherapy education package (Modules 1-7)
- Cardio-pulmonary resuscitation and anaphylactic shock
- Management and use of infusion pumps
- Meet the criteria for training and competency within your local area.
- Demonstrate knowledge and understanding of local policies and procedures pertaining to this practice.

Governance

Chemotherapy practice is a dynamic process and changes in practice and regulation occur frequently, therefore this document should be reviewed annually to ensure that the contents remain relevant. This is the responsibility of the AngCN chemotherapy group.

References

Manual for Cancer Services: Chemotherapy Measures (2011)
Nicklin PJ and Kenworthy N (3rd Ed) (2000) Teaching and assessing in nursing practice – an experiential approach, Harcourt Publishers Limited, London

1 MODULE 1 - UNDERSTANDING CANCER

1.1 CANCER CELL BIOLOGY

A certain level of background knowledge is assumed:
An understanding of the structure and the function of a normal cell, its life cycle and protein synthesis.
An understanding of how chemotherapy works and of cancer cell biology is necessary in order to appreciate the role of chemotherapy in the treatment process.
An understanding of DNA, its synthesis and its role in cellular activity.

1.2 CARCINOGENESIS

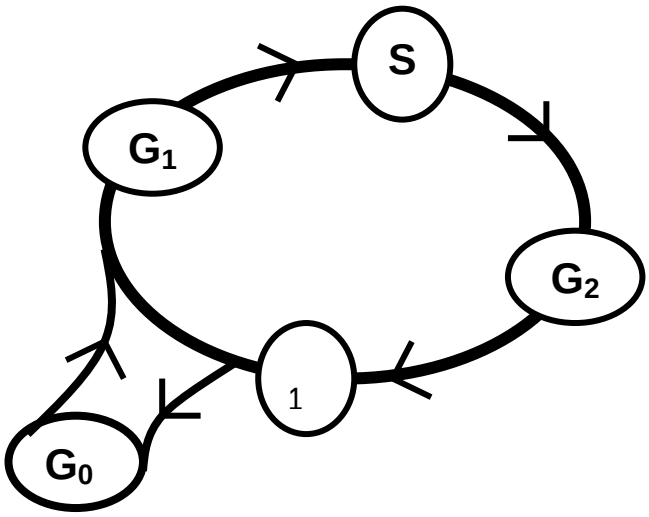
The underlying principle of cancer growth is permanent damage to the DNA of the cell.
The process from normal growth to cancerous growth requires a carcinogen. The carcinogen causes DNA damage changing the cell from normal to abnormal.
Why do some people get cancer and others do not?
There is no known safe level of exposure to carcinogens. Cancer is predominantly a disease of ageing and may be linked to failing immunity and genetic regulatory mechanisms, which are part of the ageing process.
We all produce cancer cells but internal mechanisms keep control destroying the mutated abnormal cells. Cell division whether normal or malignant, takes place in a cyclical manner. Normal cell division is controlled whereas abnormal or cancer cell division is uncontrolled.

There are five phases of the cell cycle:

- G_o (resting phase)
- G_1 (RNA synthesis)
- S (DNA synthesis)
- G_2 (RNA synthesis, organelle duplication)
- MITOSIS (cell division). Prophase, metaphase, anaphase, telophase.

The G_0 phase is the resting phase of the cell cycle and varies in time in different types of specialised cells. It follows immediately after mitosis. Brain cells have a long resting phase while bone marrow cells have a short resting phase.
An average cell cycle from G_1 through to mitosis can be estimated.

- G_1 takes approx. 8 hours
- S takes approx. 6-8 hours
- G_2 takes approx. 6-8 hours
- Mitosis takes 90 minutes



Cell regeneration can take between 13 and 48 hours inclusive of all phases. Some cells may regenerate more rapidly and others much more slowly depending on there cell specialisation. The regeneration of cancer cells may take a very short time or as long as 120 hours. A major implication for chemotherapeutics is that cancer cells are continually regenerating to the detriment of the surrounding normal population of cells. Greater proportions of cancer cells are in a phase of the cell cycle rather than in G_0, at any one time.

Reading

Morgan G (2003) Chemotherapy and the cell cycle. Cancer Nursing Practice, February, Vol 2, No 1, pp 27 - 30

1.3 CELL GROWTH FRACTIONS

Not all cells within a given cell population divide at the same time - some cells are in G_1, while others are in G_2, S or mitosis.

Growth fraction is the proportion of cells within any of these growth phases of the cell cycle at a given time.

The uncontrolled nature of cancer cells results in a higher growth fraction; and they are therefore more susceptible to chemotherapy.

Chemotherapy is not cancer cell specific and will destroy all cells with rapid cell division (mitotic turnover) and short cell time. Normal cells will therefore also be sacrificed especially those with a high growth fraction.

High Growth Fractions	Moderate Growth Fractions	Low Growth Fraction
Bone marrow stem cells White blood cells Platelets Red blood cells Lymphatic tissue Testes Hair follicle Epithelial lining of the GI tract.	Breast cells Salivary glands Skin cells Lung	Pancreas Uterus Cartilage Nerves

The growth fraction of the cancer cell changes throughout its life span. The early period of growth is similar to the surrounding cell population. As the tumour enlarges, the growth fraction decreases or levels out. The tumour cell population will eventually outgrow available nutrients and blood supply; many of the cells can become necrotic and die. This slow down effect has implications for the effectiveness of chemotherapy.

Normal cells have a controlled growth cycle and cells are only replaced when a cell of the same type dies, cell death is therefore equal to cell replacement.

Cancer cell death however is not equal to cellular replacement. When cancer cells first develop there is initially little cell death, the uncontrolled growth of cells results in the rapid increasing the cell population. This is what enables chemotherapy to attack the cancer cells, as they are rapidly dividing. Almost all chemotherapy drugs are applied to cell cycle activity and are classified according to their pharmacokinetic activity, cell cycle specificity or cell cycle non-specificity.

1.4 CANCER PREVENTION AND HEALTH EDUCATION

Preventing cancer is a national priority with the following papers and guidance focussing on providing comprehensive strategies to prevent, diagnose early and treat the disease, to ultimately improve outcomes in England:

- Saving Lives: Our Healthier Nation (DoH June 1999) - set a target of 'reducing the death rate from cancer in people under 75 years by at least a fifth by 2010, saving up to 100,000 lives in total'.
- The NHS Cancer Plan: A Plan for Investment, a Plan for Reform (July 2000).
- The NHS cancer plan and the new NHS: Providing a patient-Centred service (Oct 2004),
- The Cancer Reform Strategy (Dec 2007),
- Improving outcomes: A Strategy for Cancer (Jan 2011).
- Include the NCAG report: Ensuring quality and safety of chemotherapy services in England (Aug 2009)
- National Awareness Early Diagnosis Initiative (NAEDI)

These cover the key areas for action on prevention, which include:

- Smoking.
- Diet and nutrition.
- Physical activity.
- Alcohol.
- Sunlight.
- Radon.

Reading

- Marieb, E. (1992). Human anatomy and physiology. Redwood City. Benjamin Cummings. 88-91,99.
- Dudjak, L. (1992). Cancer Metastasis. *Seminars in Oncology Nursing*. 8. 1(Feb) 40-50
- Kartner, N and Ling, V (1989). Multi-drug resistance in cancer. *Scientific American* 260. 3, 26-33.

1.4.1 Smoking

Smoking causes about one in three cancer deaths in the UK (Callum, 1998). Lung cancer is closely associated with smoking: nine in ten deaths from lung cancer among men and nearly three in four among women are estimated to have been caused by smoking. This represents 84% of all lung cancer deaths (Callum 1998).

Cigarette smoking is also a major cause of cancer of the mouth, oesophagus, bladder, kidney and pancreas (Department of Health & Human Sciences, 2001)

There are several smoking cessation initiatives currently taking place both in primary and secondary care.

1.4.2 Diet and Nutrition

While the links between some lifestyle factors such as smoking and certain cancers such as lung have long been recognised, the links between diet and various cancers have been made more recently. Although diet may not play a role in the development of all cancers, it is estimated that around one third of all cancers are related to diet (Richards 2002). In particular, diet has been related to development of colorectal cancer, stomach, and prostate.

Obesity, particularly central obesity, where body fat is deposited around the waist and abdomen, increases the risk of developing endometrial and postmenopausal breast cancer (DOH 1998).

Therefore improving people's diet is an important public health measure. For more information on reducing the risks of developing cancer please see the recommendations made by the Committee on Medical Aspects (1998).

1.4.3 Physical Activity

There is international consensus that a physically active lifestyle is important for health and has great potential for health gain (WHO 1995, DOH 2000). Physical inactivity is highlighted in The Cancer Plan (DOH 2000) as a risk that can contribute to development of cancer.

There have been several studies conducted that suggest there is a link between inactivity and a variety of cancers (US DOH 1996, Thune & Furberg 2001).

1.4.4 Alcohol

Epidemiology studies have clearly indicated that alcohol is causally related to cancers of the oral cavity and pharynx, larynx, oesophagus and liver (Royal College of Physicians 2001). For further information please see Cancer prevention –A resource to support local action in delivering the NHS Cancer Plan (2002).

1.4.5 Sunlight

The incidence of skin cancer has increased steadily over recent years, with exposure to sunlight being the main cause (DOH 2000). The main risk factor is over exposure to the sunlight in people with sensitive skin types (English et al 1997). Excessive sun exposure in childhood has been consistently identified as a crucial factor (Mackie et al 1997). Main risk factors include:

- Fair skin which burns easily.
- Personal or family history of skin cancer.
- History of intense or prolonged sun exposure.
- Higher than average number of pigmented skin naevi (moles).

There are three main components to skin cancer prevention these include:

- Promotion of sun safe behaviour.
- Environmental measures.
- Early detection.

1.4.6 Radon

Radon is a radioactive gas that occurs naturally. It has no taste, smell, or colour and it requires special equipment to detect it. It is found everywhere but it is usually in insignificant quantities.

Radon arises from the soil into the air. Outdoors, radon is usually diluted and the risk it poses is negligible. It is when the radon stays in enclosed places that concentrations build up. Radon levels are higher in some parts of the country than others because of the geology of the area.

When radon levels build up over time this poses a serious risk to health. Health studies around the world have linked radon to lung cancer (Darby 2001). For further information please see "A resource to support local action in delivering the NHS Cancer Plan" (2002).

1.5 PATIENT EDUCATION

Information is essential for patients to make informed choices about their treatment and consent to treatment. Guidelines from the Department of Health state that seeking consent to treatment must be about enabling patients to make healthcare choices that are right for them, and recognising that different patients will make different choices in apparently similar situations (HSC 2001/023, DoH 2001). We must ensure our patients have all the information they require ensuring informed consent, but also to support and empower them as patients receiving treatment. Knowledge facilitates patients coping whereas lack of knowledge in advance of a possibly threatening event can impede coping (Lukin and Middleton 1995). Appropriate patient information will enable patients to identify, manage and report (where appropriate) side effects of the chemotherapy drugs (Lukin and Middleton 1995).

The information given to the patient should be specific. For example it is not enough just to say the chemotherapy will make the patient feel sick as you may find the patient returns for their next cycle of chemotherapy telling you they were sick for days and unable to take adequate hydration / nutrition. Patients need to clearly understand what actions to take when they have problems in this instance they would need the following information:

- Taking prophylactic anti-emetics.
- What to do in the event of prophylactic anti-emetics not being effective.
- Who to contact for additional advice.

The intent of providing adequate and appropriate education is to provide support and knowledge & to empower the patient to maintain as much independence as possible in the management of the symptom and side effects they may experience (Camp-Sorrell D 1993).

The Cancer Reform Strategy (2007) and more recently improving outcomes, a strategy for cancer (2011) sets out an ambitious vision for improving cancer patient information delivery including all patients having access to National tumour specific information pathways. These are available via the following NHS Choices website - www.nhs.uk. Information given to patients needs to be both specific to patients needs and standardised, in terms of the quality and content of the information offered. Patient information needs should be assessed at regular intervals, as information needs change as treatment progresses. Locally, information should also be available for patients about where to obtain support and information, for example local support groups. Healthcare nurses should be aware of local / national groups and be able to signpost patients and carers for additional support.

Reading

- Callum, C. (1998) The UK smoking epidemic: deaths in 1995. London Education Authority
- Camp-Sorrell D 1993 Cancer Nursing: Principles and practice 3rd Edition. (Groenwald S L, Frogge H M, Goodman M and Yarbro H C eds), Jones and Bartlett Publishers, Boston. pg 331-365.
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- Stein P (1996) Nursing the Patient with Cancer. Ch 5. (Tschudin V Ed.) Prentice Hall International.
- Thune, I. & Furberg, A. S. Physical activity and cancer risk: dose-response and cancer, all sites and site-specific. *Medicine and Science in Sports and Exercise*. 33 (6 Supp): S530-50.

2 MODULE 2 - TREATMENT PROCESS

2.1 TREATMENTS

Primary treatment options considered in cancer care include Surgery, Radiotherapy, Chemotherapy, Hormonal Therapy and Biotherapy.

2.1.1 Surgical Treatment

The majority of patients with cancer receive some form of surgical treatment as part of their diagnosis, treatment or palliation.

Surgical procedures are used in a variety of ways, including:

- Straightforward removal of tumour to achieve a cure.
- Diagnostic.
- Staging.
- De-bulking.
- Relieving symptoms.
- Reconstruction.
- Prophylactic surgery.

2.1.2 Radiotherapy

Radiation therapy is a local treatment for cancer.

It can be given:

- Concurrently or sequentially.
- As primary treatment.
- As prophylaxis.
- For palliation.

Radiation therapy can be delivered as either:

- External beam therapy.
- Brachytherapy.
- Radioisotopes.

2.1.3 Chemotherapy

The purpose of treating cancer cells with chemotherapy is to prevent abnormal cells from multiplying, invading and metastasing to distant sites.

Chemotherapy is a systemic treatment that enables drugs to reach the site of tumour as well as distant sites.
Chemotherapy drugs are used as:

- Neo-adjuvant treatment - To reduce tumour size before surgery or radiotherapy.
- Adjuvant treatment - To eliminate any remaining cancer cells following surgery or radiotherapy.
- Curative treatment - To cure the disease or induce remission.
- Palliative treatment - To relieve symptoms or improve quality of life.

They can be given as single agents or as combination chemotherapy.

2.1.4 Hormonal Therapy

Can be an effective way to treat many “hormonally responsive” tumours.
Adrenocorticoids may be used as part of treatment regimen for many haematological diseases.
Finally, hormonal therapy may be used as palliative or supportive therapy.
(e.g. steroids as anti-emetics, adjuvant analgesics, appetite stimulants).

2.1.5 Biotherapy

(Interferons, Interleukins, Haematopoietic Growth Factors, Monoclonal Antibodies).

- Biotherapy modulates the immune response by using agents to activate the immune system and treat cancer.
- Biotherapy agents also manipulate the immune system (e.g. gene therapy and donor lymphocyte infusions).
- Biologic agents can be used for diagnostic, therapeutic or supportive therapy.

Reading
Sandstorm K.S (1996) Nursing management of patients receiving Biotherapy. Seminars in Oncology Nursing, May, Vol 12 No. 2 pp 152 - 162

2.1.6 Gene Therapy

- Gene therapy is a therapeutic technique in which a functional gene is inserted into a cell to correct a metabolic abnormality or to introduce a new function.
- This therapy can be useful in the treatment of cancer because cancers are the result of genetic mutations or loss of genetic material.
- However, this therapy is not the mainstay of cancer treatment at the present time but this approach may be the therapy of the future.

2.2 CLASSIFICATION AND USE OF CHEMOTHERAPY

Chemotherapy drugs are classified according to their method of action on the cell wall and specificity or non-specificity to the phases of the cell cycle.

Many factors determine the choice of chemotherapy.

These include:

- The sensitivity of the tumour cell to the agent.
- The pH of the cell.
- The quantity of the disease present.
- The age and health of the patient.
- The number of cells within the tumour mass that are in mitosis or interphase at the time of chemotherapy administration.

Chemotherapy drugs themselves have limitations because of their toxic effect on normal cells. The short term effects of the drugs may include renal, hepatic, pulmonary and cardiac toxicity. The long term effects may be responsible for carcinogenicity (cancer development) and teratogenicity (foetal abnormalities).

2.2.1 The Alkylating agents

These were the first of the anti-cancer drugs to be produced. They are cell cycle phase non-specific. They exert their lethal effects on cells throughout the cell cycle, but they tend to be more effective against rapidly dividing cells. This may be because rapidly dividing cells have less time to repair damage caused. Alkylating agents are active against cells in G_0 by causing the resting cells to be recruited into active division. They can therefore be used to de-bulk tumours. At this point, cell cycle specific drugs can hit those cells.

Alkylating agents act by bonding DNA helix strands thereby inhibiting DNA transcription and translation processes.

Ultimately the bonding of DNA helix strands inhibits cellular synthesis activities, cellular duplication and tumour growth. Unfortunately, many tumour cells show resistance to the alkylating agents following multiple exposures which may be due to multi-drug resistant proteins, changes in cellular pH.

The dose limiting toxicities and side effects of the alkylating group are:

- Bone marrow suppression.
- Nausea and vomiting.
- Interstitial pneumonitis and pulmonary fibrosis.
- Renal and bladder toxicity.
- Alopecia.
- Allergy.

- Carcinogenesis.

2.2.2 The Antimetabolites

The antimetabolites are a group of agents that interfere with DNA and RNA synthesis by mimicking the chemical structure of essential metabolites. They prohibit cell replication by either deceiving cells into incorporating them along certain metabolic pathways essential for the synthesis of RNA or DNA so that a false genetic message is transmitted or the antimetabolites block the enzymes necessary for the synthesis of essential compounds. Hence, DNA synthesis is prevented.

Antimetabolites are mainly S phase specific; they are most effective against fast growing tumours.

Toxicities associated with antimetabolites include:
- Bone marrow depression.
- Mucositis/Stomatitis.
- Diarrhoea.

2.2.3 The Anti-Tumour Antibiotics

This group of drugs are synthesised from the bacteria of the streptomyces species. Microbial fermentation has created a number of antineoplastic agents, which have a therapeutic effect on the growth of cancer. The antibiotics function by either binding or reacting with DNA or by inhibiting the synthesis of RNA or both.

Toxicities associated with anti-tumour antibiotics are:
- Bone marrow depression (except Bleomycin).
- Skin and GI toxicity.
- Pneumonitis leading to fibrosis: Bleomycin.
- Cardiotoxicity: Doxorubicin and Daunorubicin.
- Mucositis: Doxorubicin and Daunorubicin.
- Hepatic and Renal.
- Blood clotting dysfunction.

As a class the anti-tumour antibiotics are cell cycle non-specific, although Bleomycin is most effective on G2 phase.

2.2.4 The Antimitotic Inhibitors

These are naturally occurring agents designed to halt cell reproduction during mitosis.

Plant alkaloids work by crystallising the microtubular mitotic spindle proteins during metaphase, which arrests mitosis and causes cell death. Plant alkaloids are considered cell cycle phase specific, most effective during M phase. Tenoposide and Etoposide are premitotic in their effect mainly working on G2 phase.

Dose limiting toxicities:
- Myelosuppression (Vinblastine, Etoposide, Tenoposide).
- Neurotoxicity (Vincristine, lesser extent Vinblastine).

2.2.5 The Hormones

The growth and development of certain tumours depends to some extent on a specific hormonal environment. When that environment is changed, tumour growth is impaired or arrested. Breast, thyroid, prostate and uterine cancers are examples of tumours that are sensitive to hormonal manipulation. They have tumour cell receptors, which facilitate hormones or hormone antagonists into the cell. Hormones or hormone antagonist chemotherapy agents depend on these tumour cell receptors to facilitate entry into the cell and act by blocking the synthesis of messenger RNA, which transmits the genetic information necessary for the synthesis of new proteins.

Common hormonal agents	Oestrogens	Anti-oestrogens	Adrenal cortical steroids (analogues and antagonists)
Androgens testosterone propionate Fluoxymesterone	Diethylstilbestrol (DES) Conjugated equine oestrogen (premarin)	Tamoxifen citrate Progesterone's Medroxyprogesterone acetate (provera, depoprovera) Megestrol acetate (megace)	Cortisone Dexamethasone Methyprednisolone Prednisolone Spironalactone

Each group contains many more hormones. Tumours known to be receptive to this kind of manipulation are: breast, uterine, thyroid, prostate, leukaemias, lymphomas, melanoma and myeloma.

2.2.6 The Miscellaneous Group

This group of drugs have mechanisms of action that are not as specific as the major classification of anti-cancer drugs. They have anticancer properties but their mechanisms are unusual, examples of these types of drugs are:

- L-Asparaginase creates enzyme inhibition of cancer cells and is used to treat ALL.
- Cisplatin and Carboplatin create covalent bonding of platinum bases to DNA.
- Procarbazine inhibits DNA and RNA protein synthesis.

These are by no means all the cytotoxic agents available. New anticancer drugs are being developed all the time, many drugs are going through the stages of clinical trials, and may take some time before they are available.

Biotherapies are also used in the treatment of cancer and although they have not been looked at in this work booklet, they are becoming increasingly important in the treatment of cancer and will need to be reviewed in further detail.

2.2.7 Combination therapy and cell kill hypothesis

In order to achieve the maximum effect of chemotherapy, drugs are often given in specific combinations and cycles. Even though it may be known that a certain drug has the ability to destroy cancer cells, it cannot be assumed that it has killed all the cancer cells in one dose. With this in mind, cycles of chemotherapy are given to reduce the total number cancer cells, known as the cell kill hypothesis. Combination therapy (where a combination of drugs is given at the same time) is often given to enhance the effect of tumour cell kill. It can have a synergistic action, help reduce toxicities as well as reduce the risk of drug resistance (Holmes 1997, Otto 1997) A combination of agents can have an effect on the cancer cell at different stages of the cell cycle to maximise cell kill. Therefore many treatment regimes are given in cycles and in various combinations.

In accordance with the manual of cancer standards (2011), chemotherapy measures each network will have an agreed list of regimens that are used across the network. Each nurse should be aware of what these regimens are, and where the agreed list is located, this may be held in hard copy or electronic form.

2.3 PATIENT ASSESSMENT

Patients and their families / carers who are undergoing the experience of cancer and chemotherapy treatment may have many experience physical, psychological, social and economic concerns. For example, the patient and their family can be affected by financial strain. There is the extended family to consider and how they are coping with the disease and its treatment. Fear of death; the possible loss of status and loss of any sense of importance; sometimes the loss of a social life and control; there may be children involved and there may be some form of guilt experienced.

The nurse that is caring for this group of patients will therefore need to be aware of all implications and address them as they arise. Further advice may need to be sought from specialist nurses within the department or elsewhere. However, it is fundamental that in order to meet and understand needs that holistic patient assessment is undertaken.

The requirement to offer people with cancer a range of physical, emotional, spiritual and social support was one of the key recommendations in the NICE guidance on supportive and palliative care1.

> *Key Recommendation 2: Assessment and discussion of patients' needs for physical, psychological, social, spiritual and financial support should be undertaken at key points (such as at diagnosis; at commencement, during, and at the end of treatment; at relapse; and when death is approaching). Cancer Networks should ensure that a unified approach to assessing and recording patients' needs is adopted, and that professionals carry out assessments in partnership with patients and carers.*
>
> From 'Improving Supportive and Palliative Care for Adults with Cancer' Published by the National Institute for Clinical Excellence, March 2004

The NICE guidance also gives further specific recommendations with respect to assessment:

- Patients should be offered support to help them to assess their own needs.
- They should not be subjected to unnecessary repeated assessments from different professionals aiming to elicit similar information.
- Assessments should encompass all aspects of supportive and palliative care.
- A structured assessment should be undertaken and recorded (in an agreed format) at key points in the patient pathway with mechanisms developed for sharing the data among the multidisciplinary team.
- Following each assessment, potential interventions should be discussed with patients and carers and a mutually agreed action plan formulated, and
- Health and social care professionals who undertake assessment should have received training in assessing patients' and carers' needs.

Treatment with chemotherapy represents a key stage within the patient pathway, therefore assessment should take place before each chemotherapy treatment, this should be undertaken in line with local and network guidance regarding procedures prior to administration of chemotherapy, taking into account patient checking procedures as per local guidance.

2.4 KEY WORKER

All patients who are diagnosed with cancer should be allocated a key worker. The Key Worker is a concept introduced within the "The Manual for Cancer Services" (2004) The Key Worker is defined as someone who "takes a key role in co-ordinating the patient's care and promoting continuity, ensuring the patient knows who to access for information and advice" (NICE, 2004). The Key Worker can be any healthcare professional who has a significant role with the patient. Therefore nurses who are caring for patients receiving chemotherapy through a course of treatment may well become the patient's key worker.

[1] National Institute for Clinical Excellence (2004). Guidance on cancer services: improving supportive and palliative care for adults with cancer. The manual.

The fundamental element of the key worker role is to provide information, support and guidance throughout the patient journey. Where the patient journey crosses organisational boundaries transition from one key worker to another may take place, creating seamless care for patients and their families.

- Take a key role in the holistic needs assessment of the patient and the planning of his/her care liaising with the multidisciplinary team members involved in the patients care and agreeing the care plan with the patient.

- Ensure that findings from the holistic needs assessment and care plans are communicated to others involved in the care of the patient.

- Be present at and contribute to discussions about the patients care e.g. at multidisciplinary team meetings, Gold Standard Framework meetings.

- Provide expert professional advice and support to other health professionals in the specialist area of practice.

- Lead in patient communication issues and co-ordination of the patient pathway for patients' referred to the team.

- Be accessible to the patient as a constant point of contact handing over to colleagues when unavailable and making sure the patient has clear information about alternative contacts e.g. during periods of absence; out-of-hours contacts.

- Provide information, care and support throughout the patient journey liaising between health professionals to ensure continuity of care and a seamless service. The KW may need to access other professional colleagues for patients if issues outside their area of expertise are raised.

- Ensure the patient pathway is coordinated and all relevant information is transferred to the appropriate professionals as the patient moves across care boundaries e.g. on admission to and discharge from institutions, when care is transferred between teams.

- Contribute to the audit of key worker role in their organisation.

2.5 COMMON SIDE EFFECTS AND TOXICITIES OF CHEMOTHERAPY

2.5.1 Taste Changes

Chemotherapy drugs such as Cisplatin can often leave a metallic taste in the patient's mouth during and after treatment. Patients may find they dislike food or drinks which have been a usual part of their diet. Food may have little taste 'like cardboard'; changes such as sweet taste to sour taste or just taste unpleasant. Although the effect of taste changes cannot be eliminated, measures can be deployed to help the patient cope. Sucking a mint or other strong flavoured sweets or ice lollipops can help disguise metallic or other tastes. Strong flavoured foods may help when food tastes like 'cardboard' and pineapple chunks in natural juice can also be recommended as it has been described as refreshing.

2.5.2 Nausea and Vomiting

All chemotherapy drugs have the potential to cause nausea and vomiting, however the extent of the complication is dose dependant.

The emetogenic reaction is classified in three ways:

- Acute nausea and vomiting occurring immediately or very soon after drug administration.
- Delayed nausea and vomiting occurring hours or days after the administration of chemotherapy.
- Anticipatory nausea and vomiting instigated by sensory stimuli, such as sights, smells, and conditional responses following previous emetogenic experiences.

Antiemetics are prescribed according to the chemotherapy's emetogenic potential and should be administered prior to chemotherapy.

If the suggested antiemetic fails on more than one occasion, then other antiemetics should be considered.

Emetogenic Potential of Chemotherapy Drugs			
Very high Emetic Incidence (>90%)	High Emetic Incidence (60-90%)	Moderate Emetic Incidence (30-60%)	Low Emetic Incidence (0-30%)
Cisplatin Dacarbazine Mustine Streptozocin	Carboplatin Carmustine (BCNU) Cyclophosphamide Actinomycin-D (dactinomycin) Epirubibin Idarubicin Ifosfamide Irinotecan Lomustine Mithramycin Mitoxantrone Oxaliplatin Procarbazine Semustine (Methyl-CCNU)	Arsenic Asparaginase Daunorubicin Docetaxel Doxorubicin 5-fluorouracil Mitomycin-C Paclitaxol Temozolomide Topotecan Vinorelbine (oral)	Alemtuzamab Bleomycin Bortezomib Busulfan Capecitabine Cetuximab Chlorambucil Cladrabine Cytarabine Etoposide Fludarabine Gefitnib Gemcitabine Hydroxyurea Imatinib Liposomal Daunorubicin Liposomal Doxorubicin Melphalan Mercaptopurine Methotrexate Oestrogens Razoxane Rituximab Tamoxifen Teniposide Thioguanine Thiotepa Trastuzumab Vinblastine Vincristine Vindesine Vinorelbine

Antiemetics and mode of action		
Name	Mode of action	Side effects
a) Dopamine Antagonists Examples: Metoclopramide Prochlorperazine Chlorpromazine Lorazepam Haloperidol Domperidone Methotrimeprazine	Increasing peristalsis of the gut. They are effective for nausea and vomiting associated with low emetic cytotoxics. Act centrally by blocking the CTZ	Disruption of CNS activity, extrapyrimidal reactions (EPRs). Early signs include hypotension, sedation and agitation. Severe reactions can result in acute dystonic symptoms resulting in lockjaw, muscle spasms, oculogyric crisis (rolling eyes) and general inability to co-ordinate voluntary movement. EPRs are more common in children and young adults. Should be avoided when taking anti-Parkinson drugs.
b) Anticholinergics Examples: Hyoscine Atropine	They have a direct depressive action on the vomiting centre and antispasmodic action on the gut. They are not usually used for chemo /radiotherapy induced emesis. Effective for post-operative nausea and vomiting and motion sickness.	Dry mouth Drowsiness Urine retention Confusion and dizziness in elderly (hyoscine)
c) Antihistamines Example: Cyclizine	These antagonise the action of histamine. They are effective for travel sickness. Used alone they are poorly effective in chemotherapy and radiotherapy related emesis but are often used in combination with other drugs for their sedative effects.	Sedation
d) Steroids Example: Dexamethasone	Only synthetic glucocorticosteroids are used for chemotherapy and radiotherapy related emesis. Their specific action is unclear but it is suggested they stabilise cell membranes and decrease permeability of the blood brain barrier. They are often used in conjunction with other antiemetics.	Hyperglycaemia Hypertension Mental disturbance
e) Benzodiazepines Examples: Diazepam Lorazepam	This group of antiemetics have amnesic and anxiolytic effects and tend to be sedative. They are useful in treating anticipatory nausea and vomiting.	Sedation/drowsiness
f) Cannaboids Examples: Marijuana Nabilone (semi synthetic cannaboid)	These drugs are now less commonly used in the treatment of nausea and vomiting. The specific action is unknown but they are thought to work through their sedating and relaxing effect	CNS disturbance (hypotension, dizziness, hallucinations and euphoria).
g) 5-HT3 Receptor Antagonists Examples: Ondansetron Granisetron Tropisetron	Act by blocking 5HT3 receptors in the GI tract and in the CNS.	Constipation Headaches

Alternative methods of controlling nausea and vomiting include the use of ginger and acupressure (Sea-Bands). Hypnotherapy, relaxation techniques, guided imagery, massage and acupuncture are all alternatives to drugs.

Anxiety often plays a part in inducing symptoms of nausea and vomiting.

2.5.3 Mucositis

Stomatitis is possibly one of the most debilitating and painful side effects of cancer therapy. Approximately 40% of all patients receiving chemotherapy endure stomatitis (Sonis 1999). Seventy-five percent of those with stomatitis complain of acute oral pain (Brown et al. 2002). Early intervention can limit the severity of mucositis and aggressive treatment can help prevent related complications such as infection and haemorrhage.

The mucosal lining of the entire alimentary tract undergoes changes in response to chemotherapy. Manifestations of the damaging effects of mucositis include oral and oesophageal mucositis severe enough to impair comfort, speech, swallowing and nutrition and result in gastric and intestinal ulceration with clinically significant diarrhoea and subsequent haemorrhage or perforation. (Armstrong 1994, Cox et al, 1994).

While treatment is available for mucositis, the prime consideration should be towards prevention. All patients receiving chemotherapy should be given advice on mouth care, including good oral hygiene, regular cleaning of teeth with a soft toothbrush and maintaining a good fluid intake, particularly water. No dental treatment should be undertaken without the prior consent from a consultant, although regular checkups should be maintained. Prophylaxis may also include the use of a chlorhexidine based mouthwash, especially for haematology patients or regular normal saline mouthwashes for oncology patients according to hospital protocol. Whist in hospital, all patients receiving chemotherapy should have daily oral inspections and assessment score to detect early signs of any problems, and to initiate early treatment if necessary.

Treatment for mucositis depends largely on the presenting symptoms, but may include antifungal, antiviral and/or antibiotic therapy, as well as an antacid. Regular saline or medicated preparations such as Corsodyl or Difflam will help keep the mouth clean and help any discomfort, but if a stronger analgesic effect is needed, oral morphine sulphate solution or infusional diamorphine is often the drug of choice. For patients with a Methotrexate induced mucositis, folinic acid mouthwashes can be beneficial.

2.5.4 Diarrhoea

This can result from the destruction of the actively dividing epithelial cells of the GI tract. When these cells are destroyed, atrophy of the intestinal mucosa and shortening of the intestinal villi occur. The villi and the microvilli become flattened, reducing the absorptive surface area and resulting in a ‘slick gut.’ As a consequence the intestinal contents move rapidly through the gut, reducing the absorption of nutrients.

The degree and duration of diarrhoea associated with chemotherapy depends on the agent, dose, and frequency of chemotherapy administration. Patients may experience abdominal cramps and rectal urgency which can develop into nocturnal diarrhoea or faecal incontinence leading to lethargy, weakness and fluid / electrolyte imbalance. Without adequate management, prolonged diarrhoea will cause dehydration, nutritional malabsorption, and circulatory collapse (Lin 1991).

Stool cultures should be initiated in all cases of severe diarrhoea (to eliminate any infective cause) and antidiarrhoeal agents should not be given if a bowel infection is present. Medication for diarrhoea may include loperamide, codeine phosphate or an anticholinergenic such as hyoscine or atropine. Atropine is given as a prophylaxis for those with irinotecan induced diarrhoea. Management also includes fluid replacement and monitoring of the patient for complications associated with extreme fluid loss. Skin excoriation around the anus would need treating with an effective barrier cream such as Sudocreme or Cavilon cream. Diarrhoea can be a dose limiting toxicity when associated with 5 fluorouracil chemotherapy.

2.5.5 Constipation

This can be caused by chemotherapy agents such as Vincristine and Vinblastine as a result of autonomic nerve dysfunction manifesting as colicky abdominal pain and paralytic ileus. Symptoms occur within 3-7 days of drug administration and may be accompanied by evidence of peripheral nerve dysfunction (Camp-Sorrell 1997).

An increased fluid intake and a good high fibre diet should be advised to patients receiving chemotherapy (unless contraindicated) especially in those patients with a history of constipation or those with impaired mobility. Those patients receiving a Vinca-alkaloid are particularly at risk and must be aware of the potential problem, so that early intervention is initiated. Laxative therapy may be indicated for the high risk patients, although no suppositories or enemas should be given during treatment without the prior consent of the prescribing physician (particularly in haematology patients) and after checking the blood counts.

2.5.6 Alopecia

The loss of hair occurring 2 to 3 weeks after receiving an initial dose of chemotherapy can produce anxiety in many patients. Fortunately, hair growth resumes when chemotherapy is halted and sometimes even as further therapy is given.

However, the texture and colour of the new hair may be different from the original hair and patients need to be warned although this may not be permanent (Batchelor 2001).

Reassurance and support are paramount when the patient starts losing their hair. The patient should be advised of this prior to treatment and receive information about how and where to obtain a wig and also receive information about other head attire such as turbans and hats. Not all chemotherapy affects hair loss in the same way (see table below).

Mild/Moderate Alopecia hair thinning, patchiness or fragile hair	Severe Alopecia Severe – Total Alopecia with possible loss of eyelashes, eyebrows and body hair ↑↑ - high dose intravenous therapy
6-Mercaptopurine	Aclarubicin
6-Thioguanine	Actinomycin-D
Altretamine	Adriamycin
Azathioprine	Amsacrine
Bleomycin	Busulphan↑↑
Busulphan(oral)	Cyclophosphamide↑↑
Caldribine	Dactinomycin
Capecitabine	Daunorubicin
Carboplatin	Docetaxel
Carmustine	Epirubicin
Chlorambucil	Etoposide
Cisplatin	Idarubicin
Cytarabine	Ifosfamide
Dacarbazine	Irinotecan
Floxuridine	Melphalan↑↑
Fludaribine	Methotrexate↑↑
Fluorouracil	Paclitaxel
Gemcitabine	Streptozocin
Hexamethymelanine	Topotecan
Hydroxyurea	Treosulfan
L-asparaginase	Vinblastine↑↑
Liposomal Daunorubicin	Vincristine↑↑
Liposomal Doxorubicin	Vindesine
Lomustine	
Melphalan	
Methotrexate	
Methotrexate	
Mitomycin	
Mitozantrone	
Oxaliplatin	
Pentostatin	
Procarbazine	
Streptozocin	
Tegafur-uracil	
Temozolomide	
Teniposide	
Thioguanine	
Thiotepa	
Thiotepa	
Tomudex	
Treosulfan	
Vinorelbine	

A treatment called Cool caps or Cold caps is available to prevent hair loss but is only suitable for certain regimes and cancer diseases. All nurses need to be aware of which regimes / cancer types are appropriate for the administration of scalp cooling, and ensure that appropriate consent is obtained before scalp cooling is commenced.

When the patient's hair starts to fall out they may prefer to have their hair cut very short or have their head shaved, as often the hair will fall out or thin out in clumps. The natural oils in hair are reduced due to alopecia and so the patient needs to be reminded to take extra care with the delicate skin on the scalp by moisturising regularly and by preventing any sun damage.

The patient should be advised not to undergo any form of hair treatment such as colouring or perming as this will damage the hair even further.

2.5.7 Skin changes

Many chemotherapy agents can cause skin changes such as reactivation of radiation sites, urticaria, erythema and pruritis. Hyperpigmentation can also occur especially along the line of veins used for drug administration when using 5 Fluorouracil. Patients need to be warned that this can occur and will last throughout their course of treatment, gradually fading after treatment ceases.

Chemotherapy also can also cause photosensitivity and patients should be warned to avoid direct sunlight and sunbathing during the course of their treatment. A high factor sunblock is recommended during the summer months.

Erythema of the palms of the hands and soles of the feet (sometimes referred to as plantar/palmer erythema or hand-foot syndrome) is known to occur in some patients receiving 5-Fluorouracil or Capecitebine, and less commonly with other cytotoxics. This is a distressing syndrome, which may necessitate a reduction or cessation of treatment.

Changes in finger or toe nails are often seen with the administration of chemotherapy, especially Cyclophosphamide, Docetaxel or Doxorubicin. Pigmentation can occur at the base of the nail bed and partial separation of the nail plate seen. (Holmes 1997 p183-185)

2.5.8 Fatigue

Cancer patients report fatigue as one of the most disturbing side effects they experience (Richardson et al, 1998 and Bothwick, D 2003). Factors that can influence the degree of fatigue experienced by a patient include:

- Symptoms of the disease such as changes in nutritional metabolism, anorexia and altered full blood count all contribute to causing fatigue, physical symptoms such as pain, ability to rest and sleep will all affect a patient's experience of fatigue.
- For patients who receive treatments such as chemotherapy and biotherapy, fatigue is often identified as the most distressing side effect of these treatments (Richardson 1995). Radiotherapy usually involves localised side effects, but fatigue is the only systemic side effect reported from this treatment (Holley 2000).
- The side effects of treatment (i.e. stomatitis, diarrhoea, nausea and vomiting, constipation, anorexia, taste changes and dry mouth) all affect nutritional intake which in turn influence fatigue.
- Psychosocial factors such as prolonged stress; concerns about sexual function, appearance, grief, loss and financial concerns can also have a profound effect on fatigue (Holley 2000; Whitmer and Barsevick 2001).

When assessing patients with fatigue information on the individual's experience of fatigue such as its onset, duration and intensity is required in order for a full assessment. Six basic categories for assessment can be used: general appearance, patient-described experience, attitude, speech, activity and concentration.

Educating patients to help them cope with potential fatigue and strategies to enable patients to deal with actual fatigue are the aims of management. Assessment of fatigue, problems with sleeping and development of nursing interventions to promote daytime activity and night-time rest are key to managing fatigue and preventing loss of biologic rhythm, Berger A M and Farr L (1999). Interventions such as energy conservation combined with prioritising activities have been shown to be helpful. Elimination of unnecessary activities and delegation of tasks can be very useful for patients. While rest is required, gentle exercise has been proven to be very beneficial for patients experiencing fatigue. Promotion of good nutritional intake and symptom control will assist with some of the causes and factors involved in causing fatigue.

2.5.9 Bone marrow suppression

2.5.9.1 Neutropenia

Neutrophils are polymorphonucleocytes and are phagocytic cells. These cells are responsible for the formation of exudates or pus. They represent the majority of the cells in the white cell family and are largely responsible for immune competence in terms of phagocytic activity. They provide a binding site for antibiotics, which are then transported from the blood to the tissues or site of infection with the phagocytic cell. As sepsis is the greatest single cause of death in the immunosuppressed patient, the lack of neutrophils is responsible for absent immune reactivity and the development of septic shock.

Clinically, in the absence of neutrophils the patient will not have exudates and the only indication of sepsis will be fever. Fever itself may also be absent in the patient receiving high dose steroids. In this situation, the general condition of the patient may be the only factor evident to suggest sepsis.

Management

1. Prevention of infection and early recognition and treatment:

- Educate patient about self-care strategies, including recognition of symptoms and awareness of when their counts are likely to be decreased.
- Frequent temperature monitoring particularly during neutropenic phase.
- Aseptic dressing techniques for venous access devices.
- Regular FBC and monitoring of results so that early interventions can be achieved.
- Maintenance of adequate hygiene and maintenance of skin integrity.
- Avoidance of cross infections from family or friends, particularly when the patient's blood counts are low.
- Neutropenic diet where necessary, otherwise a clean healthy safe diet for all patients.

2. Provide a 24 hour contact number:

- All patients should have an alert card as recommended by the NCAG report and Manual for Cancer Services: Chemotherapy Measures (2011).
- This is especially important as patients with a low white cell count may not produce exudate, and temperature may be the only clinical sign of sepsis. Prompt action is required as septic shock in the cancer patient can occur rapidly.
- Trusts/networks must provide a 24hour phone line for patients who have received treatment

3. Increase host defences:

- Encourage a balanced diet.
- Ensure adequate exercise, rest and sleep periods.
- Administer granulocyte colony stimulating factors to promote neutrophil recovery where prescribed.

4. Recommended actions in response to WBC and /or fevers

- Patients with white cell count below 1.0 10x 9/l, and/or a neutrophil count less than 0.5 10 X9/l with no fever, need their temperature to be monitored closely and must be aware of the risk of infection at this time and what action they must take if infection indicated. They do not require admission to hospital.
- Patients with an absolute neutrophil count of 1.0 10 X9/l whose count is predicted to drop further – this will depend on where the patient is in their chemotherapy cycle i.e. 2 days post receiving chemotherapy we can predict a drop in neutrophil count, 2 days pre next chemotherapy cycle counts are likely to be rising not falling.
- Assess patients with a temperature of 37.5oC and treat at 38oC.
- These patients require assessment immediate admission to hospital. Where blood cultures, prophylactic surveillance, urine & faecal samples, wound & orifice swabs can be carried out.
- Prophylactic broad spectrum antibiotics are administered until the organism/s is/are; or specific antibiotic sensitivities are established or the White blood cells recover.

5. Avoid unnecessary invasive procedures:

- Multiple invasive procedures only increase the risk of septic injury.
- Wash hands before any procedure and after every physical contact with the patient to prevent cross infection.

6. Monitor patient for signs of early changes in their condition:

- Cough, sore throat, dyspnoea or other respiratory changes.
- Dysuria, malodorous or cloudy urine, haematuria, frequency.
- Diarrhoea, peri-anal soreness.
- Tenderness of the mucous membranes, development of tissue fissures, ulcers, or other skin lesions or discharge from surgical or central venous catheters or urinary catheter sites.
- Deteriorating signs of sepsis (see Module 8).

Access to Emergency Care and Emergency Departments

In line with guidance from NCAG report and with the publication of the subsequent Acute Oncology Measures has recommended that a more systemic approach should be taken to dealing with cancer-related emergencies. These recommendations have been embodied in the concept of the 'Acute Oncology Service'. Emergency departments should have access to information regarding patients receiving chemotherapy and have management processes to facilitate rapid triage and management process in place to ensure that patients are treated effectively and safely.

2.5.9.2 Anaemia

Decreases in red blood cell haemoglobin occur as a result of many benign and malignant conditions. In cancer, patients can experience anaemia as a result of chemotherapy-induced bone marrow suppression, superimposed infection, drug therapies for symptom management, bleeding, tumour progression or endocrinopathies stimulated by cancer cells.

Cancer patients are susceptible to the development of acute and chronic anaemia, which may be either mild or severe. The patient presents with breathlessness and fatigue due to the decline in tissue oxygenation. Consequently, there is a need to plan nursing care that will conserve the patient's strength until the haemoglobin can be returned to normal. Severe anaemia may see the patient present with: headache, vertigo, tachycardia, dyspnoea at rest and tachypnoea.

Long term chemotherapy treatment or continuous infusions may lead to anaemia of the chronic type, as these cells are slower to return to normal. The physical assessment of the patient with anaemia will reflect the compensatory changes which the body initiates to improve oxygenation. Correction and management of anaemia is a vital concern for health professionals caring for cancer patients. It is necessary to have well oxygenated tissues in order to maintain a feeling of well being for the patient (i.e. energy and the capacity for activity) and to maximise the effects of therapy.

Management

Nursing interventions to facilitate activities of daily living and to reduce fatigue are aimed at early recognition of symptoms, early safe intervention and, perhaps most importantly, patient education. Patient education is an essential part of our practice as nurses. If the patient is well informed about their disease and its implications then they will be able to exert more control over its management. Such self-control has positive effects for the patient's physical and psychological well being.

1. Ascertain the cause, extent and limitations (to the patient) of the anaemia.
2. Assist with daily activities for energy conservation.
3. Assessment and interventions in anaemia related hypoxia:

- Assess for signs of pallor, dyspnoea.
- Chose an appropriate oxygen delivery system and safely administer oxygen when required.

4. Dietary management:

- Assess for adequate intake of iron, B12 and folic acid (to ensure adequate haemoglobin synthesis, Cook (2000) points out that the body can store B12 for many years but has only low reserves of folate to sustain red cell production for a few days.
- Refer to dietician.

5. Administer packed red blood cells as required:

- Always follow local procedure on administering blood products.
- The general formula is 1 unit of packed red cells for each 1g of haemoglobin lost.
- Ensure ABO and Rh compatibility of transfusions to reduce risk of haemolytic reactions and any other requirements such as irradiated.
- Administer pre-medication to prevent or minimise transfusion reactions (antihistamines and/or hydrocortisone) if prescribed.
- Packed red cells are normally leucocyte-depleted check on the bag. Observe for signs of non-haemolytic reaction, i.e. chills, fever, headache (usually occurs in the first 20 - 30 minutes or within 24 hours).
- Check whether irradiated blood products are required.
- Depending on the type of disease patients may have their haemoglobin supported by the administration of a sub-cutaneous injection such as Epoetin.

2.5.9.3 Thrombocytopenia

Thrombocytopenia is an abnormal decrease in the serum platelet count which has the potential to result in haemorrhage or bruising. Platelets are crucial to the process of haemostasis. The platelet count can drop significantly whilst a patient is receiving chemotherapy. The patient must be aware of any signs of thrombocytopenia, so they can inform the day unit or ward immediately.

When the platelet count drops, the patient may notice a pin-prick rash, purpura or they may have evidence of bleeding.

The most common sites of bleeding are:

- The mucous membranes.
- The skin on the lower limbs and trunk.
- The gastrointestinal system.
- The respiratory system.
- The genitourinary system.
- Intracranial haemorrhage.

Many of these are fragile areas and although they can bleed for other reasons, the platelet count must be checked so that corrective measures can be taken if necessary i.e. platelet transfusion.

Although a platelet transfusion will bring the count to a safer level, precautions need to be taken to protect the skin and mucous membranes from abrasions.

Management

1. Physical assessment of the patient:

- Observe for signs and symptoms of bleeding such as petechiae, purpura, haematuria, prolonged menstrual loss, epistaxis, easy bruising etc.
- Cerebral bleeding may be demonstrated by blurred visions, headaches pupillary changes or confusion.

2. Avoid unnecessary invasive procedures that may increase the possibility of bleeding;

- Avoid IM injections, rectal examinations or suppositories. Advise the patient not to shave with a razor blade.
- Minimise venepuncture.

3. Administer platelet transfusions as prescribed when required as per local policy

- Monitor for any transfusion reactions.
- Are HLA matched platelets required.
- Check whether platelets are leukodepleted and whether irradiated platelets are required

4. Educate the patient to prevent bleeding

- Use of soft toothbrush.
- Advise they must not take drugs such as aspirin, anti-inflammatories.
- Avoid contact sports.
- If bleeding occurs inform the medical team as soon as possible, apply direct pressure to the area.

2.6 SPECIFIC SIDE EFFECTS AND TOXICITIES

2.6.1 Infertility

Chemotherapy can injure the germinal epithelium of gonads and become non-functioning due to direct and indirect injury. This injury can result in loss of supporting follicular cells, which can cause stromal fibrosis, follicular maturation and reduced ova numbers (Delbeke et al 2000).

Alkylating agents are the most detrimental to a patient's fertility, including Busulfan, Cyclophosphamide, Nitrogen mustard, Chlorambucil, Melphalan and Procarbazine. In addition to this, combination chemotherapy has greater effects upon fertility in comparison to single agent therapy. The consequences of gonadal failure can be infertility or premature menopause.

Management

Prior to chemotherapy infertility should be discussed with the patient and treatment options given them. For men, sperm banking and for women embryo banking or storage of ovarian tissue may be an option.

Ovarian tissue storage has not been very successful in the past, although research and progress is constantly being made. Although patients are warned of the prospects of becoming infertile, there are many documented cases of fertility being maintained without medical intervention. Unless otherwise known, precautions should always be maintained to prevent pregnancy during and after treatment until safe to do otherwise (Schover et al 2000).

2.6.2 Organ Toxicity

Specific Organ Toxicities of Selected Cytotoxic Drugs	
Cardiac	
Doxorubicin, Daunorubicin, Mitoxantrone	Cumulative dose-related myopathy and heart failure (limit lifetime dose to lessen incidence)
Pulmonary	
Bleomycin fibrosis	Cumulative dose-related pulmonary
Mitomycin C and Alkylating agent Busulfan	Rare acute fibrosis, may respond to corticosteroids
Hepatotoxicity	
Methotrexate	Fibrosis with chronic dosing
Carmustine	High dose-related liver enzyme elevation
Renal	
Cisplatin	Tubular necrosis (prevent with hydration, diuretics)
Cyclophosphamide, Ifosfamide	Hemorrhagic cystitis (bleeding from urinary bladder; prevent with hydration and drugs such as Mesna)
Streptozocin	Renal tubular necrosis
Nervous system	
Vincristine, Paclitaxel, Vinblastine, Cisplatin, Oxaliplatin	Peripheral nerve damage; tingling parasthesias and paralytic ileus
Fluorouracil, Cytarabine	Cerebellar changes, ataxia, slurred speech
Procarbazine	Drowsiness, confusion, parasthesias
Skin and mucous membranes	
Fluorouracil, Methotrexate	Stomatitis
Bleomycin	Erythema, thickening, desquamation
Ifosfamide	Encephalopathy

2.6.3 Ototoxicity

Ototoxicity is mostly caused by the use of platinum based chemotherapies. Damage to the secretary mechanism of the organ of Corti occurs and manifests as high frequency hearing loss and tinnitus. Risk factors are thought to include the cumulative doses, its infusion rate, combination with vinca-alkaloids and pre-existing hearing impairment.

Management

Although baseline audiometric testing can be useful in determining existing hearing problems, it has no value in predicting those that may be affected by chemotherapy. Some clinicians believe that the benefits of treatment outweigh the risk of hearing loss, and testing is unnecessary.

2.6.4 Secondary malignancy

Despite seeing more secondary malignancies the risk remains small. The highest incidence is seen in the long term survivors of Hodgkin's disease who had both chemotherapy and radiotherapy.

Management

A second malignancy cannot be prevented. They are usually notoriously difficult to treat, although standard treatment protocols would be offered. Failing this, supportive therapy would be continued.

2.7 MANAGEMENT AND TELEPHONE ENQUIRIES

Each patient should be given advice on their treatment and the side effects that could result from it as described in module 2. Each patient must also give the 24 /7 Patient Telephone Helpline contact details in the event they have any concerns or any problems / symptoms occur.

All patients should be triaged following the guidance in the Oncology/Haematology 24-Hour Triage Rapid Assessment and Access Tool Kit. All triage data should be recorded on the Triage Log Sheet, an example of which is located on p10 of the guidance.

As a consequence the nurse caring for these patients and the member of staff on the 24/7 call rota will need to know how to deal with these calls and what advice to give these patients when they call.

2.7.1 General principles

All appropriate information to be obtained from the patient is detailed on the Triage Log Sheet but includes:
Name, Date of birth, Hospital number (if possible), address and Consultant, Diagnosis, Treatment and when this was last received, or if they treatment finished the date of completion.

Any medication the patient is currently taking?

As the patient describes the problem ascertain whether there are any signs and symptoms of infection:

- Does the patient have a temperature?
- When and how often was the temperature taken?
- Have they experienced shivering, rigor, sweating etc?
- Any respiratory symptoms including shortness of breath etc?
- Any GI symptoms including diarrhoea, vomiting, constipation?
- Any difficulties passing urine?
- Any other symptoms such as pain, bleeding or neurological problems?

Document all information and seek advice from senior member of staff or medical staff and ensure the patient is followed up.

2.8 COMPLICATIONS FOLLOWING CHEMOTHERAPY

Many problems can occur as a result of receiving chemotherapy, including those which occur when the bone marrow is suppressed. Not all cytotoxic agents can affect the bone marrow in this way, but all have the potential to cause discrepancies in normal blood values. Further information can be found in Module 2, Section 2.3.

2.8.1 Neutropenic Sepsis

Neutropenic sepsis is a medical emergency and must be treated with a matter of urgency. A neutropenic patient with an infection can die very quickly if left untreated, and must be given IV antibiotics as soon as possible, especially if shocked. The recommended time scale is to administer antibiotics within one hour of suspecting Neutropenic Sepsis.

2.8.2 Tumour Lysis

Tumour lysis can occur in any patient with known bulk disease receiving chemotherapy, but is usually associated with the high grade lymphomas and leukaemias which are particularly sensitive to treatment. It is a recognised condition that can be prevented with appropriate management and careful monitoring.

Rapid dissolution of the tumour in these diseases can occur following chemotherapy, which can potentially result in an acute metabolic disturbance. Urea, urates and phosphates are known bi-products of cell destruction, and when there is mass destruction over a short period of time, metabolic changes occur which can become life threatening.

When there is a rapid reduction in tumour mass, hyperuricaemia, hyperphosphataemia, hyperkalemia, hypocalcaemia, and uraemia can occur resulting in renal failure and cardiovascular dysfunction if appropriate preventative measures have not been taken.

For high risk patients, allopurinol is prescribed to commence at least 24 hours prior to chemotherapy. Allopurinol can partially prevent the formation of uric acid crystals, and is continued for as long as the risk continues (at the discretion of the prescribing consultant).

In some situations, intravenous fluids may be indicated to establish a good diuresis, especially where the patient is unwilling or unable to maintain a good oral fluid intake. (Souhami & Tobias 1995). Uric acid is more easily dissolved in an alkaline solution. Sodium bicarbonate may therefore be added to the intravenous infusion to maintain the urinary pH above 7 and aid excretion of uric acid.

2.8.3 Anaphylaxis

An adverse reaction occurring generally within seconds or minutes of drug administration with features of an anaphylactic (antibody mediated) or anaphylactoid (not antibody mediated) reaction. Reactions may include urticaria, dyspnoea, bronchospasm, angioedema, hypotension, tachycardia, or occasionally cardiorespiratory arrest.

IMPORTANCE OF REACTIONS

1. May be life threatening for the patient.
2. Unpleasant and frightening for patient and staff.
3. Depending on the mechanism of the reaction, discontinuation or modification of the protocol may be necessary. Such changes may decrease efficacy of therapy.
4. A high incidence of reactions may require additional resources by nursing staff, doctors and pharmacy.

MECHANISMS OF ACTION

There are several possible mechanisms, these include:

1. The drug is antigenic. This usually requires a large molecular weight.
2. The drug is a hapten. Haptens are smaller molecules that become antigenic when they combine with a protein.
3. The drug itself is not responsible but a contaminant in the formulation is responsible.
4. The solvent for the drug is responsible.
5. The drug itself elicits an anaphylactoid reaction.

Anaphylactic versus Anaphylactoid Reactions

Unfortunately, the difference cannot be reliably determined clinically. Anaphylactic reactions that are immunologically mediated by an antibody imply: prior exposure to the drug, reaction risk associated with every subsequent exposure, increasing severity of reactions with each exposure, and discontinuation of the drug usually necessary. The majority of acute hypersensitivity reactions to chemotherapeutic agents in oncology are of the anaphylactoid type. Anaphylactoid reactions are idiosyncratic, may occur with the initial or subsequent exposure to the drug, may be pharmacologically blocked, and may not require that the drug administration be discontinued.

Procedures

Where a patient is receiving a drug which has the potential to cause anaphylactic/ acute hypersensitivity reactions:

1. The patient should be monitored closely.
2. A doctor should be readily available.
3. Emergency drugs (adrenaline, chlorphenamine and injectable corticosteroids) and emergency resuscitation equipment must be kept near the patient when the drug is being administered.

Cytotoxic drugs with the potential to cause anaphylactic/ acute hypersensitivity reactions include:
Asparaginase, Bleomycin, Carboplatin, Epipodophyllotoxins, Lymphocyte Immune Globulins, monoclonal antibodies and Taxanes

Treatment of Reactions

1. Stop chemotherapy / monoclonal antibody infusion.
2. The doctor must completely assess patient with particular attention to cardiorespiratory status and order the appropriate treatment.
3. Follow local procedures for management of anaphylactic reactions (all nurses giving chemotherapy need to be aware of these before chemotherapy treatment starts).
4. Reassure patient that the reaction is a recognised and treatable problem.
5. Monitor the patient until resolution of any observed symptoms.

6. For easily controlled hypersensitivity reactions involving etoposide and monoclonal antibodies, the infusion can usually be slowly and cautiously restarted. For reactions involving taxanes, the responsible doctor should be contacted for a decision on further drug administration.

2.9 MANAGEMENT OF REACTIONS TO SPECIFIC DRUGS

Asparaginase

Asparaginase produces hypersensitivity reactions in 6-43% of patients with a 1% mortality rate from anaphylaxis. Intermittent IV administration produces anaphylactic reactions three times more frequently than intermittent IM administration. When the drug is used with prednisolone, mercaptopurine and/or vincristine, the risk is decreased. Intramuscular injections cause allergic reactions in 6-18% of children. The reactions are more delayed in onset, less frequently affect the airway and are seldom life-threatening. Skin manifestations in the form of hives and rashes are much more common. When E.coli asparaginase causes a type 1 (anaphylactoid) reaction consider the use of Erwinia asparaginase.

Skin testing has not been completely reliable in predicting asparaginase hypersensitivity. Some protocols require an intra-dermal test to be performed prior to the initial dose of the drug and when a week or more has elapsed between doses. Consult specific protocol for details. After injection of the intra-dermal test, the test site should be observed for 1 hour for the appearance of a wheal or erythema, indicating a positive reaction. In the case of a positive skin test, consider the use of a desensitisation procedure to initiate therapy. Consult the Pharmacy for further information regarding this.

Bleomycin

Fever and chills occur with each treatment in up to 50% of patients. The reaction starts 4-10 hours post treatment and can last for up to 48 hours. Anaphylaxis has been reported in 1-8% of patients treated with bleomycin and is more common with patients being treated for lymphoma.

Prophylaxis of Hypersensitivity Reactions from Bleomycin Pre-treatment with hydrocortisone 100 mg IV 30 minutes prior to bleomycin significantly reduces the severity of the reaction. Paracetamol every three to four hours can be used to control fever if it occurs.

Carboplatin

Carboplatin produces hypersensitivity reactions in 2-30% of patients. Hypersensitivity reactions may occur during or after the first dose but are much more likely to occur after several courses usually midway through an infusion. Symptoms vary but the most common include fever, flushing, urticaria, pruritis, cough, abdominal pain and emesis. More severe symptoms include hypertension or hypotension, tachycardia, wheezing and respiratory arrest. Most reactions subside quickly when the infusion is stopped and corticosteroids and antihistamines are administered. Re-challenge with carboplatin using premedication with corticosteroids and an antihistamine is not usually successful however there has been limited success with prolonged desensitisation protocols. Contact the Pharmacy for more information.

Epipodophyllotoxins: Etoposide (VP16), Teniposide (VM-26)

This is one of the most common causes of acute hypersensitivity reactions and may occur in 2% of patients receiving the drug. The reaction typically occurs within the first minute or two of the infusion. Patients may experience shortness of breath, an oppressive feeling in their chest, and an unpleasant sensation of impending doom. Clinically they may look very sick with flushing, tachycardia, bronchospasm, and hypotension. Fortunately, most reactions subside quickly when the infusion is stopped and serious consequences are uncommon. Features that indicate that this reaction is not immunologically mediated include: no relationship to the first or repeat doses, no reported cases with oral etoposide, lower risk when drug given by central lines and successful re-challenge usually possible. Once the reaction has subsided, the patient should be reassured that restarting of the etoposide infusion at a slow rate under close supervision is associated with a very low risk of a further reaction.

Lymphocyte Immune Globulin (ATG, ALG, Antithymocte Immunoglobulin)

Fever and chills occur in the majority of patients receiving ATG. The febrile reactions tend to decrease in severity after the first few doses of the drug but necessitate the administration of prophylactic measures (see below). True anaphylaxis occurs in less than 1% of patients receiving ATG. It may occur at any time during ATG administration and may be indicated by hypotension, respiratory distress, or pain in the chest, flank or back. Serum sickness reactions have occurred in a high percentage (up to 85-100%) of patients receiving the drug and may occur during ATG therapy or following discontinuation of the drug, but generally develop within 6-18 days following initiation of therapy. The

manifestations of serum sickness include fever, malaise, arthralgia, nausea and vomiting, lymphadenopathy, and cutaneous eruptions.

Prophylaxis of Hypersensitivity Reactions and Serum Sickness from ATG/ALG

Patients receiving ATG/ALG should receive a test dose prior to receiving treatment. Patients should be pre-medicated with paracetamol and chlorphenamine prior to each dose. Corticosteroids should also be given for serum sickness prophylaxis - refer to the protocol by which the patient is being treated for timing, dosage and duration of steroids.

Monoclonal Antibodies: e.g., Alemtuzumab, Cetuximab, Gemtuzumab, Rituximab, Trastuzumab

Up to 80% of patients receiving monoclonal antibodies may experience chills and/or fevers, rashes, hypotension and dyspnoea predominantly during the first infusion. All of the agents may produce a post infusion reaction starting 2-24 hours post dose. Severe allergic reactions are seen less commonly, in around 1-2% of patients.

Prophylaxis of Hypersensitivity Reactions from Monoclonal antibodies

No specific pre-treatment is recommended for most of these products. Paracetamol and an antihistamine may relieve the infusion related symptoms.

Alemtuzumab

All patients should receive an antihistamine (either IV or orally) and an analgesic e.g. paracetamol before every dose of alemtuzumab.

- For the treatment of CLL: Patients should receive hydrocortisone 100-200mg 30-60 minutes before each dose during the dose escalation phase only (i.e. the first 3 doses of 3mg, 10mg and 30mg).
- For patients receiving alemtuzumab as part a transplant conditioning regimen methylprednisolone IV 2mg/kg should be given 30 - 60 minutes prior to the first infusion.

In the event that acute infusion reactions persist, the infusion time may be extended up to 8 hours from the time of reconstitution of alemtuzumab in solution for infusion.

Taxanes: Paclitaxel and Docetaxel

Both paclitaxel and docetaxel are associated with acute hypersensitivity reactions. The incidence with paclitaxel is approximately 40% (2% severe) and the rate with docetaxel is 30% (7% severe). Clinical manifestations include skin changes (pruritus, erythema, rashes, urticaria), angioedema, dyspnoea (with or without bronchospasm), blood pressure changes (decrease or increase), and rarely, cardiovascular collapse. Because of poor aqueous solubility, paclitaxel is formulated in cremophor EL (polyoxyethylated castor oil) and this substance is thought to be the cause of the reaction. The incidence of hypersensitivity reactions can be diminished by a preventative protocol of dexamethasone and H1 and H2 blockers. The occurrence of a reaction does not preclude re-challenge with the drug.

Prophylaxis of Hypersensitivity Reactions from Docetaxel

NB, Pre-treat according to protocol by which patient is being treated. If no protocol available:
Dexamethasone 8mg twice a day for 3 days starting 24 hours prior to chemotherapy.

Prophylaxis of Hypersensitivity Reactions from Paclitaxel

NB, Pretreat according to protocol by which patient is being treated. If no protocol available:

1. Dexamethasone 20 mg orally 12 hours and 6 hours before treatment. Alternatively 20mg IV may be used 30 minutes before chemotherapy.
2. Chlorphenamine 10 mg IV 30 minutes before chemotherapy.
3. Cimetidine 300 mg or ranitidine 50 mg IV over 10 minutes 30 minutes prior to chemotherapy.

In the event of a hypersensitivity reaction to paclitaxel the patient may be retreated at full dose after administration of prophylactic medication. A variety of different re-treatment strategies have been reported in the literature. If re-treatment is felt to beneficial the following regimen has been suggested:

1. Dexamethasone 20 mg IV 6 hourly to a total of 80mg with a final dose 30 minutes prior to receiving paclitaxel.
2. Ranitidine 50mg IV 30 minutes prior to paclitaxel.
3. Chlorphenamine 10mg IV 30 minutes prior to paclitaxel.
4. Paclitaxel given at 10% of the rate needed to give the solution over 3 hours (i.e. approximately 16ml/hour). If no further reaction is seen within 2 hours then the rate can be increased to 32ml/hour for 1 hour, then 64ml/hour for 1 hours, then 120ml/hour for 1 hour and finally back to the standard 166ml/hour. Each escalation of rate should only be undertaken if no hypersensitivity has been seen in the previous hour.

5. Emergency resuscitation equipment and personnel should be available during the period of re-challenge.

2.10 DISCHARGE ADVICE

When preparing the patient who has received chemotherapy to go home the nurse should make particular reference to the side effects of chemotherapy, what the patient might experience and how to manage that experience, and who to contact should they have any ongoing concerns or in an emergency situation.

Discharge advice should be given in relation to:-

2.10.1 Low Blood Counts

Neutropenia

- His/her increased susceptibility to infection.
- How to take his / her temperature.
- The relevance of the temperature measurement.
- Signs and symptoms of rigors.
- Who to contact 24 hours / day.

Anaemia

- Signs and symptoms of anaemia .
- Thrombocytopenia.
- Risk of bruising and haemorrhage.
- Headache associated with nausea and vomiting or that does not respond normally to permitted analgesics.

2.10.2 Altered Body Image

- Alopecia.

2.10.3 Nutrition and Hydration

- Alteration in taste.
- Fluid intake.

2.10.4 Gastrointestinal Disturbances

- Mucositis.

2.10.5 Specific Side Effects of Individual Drugs

Upon completion of the discussion with the patient you should ensure:

- That the patient/carer understands the importance of reporting any problems at the earliest sign or to contact the hospital for any query possibly related to their current cancer treatment.
- The patient/carer has the appropriate numbers for emergency use and reassurance.
- The patient/carer is aware of the availability of 24 hour advice.
- The patient understands how and when to take all their medication.

A 24 hour contact number for advice and support on side effects is critical. Knowledge that there is a safety net, that patients do not have to cope alone and that there is someone 'out there' ready with advice is often all that is needed to allay fear. (Stein 1996)

End of Treatment Summary Record and Ongoing Care after Completion of Chemotherapy

As the majority of cancer survivors spend most of their time in the community rather than the hospital, the roles of the GP and other members of the primary care team are becoming increasingly important in the coordination and delivery of cancer survivorship care. This is particularly the case for supporting the early detection, monitoring and management of the signs and symptoms and management of immediate or ongoing effects associated with the disease or its treatment. It will therefore be essential to ensure that maximum utilisation is made of the consultations that are already occurring between cancer survivors and their GP.

Curative and palliative treatments now in use are actively changing and becoming increasingly more specialised. Changes in follow up practice have also resulted in the involvement of a much wider range of health care professionals in the delivery of follow up management and care. It is therefore unrealistic to expect primary care personnel to be aware of all the potential immediate and long term effects of treatment, the follow up management and care arrangements that have been put in place for their patient or the monitoring / management that may be required by the GP.

Effective communication between the specialist cancer team and the GP/ primary care team is therefore becoming of paramount importance in the delivery of high quality care and management to cancer survivors. Presently there is wide variation in the quality and content of the summary information communicated to the GP, particularly in relation to the risks of future problems, ongoing follow up and management arrangements and / or the monitoring and management required by the primary care team. This is considered to be mainly related to the seniority / experience of the completing clinician or individual clinician or specialist team's practice.

Therefore, in line with current guidance, it is recommended that an end of treatment summary letter is developed; a copy of this should be given to the GP, all healthcare professionals involved in patients ongoing care and management, and in accordance with local policy, a copy to the patient.

Key elements of the end of treatment summary may include;

- Diagnosis and date of diagnosis.
- Histology/ staging / grade.
- Significant clinical findings.
- Summary of initial phase treatment and any complications encountered by the patient during this period.
- Treatment intent-curative, management of active/advanced disease, palliation/symptom control.
- Treatment outcome and/or expected median survival for this condition, complete remission, partial response, residual disease, etc.
- Possible acute treatment toxicities and appropriate action/ management.
- Likelihood of compromised immunity.
- Likely risk of late effects of treatment.
- Alert symptoms / triggers that merit discussion or referral for a specialist opinion.
- Likely risk of recurrence and trigger symptoms that should alert the GP or other health care professional to refer or seek a specialist opinion.
- A summary of the management plan for the patient following the initial treatment phase including:
    - Follow Up schedule and format, e.g. face to face, telephone, patient self referral.
    - Schedule for any screening, investigation, tests required during this period.
    - Referrals that have been made to other services.
    - Outline of ongoing treatment planned and likely duration of this therapy.
    - Actions needed by the GP including symptom management, screening / monitoring investigations and medication review.
- Notification that the patient should be entered onto the primary care palliative or supportive care register if applicable for the individual patient.
- A summary of the information that has been communicated to the patient and /or their carer/family. A copy of the written patient information given to the patient should be included with the summary record if appropriate.
- Key contact details/local arrangements for urgent discussion/ fast track referral to specialist cancer team and out of hour's service.

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3 MODULE 3 - SAFE HANDLING AND DISPOSAL OF CYTOTOXIC DRUGS

3.1 INTRODUCTION

Cytotoxic chemotherapy agents are considered to be substances hazardous to health, and as such there are legislative documents outlining guidance for their safe use, to prevent any inappropriate use and abuse of this group of drug therapies. This legislation is designed to protect the person receiving treatment and individuals who come into contact with it, either through its production, reconstruction, transportation, administration or disposal.

The relevant documents include:

- Safe handling of cytotoxic drugs HSE Information Sheet MISC615.
- Control of Substances Hazardous to Health (COSHH) regulations.
- MARCH guidelines.
- Local policies/guidelines.

The three main principles underpinning the safe handling of cytotoxic drugs are:
The products must be protected from microbiological contamination by adherence to strict aseptic techniques.
The personnel and carers involved must be protected from exposure to hazardous materials generated during reconstitution, transport, administration, elimination and disposal.
The environment must be protected from accidental spill.

3.2 OCCUPATIONAL EXPOSURE

It is essential to minimise or eliminate (if possible), all potential risks of accidental exposure by adhering to the protocols in place for the safe handling of cytotoxic drugs in clinical practice. Research has been undertaken in the past, which has measured occupational exposure, risk factors and physical sequelae associated with exposure. This research has shown that dealing with these drugs without precautions could cause chromosomal abnormalities, congenital malformations and loss of fertility. Occupational exposure is therefore an important area that requires effective strategies for minimising exposure.

It is the employer's responsibility to:

- Provide a safe system of work for all staff involved in the safe preparation, administration, handling, transportation or disposal of cytotoxic drugs.
- Ensure that all staff who are engaged in the above activities are appropriately trained and assessed as competent to carry out their duties.
- Ensure that appropriate and properly maintained equipment and facilities are available to all those in their employment.
- Standard operating procedures are in place for activities involving cytotoxic drugs.

3.3 OCCUPATIONAL EXPOSURE AND PREGNANCY

There have been several papers discussing the association between the first trimester in pregnancy, of nurses exposed to cytotoxic drugs and foetal loss.

It is therefore essential that nurses who are pregnant should not deal with cytotoxic drugs in the first trimester. Various research papers account that pregnant patients receiving cytotoxic drugs for breast cancer have had no problems of spontaneous abortion after the first trimester. It is recommended that employees who are pregnant, planning pregnancy (male or female), breast feeding, or who have any other medical reasons that prohibit exposure to chemotherapy, these employees may elect to refrain from preparing or administering these agents or dealing with excreta during and following treatment.

Employees should be informed of potential risks from exposure and be allowed to make an informed decision regarding the handling of cytotoxic drugs. The completion of a risk-assessment may be helpful in these situations.

Written policies and procedures for all aspects of handling cytotoxic drugs are in place and should be followed to prevent exposure of the nurse, patients, visitors and the environment.

The emphasis should be on clear guidelines to reduce occupational exposure to all staff at all times

Three main routes of cytotoxic exposure to employees are: -

- Inhalation of drug aerosols or droplets.
- Absorption of drug through direct contact with skin (includes trauma such as needle sticks, dealing with excreta etc.) or direct contact with eyes.
- Ingestion through contact - due to poor hand washing after dealing with cytotoxic materials and then eating or smoking.

3.4 EXPOSURE RISKS

Risks include: -

- Withdrawing needles from vials.
- Transferring drugs using syringes, Needles or filter straws.
- Changing bags, bottles, or tubing.
- Priming tubing or clearing air from a syringe.
- Breaking or leaking of bottles, bags or connections (e.g. accidental puncture from closed system).
- Disposing of materials used during preparation and administration of cytotoxic drugs.
- Handling bodily fluids (e.g. blood, urine, stool, vomit, ascitic fluid, sweat).
- Disposing of linen or materials soaked or soiled with bodily fluids of patients who have received cytotoxic drugs.
- Clean up of cytotoxic spillage.

3.4.1 Symptoms Related to Exposure

The reported symptoms and/or conditions associated with occupational exposure have been varied but no evidence directly linking to administration of chemotherapy has been proven: -

Dizziness, light headedness	Dry and gritty eyes
Dermatitis	Mutagenicity of urine
Liver damage	Neutropenia
Abnormal blood results	Chromosomal aberrations
Anti-fertility effects	Foetal malformations
Carcinogenic potential	Spontaneous abortions

The potential problems caused by exposure to chemotherapy are many and the provision of a safe working environment is the only way to eliminate or minimise the risk of injury. The issue of safe handling is of paramount importance, given that cytotoxic chemotherapy is now administered in a variety of clinical settings as well as the home. Cytotoxic drugs should be made up centrally in a designated area.

3.4.2 Safety Guidelines

In order to ensure safe handling of cytotoxic drugs guidelines are in place that stipulate the following: -

3.4.2.1 Reconstitution of Cytotoxic Drugs

All cytotoxic drugs should be reconstituted in pharmacy where the use of a laminar flow cabinet is available. Preparation is most appropriately undertaken by trained pharmacy staff using a negative-pressure pharmaceutical isolator designed for the purpose. This facility is for the protection of the operator as well as the patient. Many patients are myelosuppressed as a result of their therapy plus the fact that the majority of the cytotoxic drugs used are given intravenously, therefore a sterile product must be supplied to reduce the potential for injury due to infection. The operator may be exposed to aerosol-derived carcinogenic substances while reconstituting drugs and must be protected by working in an aerosol free area. Protective clothing consisting of a closed front, long sleeved gown with elastic cuffs, gloves, eye protection and footwear must be worn.

3.4.2.2 Labelling

All labelling of cytotoxic drugs must comply with the National Pharmaceutical Guidelines and Local Trust Guidelines.

All drugs, whether in prepared syringes or in plastic IV bags, should have the following information adhered to them: -

Drug name	Drug dose and volume
Patient name and hospital number	Expiry date and time
Date and time of preparation	Storage conditions label
Batch number	Warning label (Handle with Care)

3.4.2.3 Packaging

All drugs should be packaged in a heat sealed plastic bag (black if the drugs need to be protected from light). All syringes must be capped.

3.4.2.4 Transportation and storage

All health care personal involved in transportation should be educated in the precautions that need to be observed when transporting this type of drug including cytotoxic spillage.

Prepared cytotoxic agents must be transported in designated transport bags or boxes. These should be sturdy, secure and leak-proof and should be clearly labelled: 'Cytotoxic Drugs – Handle with Care' before moving out of the reconstitution area.

Chemotherapy drugs must be delivered to a qualified nurse on the ward who takes responsibility for them
Storage of cytotoxic drugs should be in a separate storage area, distinct from the ward treatment room to prevent confusion with other medications.

3.4.2.5 Disposal of cytotoxic waste

All equipment waste (needles, syringes, IV bags, clothes, etc.) should be placed in specially designated cytotoxic waste bins (preferably 20 litre bins). The sharps disposal box must have purple colour coding to denote cytotoxic waste as well as a purple lid. Ensure that the bins are labelled with cytotoxic waste warning and area/ward labels before being removed by the cytotoxic waste team. This should be carried out on a daily basis and the bins should go to the incinerator which will burn the material at a temperature greater than 1100oC.

3.4.2.6 3.4.2.6 Handling waste from patients receiving cytotoxic drugs

Patient excreta such as urine, faeces, vomit, sputum, etc. can contain potentially hazardous amounts of cytotoxic drugs, or in some cases, their active metabolites. Excreta any kind should be handled with care following cytotoxic drug administration. Gloves and a plastic apron should be worn when dealing with waste products. Below there is a table that gives an approximation of how long the cytotoxic drugs stay in the body. As a general rule the excreta from patients receiving cytotoxic drugs should be assumed to be hazardous and treated as cytotoxic, for at least 48 hrs after the completion of treatment and such patients should be clearly identified to ward staff.

Cytotoxic Drug	Route of Administration	Duration of Protective Precautions
Bleomycin	IV, IM or SC	Urine – 72 hrs; 50% excreted in the first 24 hrs.
Busulfan	PO	Urine; 12-24 hrs
Carboplatin	IV	Urine – 24-48 hrs; 60% excreted in the first 24hrs
Cisplatin	IV	Urine – 7 days
Cyclophosphamide	IV, PO, or into a body cavity	Urine – 5 days Faeces – 5 days
Cytarabine	IV,IT,SC or IM	Faeces – 5 days Skin contact; 3 days Oral procedures; 3 days
Dactinomycin	IV	Urine – 5 days Faeces – 7 days
Daunorubicin	IV	Urine – 5 days; 20 % excreted in the first 24 hrs Faeces – 7 days
Doxorubicin	IV	Urine – 6 days Faeces – 7 days
Epirubicin	IV	Urine – 7 days Faeces – 5 days
Etoposide	PO or IV	Urine – 6 days Faeces – 7 days
Fluorouracil	PO,IV,IA Topical or in to the eye	Urine – 4 days Faeces – 7 days
Melphalan	PO	Urine – 2 days Faeces – 7 days
Mercaptopurine	PO	Urine – 3 days; 50% excreted in the first 24 hrs
Methotrexate	PO,IV,IM,IT or IA	Urine – 3 days; Major problem with urine during first 8 hrs Faeces – 7 days
Mitomycin	IV, IA, IP, into a body cavity	Urine – 24 hrs
Mitoxantrone	IV	Urine – 6 days Faeces – 7 days
Thiotepa	IV,IM, into a body cavity, into a tumour, IT or IA	Urine – 3 days
Vinca Alkaloids	IV	Urine – 4 days Faeces – 7 days.

3.4.2.7 Handling Contaminated Linen

Precautions are required to limit exposure to linens contaminated with the bodily fluids of a patient who has recently received cytotoxic drugs. Linen and other materials soaked with bodily fluids can be a source of cytotoxic exposure and must be handled in accordance with proper protective and handling procedures. Latex gloves and plastic aprons should be worn when handling these items.

Contaminated linen/uniforms may also pose a threat to laundry staff. Lightly contaminated linen may be treated as 'infected waste' double bagged in a linen bag then in a plastic bag and dealt with by the normal laundry process. Heavily contaminated items may need to be incinerated.

3.4.2.8 Cytotoxic Spillage

Cytotoxic spillage kits must be available at all times in all clinical areas where cytotoxic drugs are administered, and in all pharmacy areas where cytotoxic drugs are handled or stored.

Accidental spill represents a potential hazard to staff, patients and anyone in the immediate vicinity of the contaminated area at the time of the spill, although safe handling and good practice measures should be encouraged to prevent spillages.

Generally spills occur during administration or transportation of the cytotoxic drugs. Spillage kits are available in all oncology/haematology areas dealing with cytotoxic drugs and should be used to contain and clean up the spillage. All equipment and materials used to deal with the spill should be treated as cytotoxic waste and an incident form should be completed.

The spillage kit should contain: -

- A gown.
- 2 pairs of latex gloves.
- Protective glasses.
- Protective shoe covers.
- Mask.
- Plastic disposable scoop and container for sweeping glass particles and debris.
- Several absorbent pads.
- 2 large plastic bags and cytotoxic labels.
- Available distilled water to wipe up the spills area clean.
- Special linen bag for contaminated linen.

Ensure you are aware of the cytotoxic spillage procedure in your area.

3.4.2.9 Monitoring Staff Dealing With Cytotoxic Drugs

Whether staff should be monitored for evidence of exposure to cytotoxic drugs remains a controversial subject. The research and knowledge base relating to oncology staff testing remains insufficient to offer firm guidance on the value of these tests.

Occupational health should be informed of any new employees before they start dealing with any cytotoxic drugs.

The primary focus of safety during the preparation and administration of cytotoxic drugs must be on control of the working environment, minimising exposure and safe practise.

Recommended Good Practice

- Work should be organised to minimise quantities of drugs used.
- The number of employees potentially exposed and duration of exposure should be kept to a minimum.
- All staff should ensure the safe handling, storage and transport of cytotoxic drugs and waste material containing or contaminated by them.
- Good hygiene practices and suitable welfare facilities should be provided to ensure that staff eating, drinking and smoking are prohibited in all areas where cytotoxics are handled.
- Staff working with cytotoxic drugs must be trained on the risks and precautions to take when handling cytotoxic chemotherapy and newer agents.
- Local procedures must always be followed in relation to the administration of cytotoxic chemotherapy.

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4 MODULE 4 - PRINCIPLES OF SAFE CHEMOTHERAPY CHECKING

4.1 PREPARATION OF THE PATIENT

To safely prepare the patient prior to administering chemotherapy a number of procedures should be completed:

4.1.1 Tests and Investigations relevant to the Protocol

CT scans, MRI scans, ultrasound scans and x-rays have usually been performed pre-treatment to establish diagnosis, extent of disease and as a baseline. However, there are other specific tests required due to the organ toxicity of certain cytotoxic agents, for example:

- Lung function - Risk of pulmonary fibrosis, for example from Bleomycin.
- Audiology - Risk of high frequency hearing loss, for example from Cisplatin.
- Muga scan - Risk of cardiac problems, for example from Doxorubicin.
- GFR – To establish renal function prior to administering nephrotoxic drugs, for example Cisplatin.

4.1.2 Prescription of concurrent medication or fluids

Some chemotherapy drugs have side effects that require interventions with other medication e.g. Methotrexate requires folinic acid rescue.

You should be aware of such drugs that are regularly in use in your particular area of work.

4.1.3 Wig referral

Some drugs will cause hair loss it is important that the patient is aware of this side effect and a referral is made to surgical appliances for a wig fitting if requested before chemotherapy treatment is commenced.

4.1.4 Fertility

Any course of chemotherapy will have some effect on fertility it is imperative that any issue that the patient has regarding family planning must be raised and discussed before any treatment starts.

Check that the patient has been informed if there is a possibility of fertility problems, and that the various options of preservation have been explored. Check that appropriate arrangements have been made. Refer to local policy.

Chemotherapy is not a form of contraception and both men and women should use a barrier method of contraception to prevent pregnancy during, and for 6 months post treatment.

Post chemotherapy both men and women can have their fertility checked.

4.1.5 Side effects of the chemotherapy

Many chemotherapy drugs have side effects that require intervention with other medication. Many of the common side effects include fatigue, nausea and vomiting, bone marrow depression, stomatitis and other GI disturbances.

Other more specific examples of side effects include:-

- Pulmonary toxicity in the form of fibrosis occurs with Bleomycin but bone marrow depression rarely occurs.
- Delayed bone marrow depression occurs with drugs such as Lomustine, Carmustine and Mitomycin C.
- Review module 2 to ensure you understand the side effects of chemotherapy and that you are able to explain these to patients.

4.2 SAFE CHECKING OF CYTOTOXIC DRUGS FOR ADMINISTRATION

4.2.1 The Consent Form must be Dated and Signed

All patients receiving chemotherapy should be fully informed of their treatment.

Informed consent verifies that the patient has given their consent to receive the chemotherapy drug. Written consent must be checked prior to administering chemotherapy; the consent form should include specific details of the proposed treatment and the risks and side effects of treatment.

If a change in chemotherapy regimen or re-challenge with a previously used chemotherapy regimen is necessary, patients should be re-consented after receiving regimen specific details.

When a patient is unable to give consent this can be either because they are unable to comprehend and retain the information or they are unable to weigh and use the information to come to a decision regarding treatment. In this situation the doctor proposing treatment must decide whether the treatment is in the 'best interest' of the patient. Your local area may have a specific consent form for this circumstance.

NO ONE can give consent on behalf of an incompetent adult.

4.2.2 Patient Information

Check whether the patient has understood their treatment, its rationale, process and outcomes. Written information regarding the patient's chemotherapy regimen, the side effects it may cause and contact numbers (for both during the day and out of hours) must be given to the patient. Ensure the patients feels prepared and supported to receive their treatment.

Patients should also be assessed for the need of any additional psychological, social or spiritual support.

4.2.3 Current weight and height with accurate surface area

The patient's surface area (SA) is calculated by their height and weight using a nomogram such as a table or a surface area slide ruler.

For example the table nomogram has three columns, the height is located in the left column the weight in the right and a ruler is used to draw a line between the two. The point at which the line intersects the middle column represents the patient's body surface area (BSA).

For obese patients the ideal body weight (IBW) calculation may be used instead of the patient's actual weight. The formula most often used is the following:

IBW (female) = 45.5kg + (2.3kg x ht – 152cms)
IBW (male) = 50kg + (2.3kg x ht –152cms)

In accordance with the COIN guidelines consultants may cap the surface area for the larger patient at 2.0m2
The height, weight and calculated surface area for the first cycle of chemotherapy will be transcribed to subsequent cycles. Any alterations in surface area as a result of weight changes over a course of chemotherapy will not normally affect the dose of chemotherapy prescribed although if 10% of the patient's body weight is lost, it would then become necessary to amend the dose of chemotherapy. Dose adjustments throughout a course of treatment will be made on the degree of toxicities experienced.

4.2.4 Dose reductions

It is important to maintain the therapeutic index i.e. the relationship between the therapeutic and toxic doses of a drug. Dose reductions are therefore sometimes required. Situations such as weight loss, profound neutropenia (low neutrophil counts) post chemotherapy or slow recovery of blood counts and poor tolerance of treatment. Example: Diarrhoea is a dose limiting side effect of Fluorouracil.

The prescription may change as follows:

Example: The prescription would read:
Cisplatin: 30mg/m^2
S.A: 2.0m^2

The dose given on the first and second cycle would be 60mg.

However the patient has been profoundly neutropenic following their second cycle of chemotherapy, the doctor has therefore decided to reduce the dose by 30%. The dose now required is 70%.

$\frac{60 \times 70}{100} = 42mg$

4.2.5 Recent FBC, U&Es and LFTs

Patients must be fit enough to receive their chemotherapy and their blood results must be within the required range to commence or continue with their chemotherapy treatment.

The timing of the pre-treatment blood tests is important as the nadir or period of pancytopenia (lowest level which blood cell counts can drop) for each drug varies but is usually between 8-10 days. For patients receiving their first cycle of chemotherapy a full blood count taken up to two weeks previously is acceptable. For second and subsequent cycles full blood counts and U&Es are usually required to be taken 24 hours prior to administering treatment or 48 hours of an outpatient treatment; however there are exceptions if in doubt check with the doctor who has prescribed the treatment.

4.2.5.1 Full blood count

Full blood count values in general should be: -
HB> 10 x 10^9/L
NEUTROPHILS> 1.0 x 10^9/L
PLATELETS>100 x 10^9/L

There may be exceptions to this depending on diagnosis, consultant and / or chemotherapy regime please refer to local Policy and Procedures.

If the patient is anaemic or thrombocytopenic a replacement transfusion may be necessary or a delay in the chemotherapy until the blood counts return to acceptable levels.

4.2.5.2 Biochemical Profile

The biochemical profile is essential, in that it indicates the patient's fluid and electrolyte status. It also gives an indication of liver and renal function, which is important as most drugs are activated by the liver and should not be given in the presence of abnormal function of the liver.

Urea and Creatinine level give a basic indication of renal function, EDTA and Creatinine clearance tests are more frequently used to assess renal function for patients on chemotherapy, particularly renal toxic chemotherapy. If these are abnormal it may indicate nephron damage and impending renal failure.

You should make sure results are satisfactory and have been seen by the prescribing doctor before administering any drugs.

Some patients are more sensitive to chemotherapy than others and their FBC may fall lower than usual on a particular protocol, or take longer to recover. Dose adjustments are often made for these patients, particularly in the outpatient setting and they may receive a reduced dose. Elderly patients or those with renal or liver impairment may also receive reduced doses. If there is a query as to whether a patient should proceed with their treatment or not, it must be the doctor's responsibility to make the final decision.

4.2.6 Ensure that the Correct Drug Dose is prescribed

Drug doses are most commonly calculated by mg/m2 (i.e. mg x BSA). The BSA is more commonly used for dosing calculations because it is a more accurate measure of fluid and tissue proportion.

Some drug doses are calculated according to Creatinine clearance. Carboplatin is one drug whose dose can be worked out in this way.

A mathematical formula based on the pre-existing renal function and desired platelet nadir is used. The formula, proposed by Calvert, is as follows:

EDTA +25 x AUC = Dose (mg).
AUC (area under the curve) is obtained by plotting the plasma level of a drug over time and measuring the area beneath the plotted curve. The target area under the curve of 4 to 6mg/ml/min using Carboplatin as a single agent is often used.

4.2.7 Prescription Chart Completed in Full and Signed by a Doctor

Be aware of who can and can not sign prescription charts. This information can be found in local policies and procedures

Using detailed printed protocols and prescription charts can reduce the risk of errors occurring. Copies of protocols, particularly clinical trial protocols must be available in all areas dealing with cytotoxic drugs e.g. pharmacy, ward/clinical area and OPD Clinics.

4.2.8 Correct Timing of Administration

A check must be made that the drug is being administered within the stated time frame. A dose of chemotherapy given too early can be fatal. Inform the senior member of your team and the prescribing doctor if the timing of administration has been missed / delayed for further advice.

4.2.9 Aware of Maximum Doses

Some Chemotherapy agents have a maximum dose a patient can receive in their lifetime, because of their toxicity. It is important that the doctor documents on the chemotherapy prescription cumulative dose at each cycle and that nurses are aware of how to identify if drugs have a maximum dose.

4.2.10 Summary of Checks:

Registered nurses are responsible for safe administration of chemotherapy prescribed to the correct patient as outlined in the individual trust policy for administration of medicines by nurses/midwives and the Nursing and Midwifery Council (NMC) Guidelines.

Double checking of chemotherapy doses is recommended as best practice immediately prior to administration.

A careful checking procedure should be undertaken by two qualified nurses (one of whom should be trained in the administration of chemotherapy, the other needs to have completed the competencies in modules 1 to 4 of the AngCN chemotherapy training package) prior to administering chemotherapy. The following should be available / reviewed and checked:

- Ensure that the patient is fully informed of their treatment and that there is a signed and dated consent form (covering the entire treatment period).
- Correct Weight, height and Surface Area as recorded and calculated for cycle one.
- Recent FBC, U+E's, LFT's (except as otherwise directed by chemo protocol).
- Any other tests relevant to the protocol e.g. Creatinine clearance, lung function etc.
- Prescription chart completed in full and signed by a suitably qualified doctor.
- An accurate dose of chemotherapy has been prescribed.
- The route of administration and the duration of infusion have been specified on the prescription.
- The patient is not allergic to the prescribed medicines and there are no interactions with any of the patient's regular medicines.
- Any concurrent medication or fluids have been prescribed, e.g. folinic acid, magnesium sulphate, phenytoin, predsol eyedrops, mannitol etc.

Once you are ready to administer the chemotherapy both nurses should identify the patient checking the patients wrist band for name, hospital number or, if an outpatient, date of birth or address (two points of identification are sufficient) against the prescription chart and the individually labelled chemotherapy.

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5 MODULE 5 - VENOUS ACCESS

5.1 CANCER PATIENTS ARE AT PARTICULAR RISK OF INFECTION. THEREFORE, ALL POLICIES AIMED AT AVOIDING INFECTION MUST BE FOLLOWED. THE FOCUS FOR INFECTION CAN FREQUENTLY BE A VENOUS ACCESS DEVICE

Strategies for reducing infection include:

- Adequate skin cleansing on insertion or manipulation of any venous access devise using 2% chlorhexidine.
- Effective hand-washing techniques.
- Frequent inspection of insertion sites using Visual Infusion Phlebitis (VIP) score.
- Good sterile dressing materials.
- Aseptic technique when changing dressing.
- Changing dressing when required and not more frequently than necessary.
- Maintenance of a closed circuit.
- Avoidance of 3 way taps and connections.
- Secure fixation of cannula or central line.
- Adequate port cleansing using 2% chlorhexidine before accessing line.
- Changing of cannulas and infusion lines according to protocol.
- Accurate infusion rates.
- Ensuring fluids do not hang longer than recommended (24 hours maximum).

By adhering to these principles, the risk of infection can be reduced, although it cannot be eliminated completely. The patient should be advised that an infection could occur despite every effort and total compliance to infection control advice.

5.2 THE TECHNIQUES OF CANNULATION AND ADMINISTRATION

You must complete all local training requirements for venepuncture and cannulation procedures before attempting the procedure.

- A competent nurse in consultation with the patient should select the most appropriate vascular access device.
- The selection of the appropriate route for venous access should be based on the patients short and long term best interests.
- A nurse skilled in cannulation and the administration of IV chemotherapy (having been assessed by a venepuncture and cannulation competency programme) is key to preventing infiltration and extravasation.

5.3 MAINTAINING VASCULAR INTEGRITY

A traumatic cannulation will damage and weaken the venous wall and allow for possible leakage of drugs into the tissue. A large gauge cannula or a butterfly needle is likewise likely to cause more venous trauma. A badly anchored cannula is likely to become dislodged and a non Luer-Lock connection can possibly become disconnected.

Cannulation below an attempted cannulation or an earlier venesection site may lead to leakage of the drug through the puncture site Weinstein (2000).

Use of an infusion pump set at a high pressure may cause leakage around the cannula.

The vascular integrity of peripheral cannulas will decrease over time and it is essential that if you are in any doubt about the efficacy of a pre-existing cannula through which you are administering, or are about to administer, chemotherapy you have it re-sited. Vesicants should ideally be delivered through a newly placed cannula.

5.4 POSITIONING AND SELECTION OF CANNULAE

The positioning of the new cannula should be given careful consideration. The antecubital fossa contains large veins that would allow rapid infusion of drugs. However, because of the large amount of subcutaneous tissue in this area, it is very difficult to assess for infiltration (and thus extravasation). Infiltration with a vesicant drug in this area could cause damage and loss of joint function.

For this reason the antecubital fossa should not be used under any circumstances for the administration of chemotherapy.

Veins in the hand are commonly used in chemotherapy administration because they are readily accessible and infiltration can be easily detected. It should be remembered however that because of the small amounts of subcutaneous tissue in this area, the extravasation of a vesicant drug could cause a more extensive injury and decreased function of the hand (Berman et al, 1993). Extravasation at a joint may result in permanent damage to tendons and nerves.
Therefore the most appropriate location for a peripheral cannula is considered to be the forearm as the veins are easily detectable with wide lumans and thick walls and the skin is less sensitive. Most common are: median cubital, basilic and cephalic veins.

In patients who have had breast cancer, the arm of the unaffected side must be used for treatment. There is a possibility that the lymphatic system could be inefficient on the affected side, so using it for the administration of chemotherapy could reduce the venous return and subsequent distribution of the drugs. This is particularly so where the patient has undergone surgery and had axillary node clearance. If there are problems with venous access on the unaffected side, advice should be sought from the consultant, and if approval given, the affected side could be used if no lymphoedema was present. This must always be documented in the patient's notes. This has prompted a lot of debate as practice at IHNHST is never to use affected side.

The following patients are at increased risk of extravasation and extra caution should be taken:

- Elderly patients.
- Patients with fragile veins.
- Patients with thrombocytopenia.
- Paediatric patients.

In all other patients it is advisable to alternate arms, wherever possible, to allow the veins in one arm or hand to recover before being punctured again for the next cycle.

Size of cannula – a large gauge cannula is likely to cause venous trauma and potentially weaken the venous wall. It will also be difficult to site, especially in already damaged veins. The cannula size should be appropriate to the size of vein and duration of treatment which would normally mean using a size 22fg blue cannula or size 24fg paediatric yellow cannula. Larger sizes are unnecessary (Campbell 1998).

5.5 CANNULATION

5.5.1 Procedure

Apply the tourniquet, and select a vein in the non-dominant forearm or appropriate limb. This will cause the veins to become distended and therefore more visible

<u>Avoid, using:-</u>

- Antecubital fossa
- Lower extremities
- The side of a mastectomy
- Phlebitic areas
- Inflamed areas
- Areas with impaired lymphatic drainage
- Sclerosed areas
- Sites distal to same day venepuncture
- Pemiplegic limb (in stroke patients)

RCN (2003)Standards for infusion therapy

- Wash hands
- If necessary, gently rub the area of skin around the vein to make the vein more prominent.
- Clean site with 2% Chlorhexidine solution and allow to dry in order to decontaminate the skin.
- Insert the cannula while holding the patient's skin taut at an angle of 10 to 45 degrees depending on the depth of the vein. Flush cannula with 5 ml normalin accordance with local policy, to confirm patency of cannula.
- Once you are confident the cannula is patent secure in position with suitable dressing. Do not obstruct blood flow at entry site. Dispose of all waste and sharps safely to avoid injury.
- Document that a cannula has been inserted or re-sited.

5.5.2 Securing the cannula

The cannula should be anchored securely in order to reduce the risk of the cannula falling out or moving during the administration of chemotherapy. A loose cannula could cause mechanical phlebitis and reduce the flow of fluid through the line, as well as being uncomfortable for the patient. This can be particularly difficult for patients having 24hour infusion chemotherapy – ensure comfort for patient and patency / safety of cannula are carefully monitored.

5.5.3 Dressings

A transparent semi – permeable membrane dressing is recommended such as IV3000 or Tegaderm 3M. The cannula site is to be treated as an open wound using aseptic technique. If the cannula is only to be in-situ for a short period of time an alternative is tape (which does not touch the cannula entry site) and sterile gauze bandaged to secure the site (Mallett and Dougherty 2000). However it is recommended that Trust local policy should be referred to as some hospitals do not use tape.

5.6 VASCULAR INTEGRITY DURING ADMINISTRATION

The site of administration of chemotherapy should be observed continuously for signs of extravasation whilst administering a vesicant, or in the case of infusions, at least four hourly. Pumps should be set at 'control' rather than 'pump' setting. For paediatrics reduce the pressure alarm according to local policy.

The vascular integrity of a vein can become irritated and less stable over time, particularly at the venepuncture site following the insertion of a cannula. Because of this, if several drugs are being administered, vesicant drugs should be administered through the cannula first, before non-vesicant drugs.

5.7 CENTRAL VENOUS ACCESS DEVICES

Patency and integrity of established central lines can be ascertained by aspirating blood back. Persistent withdrawal occlusion (PWO), the inability to draw blood back, is a relatively common complication of central lines (Mayo and Pearson, 1995). PWO can occur because of incorrect positioning of the catheter, anatomic obstruction or fibrin sheath formation (Groeger et al, 1991)

The ability to aspirate blood from the central line is the best indication of line position and function. If you are unable to obtain blood return, infuse a sufficient amount of intravenous fluid (e.g. 10mls of 9% Normal Saline) to assess flow rate. Assess for the onset of shortness of breath, chest tightness, pain or collection of subcutaneous fluids. Observe the line entry site for signs of fluid leakage. Consult with a doctor if there are any concerns about catheter placement or patency or infection.

In the event of fluid leakage while you are administering chemotherapy you should stop immediately and consult with senior medical staff and await further instruction.

5.8 EXTRAVASATION

Extravasation is defined as the accidental leakage from its intended compartment (the vein) into the surrounding tissue. This usually occurs when intravenous medication passes from the blood vessel into the tissues around the blood vessel and beyond. Depending on the substance that extravasates into the tissues the degree of injury can range from a very mild skin reaction to severe necrosis.

Extravasation can occur with both peripheral and central lines.

An extravasation injury is any tissue damage occurring as a result of leakage of cytotoxic drugs into the surrounding tissue. The damage may range from erythematous reactions through to severe necrosis. Tissue damage may be so severe as to require surgical debridement and even amputation. In addition to causing great anxiety, discomfort, pain and perhaps loss of function, extravasation injuries in oncology patients may lead to infections and delays in therapy which may effect the patients overall survival.

ACTION POINT
Locate the extravasation pack in your area and familiarise yourself with the contents.
Familiarise yourself with your Trust's extravasation policy.

5.8.1 Mechanisms of Tissue Damage

This tissue damage may result from a number of factors related to the physiochemical properties of the drug or solution:

5.8.2 Cellular Toxicity

Many antineoplastic agents are vesicant (blister forming) and may cause immediate cell death. The very nature of these drugs ability to bind to the DNA of any cells it enters will lead to the inability of those cells to divide and replicate. With some drugs such as Doxorubicin it is continuously released from dying cells to healthy cells resulting in an increasing area of destruction over a period of many months. Such damage does not usually heal without requiring excision and skin grafting.

5.8.3 Osmolarity

A difference in osmotic pressure between the drug or solution and the tissue into which it leaks will cause the cells to implode through dehydration (hypertonic drugs) or to explode from fluid being forced into the cells (hypotonic drugs).

5.8.4 pH

Drugs or solutions with a pH outside the normal range of 5 to 9 may cause tissue death through destruction of the cell walls due to the alkalinity or acidity of the drug. Many cytotoxic drugs may be classed as vesicants or irritants and it is thus essential that nurses dealing with such agents are aware of the damage they can cause, how to reduce the risks of extravasation and what action to take should it occur.

5.8.5 Classification

The nature of the drug may affect both the risk and severity of damage.

VESICANT drugs such as Amscarine or Vinblastine are more likely to lead to extravasation because of the potential damage to the endothelial wall. If leakage into the tissues occurs it is much more likely to cause damage than IRRITANTS such as Carmustine or Etoposide, or NON VESICANTS such as Cytarabine or Cyclophosphamide.

An irritant is a chemotherapeutic agent capable of producing venous pain at the venepuncture site or along the vein, with or without an inflammatory reaction. A vesicant is an agent capable of causing a blister formation and/or tissue destruction (Berman et al 1993).

5.8.6 Risk Factors

There are several risk factors determining not only the occurrence of an extravasation but also the possible degree of damage. It should be remembered that other non anti cancer drugs can also be vesicant.

5.8.6.1 The patient's physical condition may determine the risk of an extravasation.

- A patient with cancer who has already had several treatments.
- An elderly or an emaciated patient may have delicate, fragile veins which are difficult to cannulate.
- A patient with peripheral neuropathy as a side effect for instance of previous Vincristine therapy or as a result of diabetes may not feel discomfort or pain of a leaking drug.
- Patients receiving chemotherapy at a site of previous radiotherapy may develop a reactivation injury.
- Patients who have had a previous extravasation injury may experience further damage at this site during subsequent administration of chemotherapy at another site.

- Patients with an altered level of consciousness.
- Decreased sensation due to e.g. neuropathy, diabetes.

5.8.7 Signs and Symptoms of Extravasation

Early recognition of extravasation is essential to minimise potential tissue damage.

The signs and symptoms that may indicate extravasation are:

- Pain, discomfort, burning sensations or any acute change at or around the cannula site.
- Swelling at the infusion site.
- Reduced flow rate of the infusion or the fast running drip.
- Lack of blood return at the cannula.
- Erythema, blotching, swelling and tenderness.
- Early firm induration – is often an indication of eventual ulceration.
- Local blistering.
- Skin becomes white and cold with no capillary filling; it may later develop a dry black eschar (scab-like covering).
- Ulceration, not usually occurring until at least 48 hours but may be delayed until one or more weeks after the injury.

Patients must be informed about the risks of extravasation and asked to report any changes in sensation at the intravenous site, especially pain or a burning sensation before administering any agent.

Only the first four of the above symptoms may be evident at the time of the extravasation and it is possible in some cases the patient may remain without symptoms for up to 48 hours or beyond.

Not all pain reported by the patient will be as a result of extravasation, it may be venous pain caused by phlebitis as a result of the sclerosing nature of the drug. It could also be due to venous spasm as the endothelial wall reacts to a cold (often pre refrigerated) infusion. Discolouration along the path of the vein may be a flare reaction due to endothelial irritation. A local hypersensitivity reaction of the vein may give rise to both pain and discolouration.

5.8.8 Pre extravasation syndrome

Little or no leakage involved, but severe phlebitis or local hypersensitivity reactions may precipitate an extravasation if the infusion is continued.

The management of extravasation remains controversial. There have been no human clinical trials to determine the best antidotes for extravasation. For this reason, it is essential that if extravasation is suspected, all care be meticulously documented. Not only on the hospital incident form, but also in the nursing and medical notes and on the specific green extravasation incident form that should be available in the extravasation pack or on request from cytotoxic pharmacy.

5.8.9 Management of an Extravasation

Extravasation must be dealt with promptly to prevent tissue necrosis.

If infiltration of irritants, exfoliants and non-vesicants into surrounding tissue has occurred treatment may consist of elevation of the limb and the use of a cold compress.

In the case of extravasation of vesicant drugs much discussion has risen around the most appropriate treatment. The guidelines in some hospitals advocate the use of various antidotes for certain drugs – Dimethylsulphoxice (DMSO) for Daunorubicin, Sodium Thiosulphate for Mustine. Complex tables and charts are devised to indicate which of the antidotes to use for which particular vesicant drugs. However the use of antidotes is controversial and is based on anecdotal and experimental evaluation rather than through a clear evidence base.

The protocol used in the Anglia Cancer Network was devised in conjunction with pharmacists, medical and nursing staff and plastic surgery team input. It aims at a standard treatment for all cases of vesicant extravasation occurrences.

The main treatment consists of infiltrating the immediate subcutaneous area with hyaluronidase and then using up to 1 litre of saline to flush the same area.

You must however follow all local policy and procedures in your area.

Document all action taken and complete a Trust incident form.

Keep the patient informed at all times and arrange appropriate follow up care.

Patients should be given an information leaflet to explain the management of their extravasation.

References

- Berman A, Carvallio M, Rice Gorrell C (1993), Cancer Chemotherapy: Intravenous Administration, Cancer Nursing 16 (2) 145 – 160
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6 MODULE 6 - ADMINISTRATION OF CHEMOTHERAPY

6.1 THE PRACTICAL ASPECTS OF ADMINISTERING CHEMOTHERAPY

Cytotoxic drugs are potentially mutagenic, teratogenic and carcinogenic, and there are also a variety of local effects, such as skin irritation, depending on the individual agent. It is therefore essential to ensure safe working practice to reduce the risk of exposure to cytotoxics during administration.

The general principles relating to safe administration of cytotoxic drugs remain the same whichever route of administration is in use.

Some practices may be different in the paediatric setting; please check your local policies.
Chemotherapy is most commonly administered via the oral or intravenous route. (Chisholm et al, 1993).
All chemotherapy is reconstituted in cytotoxic pharmacy. If chemotherapy needs to be reconstituted out of hours the on-call pharmacist should be contacted who will make arrangements for someone from the cytotoxic pharmacy to be called in.

On no account should a nurse be required to reconstitute any chemotherapy for IV or IT use.

6.2 SAFE ADMINISTRATION OF ORAL CHEMOTHERAPY

In all situations follow the guidelines in your local Policy and Procedures. In January 2008, the National Patient Safety Agency (NPSA) issued a Rapid Response Report: Risks of incorrect dosing of oral anti-cancer medicines which outlines good practice standards relating to the prescribing, dispensing or administration of oral chemotherapy and also standards for counselling and information provision to patients.

Prescribing, dispensing and administration of oral anti-cancer medicines must be carried out to the same standard as injected therapy.

Using safety checks in module 4 prepare to administer the oral chemotherapy drugs.

Doses of oral cytotoxic drugs should be rounded up or down by the prescribing doctor according to the available drug strengths, in order to prevent tablets needing to be broken in two. Oral cytotoxic drugs should never be crushed or broken. Under exceptional circumstances and after discussion with the consultant liquid preparation may be requested from Cytotoxic Pharmacy.

When dispensing oral cytotoxic drugs latex/PVC gloves should be worn and give them to the patient using a disposable cup rather than a reusable medicine pot.

Patients must be adequately counselled and written information including regimen details, treatment plan and arrangements for monitoring should be given to the patient. The use of oral chemotherapy patient's diaries are recommended.

Before every treatment cycle, all patients should be seen by an Oncologist, Haematologist, Specialist Nurse or trained Oncology Pharmacist.

6.3 SAFE ADMINISTRATION OF INTRAVENOUS CHEMOTHERAPY

In all situations follow the guidelines in your local Policy and Procedures
Using safety checks in module 4 prepare to administer the intravenous chemotherapy drugs.

6.3.1 Preparation

The patient should be advised to remain as still as possible while the chemotherapy is being administered and to keep their hands away from the administration site.

Advise the patient of the immediate side effects, which may be experienced during administration of certain drugs e.g. facial flushing, metallic taste.

Encourage the patient to report any unusual sensations, particularly of any discomfort at the site of administration. Most cytotoxic drugs are stored in the fridge and are still cold when they are administered. It is important that the patient identifies this feeling of coldness and can distinguish it from a sharp burning pain that may indicate extravasation (see module 5).

6.3.2 Personal Protection

When administering IV drugs the nurse should again wear latex/PVC gloves but also an apron to avoid any spills or splashes onto his/her uniform. A sheet with a plastic backing (such as an Inco Sheet) should be placed directly under the cannula or central line to protect the patient from any drips or splashes.

6.3.3 Access

Venous access should be achieved either by the placement of a peripheral cannula (see module 5) or by accessing the patient's central venous access device. Administration of the chemotherapy should only proceed once the nurse is confident the access device is patent.

6.3.4 Administration

The majority of bolus doses of chemotherapy are administered via a fast running drip. It is only a requirement when administering vesicant chemotherapy but when administering two or more chemotherapy drugs simplifies the process of flushing between drugs and assists in the assessment of venous patency. A fast running drip is a free running infusion of compatible fluid (usually normal saline) which is connected to the patient and allowed to infuse at a relatively fast rate.

Once patency has been assured the chemotherapy is injected simultaneously via the side access port of the giving set. Attach the Luer-Lock syringe to the side arm of the giving set ensuring the syringe is attached.

When giving a series of cytotoxic drugs intravenously the vesicant should be administered first, while patency of the vein and cannula is at its best.

Non-irritant cytotoxic drugs (such as low dose Cytarabine, 100mg/m2) do not necessarily need to be given using a fast running drip and may be injected directly into the venous access device. However, if a fast running drip is already established for other drugs being given then this is the preferred method of administration.

In order to prevent any spillages of chemotherapy when the infusion is being transported to the patient or waiting for connection, the giving set should always be primed with a compatible fluid first and then the infusion bag of chemotherapy attached to the giving set at waist height to minimise the risk of contamination in the event of a spillage. This should be done over a clean tray or yellow clinical waste bag. It is recommended that the bag is in a horizontal position and the port through which the set is placed is not kinked. This reduces the risk of the giving set piercing through the port and causing leakage.

6.3.5 Disposal of Cytotoxic Waste

All equipment used in the administration of chemotherapy should be disposed of in an appropriately labelled cytotoxic waste bin ready for incineration (1100°C).

6.3.6 Continuous infusion of Chemotherapy

Some chemotherapy protocols require drugs to be administered to a patient continuously over a period of days. In some regimens this can be done as an outpatient using an ambulatory pump such as the CADD pump (Computerised Ambulatory Drug Delivery), a Walkmed pump for 5FU, elastomeric infusion devices or the Fresenius home pump. These pumps deliver small volumes of drugs intravenously over a prescribed period of time.

If these pumps are used in your area you should familiarise yourself with both the protocols they are used for, how to operate them safely and potential problems that may be encountered with their use.

Be aware of the risk of leaving clamps on as there will be no alarm to warn of this – check carefully.

Reference

- Chisholm, L., Berman, A. et al (1993) Programmed Instruction: Cancer Care. Cancer Chemotherapy: alternative administration routes. Cancer Nursing 16 (3) 237-246.

7 MODULE 7 - INTRATHECAL CHEMOTHERAPY

Intrathecal administration of chemotherapy allows high concentration of drug in the diseased area whilst minimising the systemic concentrations and thus side effects.

The intrathecal administration of chemotherapy goes directly into the spinal fluid, which reaches the central nervous system to prevent or treat local disease. Many chemotherapy agents are unable to cross the blood-brain barrier; therefore they are not able to provide central nervous system control over disease.

The cancers most commonly associated with meningeal metastasis include breast cancer, lung cancer, gastrointestinal carcinoma, leukaemia and lymphoma.

CYTOTOXIC DRUGS USED FOR INTRATHECAL ROUTE ARE CYTARABINE (ARA-C) AND METHOTREXATE ONLY.

WARNING:
There are a number of reported cases of accidental Intrathecal injections of Vinca alkaloids, Vincristine or Vinblastine, all of which had a FATAL outcome.
In almost all cases the cause of the accident was confusion between a syringe of Methotrexate or Cytarabine, for Intrathecal injection, and one of the Vinca alkaloids intended for intravenous injection at the same time.
Therefore national and local guidance must be followed at all times:

- Department of Health HSC 2008/001 11.08.08)
- NPSA Rapid Response Alert (NPSA/2008/RRR004)

Great care is therefore essential to prevent confusion.

All intravenous chemotherapy should be administered before Intrathecal chemotherapy drugs are requested and issued.

In adult patients all Vinca Alkaloid drugs should be supplied from the hospital pharmacy ready to administer in a 50ml minibag. This is to reduce further the risk of the patient being given these drugs via the intrathecal route.

Intrathecal chemotherapy can only signed out of pharmacy and taken to the ward by a designated member of staff.

The Intrathecal chemotherapy must be stored in a locked dedicated refrigerator used only for the storage of intrathecal doses and must only be removed by the administering doctor. If no fridge is available the intrathecal dose should be collected from pharmacy by designated personnel at point of administration.

A pre-printed dedicated intrathecal chemotherapy chart must only be used for prescribing, and can only be prescribed by a haematology consultant or haematology specialist registrar on the chemotherapy register.

The Intrathecal chemotherapy may only be checked by the administering haematology specialist registrar or haematology consultant and trained nurse both of whom are listed on the chemotherapy administration register. The checklist is completed by one of the checkers and filed in the patient's medical notes.

Intrathecal chemotherapy must only be administered in a designated area.

Competencies of all personnel who appear on the intrathecal register must be reassessed annually to remain on the register.

7.1 IMPORTANT

Ensure you are familiar with the Policies and Procedures that relate to IT chemotherapy in your hospital, particularly in relation to where IT chemotherapy can be administered, by whom and when it can be administered. Patients are

advised to remain supine or semi-recumbent for 20-30 minutes. Acute complications include headache, nausea, vomiting, fever and nuchal rigidity, which usually subside in 48-72 hours.

Reference

- Department of Health (2008) Updated National Guidance on the Safe Administration of Intrathecal Chemotherapy HSC 2003/010 London
- NPSA Rapid Response Alert (NPSA/2008/RRR004)

ADDITIONAL RESOURCES

- Pan London Guidelines for the Safe Prescribing, Handling and Administration of Systemic Anti Cancer Treatment Drugs (2011)
- Updated National Guidance on the Safe Administration of Intrathecal Chemotherapy (Department of Health, 2008)
- RCN Competencies: an integrated competency framework for training programmes in the safe administration of chemotherapy to children and young people (Royal College of Nursing, 2005)
- Local anti-emetic policies
- Standards for Medicines Management (NMC,2008)
- The Scope of Professional Practice (NMC, 2004)
- Resuscitation Council (UK) (2005) The Emergency Medical Treatment of Anaphylactic Reactions for First Medical Responders (Available at: www.resus.org.uk/pages/reaction.htm)
- Patient Information on cytotoxic medication used in your area
- Local central venous access device policies
- Manual of Cancer Service Standards: Topic 3C (Department of Health, 2004)
- Reference List
- Guyton A C and Hall J E (11th Edition) (2005) Textbook of medical physiology, W B Saunders Company, Pennsylvania.
- Montague S E, Watson R and Herbert, R. (3rd Edition) (2005) Physiology for Nursing Practice, Balliere Tindall, An imprint of Harcourt Brace and Company Limited, London.
- Nicklin P J and Kenworthy N (3rd Edition) (2000) Teaching and assessing in nursing practice – an experiential approach, Harcourt Publishers Limited, London.
- Other reading
- Lilly Oncology (2006) Cancer Chemotherapy - Guidelines for the administration of chemotherapy and the Nursing care of cancer patients. 6th Edition.
- NMC Record Keeping Guidance (NMC, 2007).
- The NMC Code of Professional Conduct: Standards for Conduct, Performance and Ethics (NMC, 2008)
- Local medicines administration policies.
- Dougherty, L. and Lister, S. (2011) The Royal Marsden NHS Trust Manual of Clinical Nursing Procedures (6th Edition).
- Chemotherapy/Cytotoxic Medication Protocols (in clinical areas / pharmacy).
- British National Formulary for Children.
- Keating, P. (2001) Administering intravenous therapy to children in the community: guidance for nursing staff (3rd edition), Royal College of Nursing.
- Royal College of Nursing Rheumatology Nursing Forum & the RCN Paediatric Rheumatology Specialist Nurses Group (2004) Administering subcutaneous methotrexate for inflammatory arthritis: guidance for nurses (RCN).
- RCN (2005) Competencies: an education and training competency framework for administering medicines intravenously to children and young people.
- NCAG Report: Ensuring Quality and Safety of Chemotherapy Services in England. August 2009.
- NCEPOD: For better for worse? A review of the care of patients who died within 30 days of receiving systemic anti-caner therapy. (Nov 2008).
- Health and Safety Executive: Control of Substances Hazardous to Health (COSHH). www.hse.gov.uk/coshh
- March Guidelines. The online resource for the management and awareness of risks of cytotoxic handling.
- www.marchguidelines.com
- Skills for Health: Chemotherapy Competences www.skillsforhealth.org.uk
- Department of Health www.dh.gov.org

8 EVIDENCE OF AGREEMENT

This Training Pack has been approved by:

The AngCN Chemotherapy Nurses Group Chair
Name: Ruth Giles Organisation: Peterborough City Hospital Date agreed: 15 September 2011
Chair of the AngCN Chemotherapy Board
Name: Dr Karen McAdam Organisation: Peterborough City Hospital Date agreed: 20 September 2011
The AngCN Chemotherapy Nurses Group
This document was discussed at the AngCN Chemotherapy Nurses Group on 15 September 2011 and was agreed to by all members.
The AngCN Chemotherapy Board
This document was discussed at the AngCN Chemotherapy Board meeting on 20 September 2011 and was agreed to by all members.

Document Management

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Monitoring the effectiveness of the Process

Process for Monitoring compliance and Effectiveness - Review of compliance as determined by audit. Any non compliance to be presented by PQ Manager to the AngCN Business Meeting on an annual basis – the minutes of this meeting are retained for a minimum of five years.
Standards/Key Performance Indicators – This process forms part of a quality system working to, but not accredited to, International Standard BS EN ISO 9001:2008. The effectiveness of the process will be monitored in accordance with the methods given in the quality manual, AngCN-QM.

Equality and Diversity Statement

This document complies with the Suffolk PCT Equality and Diversity statement – an EqIA assessment is available on request to Anglia Cancer Network QA Manager, Gibson Centre, Exning Road, Newmarket, CB8 7JG.

Disclaimer

It is your responsibility to check against the electronic library that this printed-out copy is the most recent issue of this document. Please notify any changes required to the Anglia Cancer Network Programme Quality Manager.

APPENDIX A - GP END OF TREATMENT SUMMARY

Insert GP Contact Details and Address

Insert Trust Logo

Dear Dr X

Re: Add in patient name, address, date of birth and record number

Your patient has now completed their initial treatment for cancer and a summary of their diagnosis, treatment and ongoing management plan are outlined below. The patient has a copy of this summary.

<table>
<tr><td>Diagnosis:</td><td>Date of Diagnosis:</td><td>Organ/Staging

Local/Distant</td></tr>
<tr><td colspan="2">Summary of Treatment and relevant dates:</td><td>Treatment Aim:</td></tr>
<tr><td colspan="2" rowspan="2">Possible treatment toxicities and / or late effects:</td><td>Advise entry onto primary care palliative or supportive care register

Yes / No</td></tr>
<tr><td>DS 1500 application completed

Yes/No

Prescription Charge exemption arranged

Yes/No</td></tr>
<tr><td colspan="2">Alert Symptoms that require referral back to specialist team:</td><td>Contacts for re referrals or queries:

In Hours:

Out of hours:</td></tr>
<tr><td colspan="2">Secondary Care Ongoing Management Plan: (tests, appointments etc)

.</td><td>Other service referrals made: (delete as nec)
District Nurse
AHP
Social Worker
Dietician
Clinical Nurse Specialist
Psychologist
Benefits/Advice Service
Other</td></tr>
<tr><td colspan="3">Required GP actions in addition to GP Cancer Care Review (e.g. ongoing medication, osteoporosis and cardiac screening)</td></tr>
<tr><td colspan="3">Summary of information given to the patient about their cancer and future progress:</td></tr>
<tr><td colspan="3">Additional information including issues relating to lifestyle and support needs:</td></tr>
</table>

Completing Doctor: Signature: Date:

GP READ CODES FOR COMMON CANCERS (For GP Use only). Other codes available if required.
(Note: System codes are case sensitive so always ensure codes are transcribed exactly as below).

System 1	(5 digit codes)	All other systems	Version 3 five byte codes (October 2010 release)
Diagnosis:		Diagnosis	
Lung Malignant Tumour	XaOKG	Malignant neoplasm of bronchus or lung	B22z.
Carcinoma of Prostate	X78Y6	Malignant neoplasm of prostate	B46..
Malignant tumour of rectum	XE1vW	Malignant neoplasm of Rectum	B141.
Bowel Intestine	X78gK	Malignant neoplasm of Colon	B13..
Large Bowel	X78gN	Malignant neoplasm of female breast	B34..
Female Malignant Neoplasia	B34..	Malignant neoplasm of male breast	B35..
Male Malignant Neoplasia	B35..		
Histology/Staging/Grade:		Histology/Staging/Grade:	
Histology Abnormal	4K14.	Histology Abnormal	4K14.
Tumour grade	X7A6m	Tumour staging	4M…
Dukes/Gleason tumour stage	XaOLF	Gleason grading of prostate Ca	4M0..
Recurrent tumour	XaOR3	Recurrence of tumour	4M6..
Local Tumour Spread	X7818		
Mets from 1°	XaFr.	Metastatic NOS	BB13.
Treatment		Treatment	
Palliative Radiotherapy	5149.	Radiotherapy tumour palliation	5149.
Curative Radiotherapy	XalpH	Radiotherapy	7M371
Chemotherapy	x71bL	Chemotherapy	8BAD.
Radiotherapy	Xa851		
Treatment Aim:		Treatment Aim:	
Curative procedure	Xallm	Curative treatment	8BJ0.
Palliative procedure	XaiL3	Palliative treatment	8BJ1.
Treatment toxicities/late effects:			
Osteoporotic #	Xa1TO	At risk of osteoporosis	1409.
Osteoporosis	XaELC	Osteoporosis	N330.
Infection	Xa9ua		
Ongoing Management Plan		Ongoing Management Plan	
Follow up arranged (<1yr)	8H8..	Follow up arranged	8H8..
Follow up arranged (>1yr)	XaL..		
No FU	8HA1.	No follow up arranged	8HA..
Referral PRN	8HAZ.		
Referrals made to other services:		Referrals made to other services:	
District Nurse	XaBsn	Refer to District Nurse	8H72.
Social Worker	XaBsr	Refer to Social Worker	8H75.
Nurse Specialist	XaAgq		
SALT	XaBT6		
Actions required by the GP		Actions required by the GP	
Tumour marker monitoring	Xalqg	Tumour marker monitoring	8A9..
PSA	Xalqh	PSA	43Z2.
Osteoporosis monitoring	XalSd	Osteoporosis monitoring	66a..
Referral for specialist opinion	Xalst		
Advised to apply for free prescriptions	9D05	Entitled to free prescription	6616.
Cancer Care Review	Xalyc	Cancer Care Review	8BAV.
Palliative Care Review	XalG1	Palliative Care Plan Review	8CM3.
Medication:		Medication:	
New medication started by specialist	XEOhn	Medication given	8BC2.
Medication changed by specialist	8B316	Medication changed	8B316
Advice to GP to start medication	XaKbF		
Advice to GP to stop medication	XaJC2		

Information to patient:		Information to patient:	
DS1500 form claim	XaCDx	DS1500 completed	9EB5.
Benefits counselling	6743.	Benefits counselling	6743.
Cancer information offered	XaImL	Cancer information offered	677H.
Cancer diagnosis discussed	XaIpL	Cancer diagnosis discussed	8CL0.
Aware of diagnosis	XaQly		
Unaware of prognosis	XaVzE		
Carer aware of diagnosis	XaVzA		
Miscellaneous:		Miscellaneous:	
On GSF palliative care framework	XaJv2	On GSF Palliative Care Framework	8CM1.
GP OOH service notified	Xaltp	GP OOH service notified	9e0..
Carers details	9180.	Carer details	9180.

Summary of Action when Sending your Patient Home after Chemotherapy

- Ensure patient has their hand held file or information pack containing side effects and emergency contact numbers.
- District Nurse /MacMillan Referral (if required).
- General Nurse letter including ADVICE FOR HEALTH PROFESSIONAL OF PATIENTS RECEIVING CHEMOTHERAPY.
- Ensure follow up is made for the next cycle of chemotherapy and Doctors consultation.
- Follow up telephone call if part of your local practice.
- Ensure the patient is aware of the side effects of chemotherapy and actions to take if problems occur.
- End of treatment summary following completion of chemotherapy treatment.

NHS Improvement survivorship.

National Cancer Survivorship Initiative
December 2010