PORTFOLIO OF LEARNING OBJECTIVES
STUDENT NURSE PACK

CRITICAL CARE DEPARTMENT

QUEEN ELIZABETH HOSPITAL
GATESHEAD HEALTH NHS FOUNDATION TRUST

Aug 2012

Acknowledgements: Donna Walton, Claire Nelson, Debbie Woodall, Diane McGibbon, Joy Gibson, Gillian Bowden, Andrew Sowerby, Maggie Bolton
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Dear

On behalf of the staff on the Critical Care Department, we would like to welcome you to the unit.

Enclosed you will find an information pack which we hope you will find useful whilst you are on placement.

During your placement your mentor will be…………………..

Co - mentor………………………

It is recognised that all students who come to the Critical Care Department are at various stages of their training. This will always be taken into account and each student will be treated as an individual.

If you have any queries or would like to arrange an informal pre-placement visit, please contact Julie Platten, Education and Practice Development Facilitator 4452007/4452008/4453204.

Off duty and shift patterns can also be discussed at this time.
Introduction
The twelve-bedded Critical Care Department (C.C.D.) currently is run by the surgical division managed by Steve Atkinson. The Clinical Lead is Dr. S. Christian and Joanne Coleman and Faye Butler are our Modern Matrons.

Critical Care Philosophy
As a dedicated team of professionals we promise to provide you and your family/friends, with a high quality package of care.

Within our care you will be respected as a unique individual with dignity. We intend to provide a high standard of care appropriate to your needs, to encourage your family to be involved in your care and to provide mutual support.

Our aim is to enable you to quickly progress to good health always seeking to achieve clarity, confidentiality and excellent communication.

With the addition of advanced equipment we will enhance our knowledge, experience and skills with qualities such as compassion and understanding, to form a solid partnership with you and your family that will meet your needs whilst in our care.

Through our aim is to promote health and a good quality of life, there may come a time when we must acknowledge that recovery is not possible – then it is our aim to ensure a peaceful dignified death, whilst upholding your ethical and moral beliefs.

Admission of Patients to Critical Care
Critical care must be patient focused, putting the patient at the centre of the service. Classification of patients in critical care areas focuses on the level of individual patient needs. These levels are government set initiatives and are countrywide.
Level 0 Patients whose needs can be met through normal ward care in an acute hospital.

Level 1 Patients at risk of their condition deteriorating, or those recently relocated from higher levels of care, whose needs can be met on an acute ward with additional advice and support from the critical care team.

Level 2 Patients requiring more detailed observations or interventions including support for a single failing organ system or postoperative care and those ‘stepping down’ from higher levels of care.

Level 3 Patients requiring advanced respiratory support alone or basic respiratory support together with the support of at least two organs systems. This level includes all complex patients requiring support for multi-organ failure.

Comprehensive Critical Care, DoH, (2000)

**Acute Response Team**

The ART are specialised nurses, part of their role is to support the safe discharge of critical care patients to the ward, supporting the ward team to ensure continued effective management of these often vulnerable patients. Additionally they can support the ward on aspects of care, e.g. tracheostomy, pain control, and review patients who trigger on the EWS chart.

**Rehabilitation Team**

The critical care dept has a dedicated rehabilitation team. It has been long recognised that specialised caring should not end following liberation from mechanical ventilation and departure from critical care. For many survivors this is where their memories and problems begin. The rehab team being designed to identify problems and initiate appropriate interventions to improve overall quality of life and hasten recovery.

Sanjay et al (2011) CRIT CARE MEDVOL 39. NO 2
**Types of Patients Admitted to Level 2 Care**
Any patient requiring level 2 support
Including, surgical, medicine, orthopaedic, gynaecological, gynaecological oncology, obstetric, very occasionally paediatric patients.

**Types of Patients Admitted to Level 3 Care**
Any patient requiring level 3 support

**Catering**
A selection of hot and cold meals is available from the hospital canteen located in the medical corridor.

Dining Room

Coffee Shop, Jubilee wing

Open 24 hours for Staff
10.00 – 17.30 (Monday – Friday)

Alternatively the unit possesses 2 microwaves, which are available for staff use. A selection of sandwiches and other refreshments can also be obtained from W. H. Smiths near the main entrance.

In addition there is a WRVS shop in the outpatients department open 09.00-16.00 Monday to Friday.

**Chaplin**
There is a 24-hour multi-denominational chaplaincy service available, contact made by bleping the appropriate faith. Contact numbers for leaders of non christian faiths are listed in the internal telephone directory.

**Fire and Cardiac Arrest**
Cardiac Arrest - Dial 2222
Fire - Dial 3333

**Off Duty**
SMART rostering is available on the C.C.D. Off duty is normally prepared 4-6 weeks in advance. You must ensure that you work at least 50% of your week with your mentor.
Please endeavour to have your learning outcomes book provided by the university available on each shift as this will allow ongoing evaluation between you and your mentor. You will receive an initial, an intermediate and a final interview with your mentor during your placement on the C.C.D. to assess your progress.

**Shift Times**

Our week begins on a Sunday providing 24-hour cover on a rotational shift pattern.

<table>
<thead>
<tr>
<th>Shift Type</th>
<th>Time</th>
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<tbody>
<tr>
<td>Long shift</td>
<td>07.30-20.30</td>
</tr>
<tr>
<td>Early shift</td>
<td>07.30-14.00</td>
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<tr>
<td>Late shift</td>
<td>13.30-20.30</td>
</tr>
<tr>
<td>Night shift</td>
<td>20.00-08.00</td>
</tr>
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</table>

Please discuss your shift pattern with your mentor. If your mentor works internal rotation and will be on night duty during your placement you may work one week only of night duty with them.

**Study Leave**

As a student nurse your mentor will expect you to be professional, flexible, approachable and confidential. You will be expected to facilitate your own learning by using all resources available to you whilst on placement on C.C.D. These include access to the Internet and use of the unit library.

There are also various specialist nurses based within the trust and you may have the opportunity to spend time with these staff to gain an insight into their role.

**Visitors/Relatives**

Visitors are asked to ring the doorbell before entering the C.C.D. and wait for a member of staff to attend to them before entering the unit.

Visiting is limited to immediate family only with a maximum of two visitors allowed at any one time. Times are 13.00 - 16.00, 17.30 – 20.00.

Facilities for relatives/visitors include:

- Toilet facilities are available in the CCD waiting room, catering facilities are available from the hospital canteen or coffee shop.
- Public payphones are situated near the main entrance.
Uniforms
Navy Blue  Band 6/7
Blue      Band 5
Lilac     Healthcare/ Team Assistants
White     Students
LEARNING ZONES

LEVEL 3
- Accident & Emergency
- Physiotherapy Team
- Breast Nurse Specialist
- Clinical Ergonomics
- Vascular Nurse Specialist
- Infection Control Team
- Endoscopy Department
- X ray Department

LEVEL 2
- Critical Care
- CCOT
- Pre-Assessment Nurse
- Occupational Health Department
- Research Sister
- Paramedics

LEVEL 1
- Chaplain
- Pain Nurse Specialist
- Cardiac Rehabilitation Team
- Macmillan Nurses
- Tissue Viability Nurse
- Diabetes Team
- Dietetics Team
- Theatre Department
- Nutrition Nurse Specialist
- Colorectal Team
- Dysphagia Nurse Specialist
- Coronary Care Unit
- Paramedics
<table>
<thead>
<tr>
<th>DEPARTMENT</th>
<th>CONTACT</th>
<th>TELEPHONE NO.</th>
<th>BLEEP NO.</th>
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</thead>
<tbody>
<tr>
<td>Accident and emergency</td>
<td>Carmel Slater</td>
<td>2965</td>
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<tr>
<td>Breast nurse</td>
<td>Caroline Buchanan</td>
<td>3738</td>
<td>2046</td>
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<tr>
<td>Cardiac Rehabilitation Team</td>
<td>Designated on CCU rota</td>
<td>3783</td>
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<tr>
<td>Chaplain</td>
<td>Jonathan Perry</td>
<td>2072</td>
<td>2120</td>
</tr>
<tr>
<td>Clinical Ergonomics</td>
<td>Ann Page</td>
<td>2676</td>
<td>2258</td>
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<tr>
<td>Colorectal Team</td>
<td>Tracy Pinchbeck Heather Wilson</td>
<td>3151</td>
<td>2059</td>
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<tr>
<td></td>
<td></td>
<td>3152</td>
<td>2041</td>
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<tr>
<td>Coronary Care Unit</td>
<td>Sr. E Whitfield</td>
<td>2018</td>
<td>2373</td>
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<tr>
<td>Diabetes team</td>
<td>Michelle Hook</td>
<td>5304</td>
<td>2388</td>
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<tr>
<td>Dietetics Team</td>
<td>Dieticians</td>
<td>2043</td>
<td>2232</td>
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<tr>
<td>Dysphasia Nurse Specialist</td>
<td>Steve Davis</td>
<td></td>
<td>#6308</td>
</tr>
<tr>
<td>Endoscopy Department</td>
<td>Sr S Dreyer</td>
<td>2586</td>
<td>2399</td>
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<tr>
<td>Critical Care Department</td>
<td>Sr Julie Platten</td>
<td>2127</td>
<td>2218</td>
</tr>
<tr>
<td>ART</td>
<td>Andy Rooks</td>
<td>3129</td>
<td>2698</td>
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<tr>
<td>Infection Control Team</td>
<td>Viv Atkinson</td>
<td>3182</td>
<td>2023</td>
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<tr>
<td>Mortuary</td>
<td>Mortuary Technician</td>
<td>2309</td>
<td>Via switchboard</td>
</tr>
<tr>
<td>Macmillan Nurses</td>
<td>Helen Mandeville</td>
<td>2077</td>
<td>2361</td>
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<tr>
<td>Nutrition Nurse Specialist</td>
<td>Tracy Cowper Debbie Woodall</td>
<td>3175</td>
<td>2372</td>
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<tr>
<td>Occupational Health</td>
<td></td>
<td>6161</td>
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</tr>
<tr>
<td>Paramedics</td>
<td>Angela Drummond Ambulance HQ</td>
<td>273 1212</td>
<td></td>
</tr>
<tr>
<td>Physiotherapy Team</td>
<td>Fiona McClintock</td>
<td>2320</td>
<td>2066</td>
</tr>
<tr>
<td>Pre – Assessment</td>
<td></td>
<td>2574</td>
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<tr>
<td>Theatre Department</td>
<td>Maureen May</td>
<td>3974</td>
<td></td>
</tr>
<tr>
<td>Tissue Viability</td>
<td>Linda</td>
<td>5132</td>
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</table>
**Accident and Emergency.**
To gain an insight into the various aspects of accident and emergency nursing.

**Breast nurse specialist.**
To work alongside the breast nurse specialist for one day, to gain an insight into her role within the multidisciplinary team.

**Cardiac rehabilitation team.**
To be aware of the role of the cardiac rehab team within the hospital, who visit patients on an individual basis.

**Chaplain.**
To gain insight into the role of the chaplain within the hospital, dealing with both patients and relatives.

**Clinical ergonomics.**
To be aware of the advisory capacity, of this department, involving patient moving and handling.

**Colorectal team.**
To gain an insight into the role of the colorectal team, concerning pre and post op care. Along with health promotion, of patients with a stoma.

**Coronary care unit.**
To work on the coronary care unit, to gain an insight into the role of the coronary care nurse.

**Critical Care Outreach Team**
To work with the critical care outreach team and to gain insight into the role outreach has to play Trust wide.
Diabetics team.
To be aware of the role of the diabetic team within critical care.

Dietetics team.
To be aware of the role of the dietetic team within critical care, predominately, the dietician and their role in patient care.

Dysphasia nurse specialist.
Involved in the assessment of stroke patients, and patients with artificial airways, needing swallow assessments.

Endoscopy department.
To be aware of the nurses' role, within this area and the various procedures, carried out within the endoscopy department.

Infection control team.
To be aware of the infection control team, within the hospital, and the importance of infection control within the critical care area.

Macmillan nurses.
To gain insight into the advisory and supportive role of the Macmillan nurses. To also gain an understanding of the impact of terminal illness on critical care patients.

Nutrition nurse specialist.
To work alongside the nutrition nurse, to gain an insight into the nutritional needs of the critically ill patient.

Mortuary.
The opportunity to see a post-mortem if appropriate, if the student nurse wishes.

Occupational health department.
To gain knowledge and advice this department offers to staff.
**Paramedics.**
To be aware the paramedics role, in the safe transfer of the critically ill patient. At the present time it is not possible to arrange to spend time with the paramedics however, this may change in time.

**Physiotherapist.**
To work with the team to gain insight into their involvement within the multidisciplinary team, and the importance of the physio pre and post operatively.

**Pre assessment nurse.**
Working alongside the pre assessment nurse. To help be aware of the importance of pre op care, and tests and procedures at the pre op phase.

**Research Sister**
To gain insight into the role of the research sister within the critical care dept including audit.

**Theatre department.**
To gain an insight into the role nurses have within the theatre environment, regarding anaesthesia, recovery, and theatre nursing. Current trust policy requires students to gain permission from the patient, consultant, and theatre sister prior to visiting.

**Tissue viability nurse.**
To gain experience and knowledge into the role of the tissue viability nurse, who acts as an advisory support source, regarding wound management and pressure damage.

**Vascular nurse specialist.**
To work with the vascular team, to gain an insight into the vascular and arterial systems and leg ulcer care.

**Xray department.**
To work within various areas of the department to gain knowledge and insight of the process carried out within this specialist area.
Glossary of Terms

ABG (Arterial blood gases)
Oxygen and carbon dioxide in arterial blood is measured by various methods to assess the adequacy of ventilation and oxygenation, also the acid/base balance of the patient.

ARDS (Adult respiratory distress syndrome)
A respiratory emergency caused by respiratory insufficiency and failure. May occur after aspiration of a foreign body, cardiopulmonary bypass surgery, gram negative sepsis, multiple blood transfusions, oxygen toxicity, pneumonia or respiratory infection.

Arterial line
A cannula inserted into the artery allowing easy access to arterial blood and continual blood pressure measurement.

Bagging and suction
Hyperinflation of the lungs using a re-breathe or water bag to enable suction of secretions from the trachea.

Central venous pressure
The pressure of the blood in the central or great veins of the chest close to the right atrium.

CT Scan
An X-ray technique that produces a film representing a detailed cross section of tissue structure.

DC Shock (direct current cardioversion)
The restoration of the hearts normal sinus rhythm by the delivery of a synchronised electric shock through the chest usually delivered by a defibrillator. Used in the treatment of AF and VT.
DIC (Dissemination intravascular coagulation)
A grave coagulation malfunction resulting from over stimulation of the body’s clotting and anti-clotting process in response to disease or injury.

ECG (Electro-cardiograph)
A procedure by which the electrical activity of the myocardium is recorded to detect abnormal transmission of the cardiac impulses through the conductive tissues of the muscle.

Echocardiogram
A diagnostic procedure for studying the structure and motion of the heart.

Enteral feeding
Artificial feeding delivered by nasogastric, gastrostomy or jejunostomy tubes via the alimentary tract.

Endotracheal tube
An artificial airway inserted through the nose or mouth into the trachea to aid ventilation.

Extubation
The process of withdrawing the endotracheal tube from the trachea.

FiO₂ (Fraction of inspired oxygen)
The percentage of oxygen delivered to the patient ie 0.6 FiO₂ = 60%

GCS (Glasgow coma score)
A quick practical and standardised system for assessing the degree of conscious impairment in the critically ill and for predicting the duration and ultimate outcome, primarily with head injuries.

Intubation
Passage of an endotracheal tube into the trachea either through the nose or mouth.
LFT’s (Liver function test)
A test used to evaluate various functions of the liver from a blood sample.

SaO₂ (Oxygen saturations)
The fraction of a total haemoglobin in the form of HbO₂ at a defined PO₂.

Percutaneous tracheostomy
a relatively simple procedure for patients requiring long term ventilation without the need for planned surgery.

Sensory imbalance
Defined as sensory overload which is a marked increase in intensity of stimuli above normal level, or sensory deprivation which is a lack of normal sensory input.

Swan Ganz
A technique used to determine left ventricular function by measuring left arterial wedge pressure.

Tracheostomy
An opening through the neck into the trachea, through which a tube may be inserted.

Prefixes

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Meaning</th>
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<tbody>
<tr>
<td>a/an</td>
<td>lacking/want of</td>
</tr>
<tr>
<td>ab</td>
<td>from</td>
</tr>
<tr>
<td>ante</td>
<td>before</td>
</tr>
<tr>
<td>anti</td>
<td>against</td>
</tr>
<tr>
<td>bi</td>
<td>two</td>
</tr>
<tr>
<td>cardia</td>
<td>refers to the heart</td>
</tr>
<tr>
<td>centi</td>
<td>one hundredth part of</td>
</tr>
<tr>
<td>cysto</td>
<td>relating to the bladder</td>
</tr>
<tr>
<td>dys</td>
<td>difficulty</td>
</tr>
<tr>
<td>ecto</td>
<td>outside</td>
</tr>
<tr>
<td>endo</td>
<td>within</td>
</tr>
</tbody>
</table>
epi  upon
en   good
ex   of or away from
gastro stomach
haem, haemato, haemo relating to the blood
hemi one half of
hetero other or different
homeo similar
hyper above
hypo below
intra within
lac milk
litho stone
macro large
micro small
megalo great
mono small
myo relating to muscle
nacro stupor
naso relating to the nose
necro dead
nephro relating to the kidney
neuro relating to the nerve tissue
opthal relating to the eyes
optic relating to the vision
ortho straight
osteo relating to the bone
patho disease
peri around
poly many
post after, behind
pre before
re back, again
renal relating to the kidney
retro backward
semi half
sub  under, near
supra  above
syn  together
trans  through, across
tunica  a coat
zona  encircling

**Suffixes**

ectomy  removal of
itis  inflammation of
oscopy  examination of, using an instrument
salpinx  a tube
somatic  relating to the body a exposed to the mind
sternal  relating to the sternum
tomy  to cut
uresis  urination
version  turning
Respiration

What is Respiration
Respiration is the act of breathing. The oxygen contained in the air we breathe is essential to life, without it we would die in a matter of minutes. Carbon dioxide is poisonous in high concentrations and has to be removed from the body. The lungs provide the mechanism by which oxygen and carbon dioxide are exchanged.

Respiration consists of an inspiration (air moving into the lungs), expiration (air moving out of the lungs) and a pause. By means of respiration oxygen is taken around the body, carbon dioxide is collected and excreted.

Respiration is an involuntary action. It is brought about by stimulation of the respiratory centre in the brain brought about by the presence of carbon dioxide in the blood, representing the need of the body for oxygen.

The air reaches the lungs through a series of conducting tubes. First it passes through the pharynx, through the larynx and down the trachea. At its lower end, the trachea divides into two smaller tubes, called the left and right bronchi. The bronchi divide into bronchioles and then again, ending in tiny air sacs called alveoli, where most of the gaseous exchange occurs.

The diaphragm is a sheet of muscle separating the thorax from the abdomen. During inspiration, it contracts and lowers the pressure in the thorax thereby drawing air into the lungs. During expiration the diaphragm relaxes and rises again pushing air out of the lungs.

When breathing is difficult, the accessory muscles come into action; these normally move the head, arms and shoulder blades.

Normal Respiration

It is rhythmical quiet regular and conformable rate per minute-16-20. The rate may be increased by taking exercise, by excitation or emotion. It is decreased by rest and sleep.
Recording the Respirations

The nurse should note the rate, regularity and any discomfort, which may be apparent. It is quite easy to note the movement of the patient’s chest while recording the pulse. The respirations should also be counted for a full minute. It is best if the patient is unaware of what you are doing. Record respirations on the EWS chart.

The Air Passages

Gardiner, P
Systems of Life, the respiratory system, Part I
Nursing Times (1991) Vol.87, No.2 p55
Physiology of Respiration

The purpose of respiration is to provide the cells of the body with oxygen and remove carbon dioxide, produced by cellular activity.

There are three basic processes of respiration:

- Pulmonary ventilation, (breathing).
- Inspiration, (inhalation).
- Expiration, (exhalation).

**Pulmonary Ventilation**

The process by which gasses are exchanged between the atmosphere and the lung alveoli. To allow air to move into the lungs a pressure gradient exists.

**Inspiration**

The process where the air moves into the lungs by the pressure inside the lungs being less than the pressure of the atmosphere.
Expiration
The air moves out of the lungs by the pressure inside the lungs being greater than the pressure of the atmosphere. The diagram on the previous page shows the changes in pressure during inspiration and expiration.

Oxygen Therapy

What is Oxygen Therapy

The use of supplementary oxygen is the primary treatment for patients with respiratory failure to prevent hypoxia, a condition where insufficient oxygen is available for cells of the body, especially those in the brain and vital organs. This may occur in the following circumstances:

- Respiratory disease, when the air available for respiration is reduced, e.g. infection, COAD (chronic obstructive airways disease), pulmonary infarction/embolus, asthma

- Chest injuries following trauma when the mechanism of respiration may be impaired

- Heart disease, when the cardiac output is reduced, e.g. myocardial infarction (heart attack)

- Haemorrhage, when the oxygen carrying capacity of the blood is reduced

- Pre-operatively and post-operatively when analgesic drugs may have an effect on respiratory function, e.g. narcotics

- Emergency situations, e.g. cardiac or respiratory arrest, cardiogenic, bacteraemic or haemorrhagic shock

Except in emergency situations, oxygen therapy will be prescribed by the doctor, who will specify the percentage of oxygen and the method of administration.
Equipment Required

- Oxygen supply e.g. piped or cylinder
  - Flow meter
  - Appropriate oxygen adapter
  - Appropriate mask and tubing

Humidified Oxygen

- Inspirons
- Sterile water
- Elephant tubing
- Water trap
- Appropriate mask

Heated Humidified Oxygen

- Fisher paykell, including wiring and water chamber
  - Sterile water bags for humidification
  - Elephant tubing for fisher paykell system
    - Flow meter
    - Oxygen tubing
    - Appropriate mask

It is important that the oxygen administered is adequately humidified to prevent drying of the mucosa of the respiratory tract.

Administration of Oxygen

Oxygen Masks

Designed to give an accurate percentage of oxygen by entraining an appropriate amount of air for a specific flow of oxygen. Instructions are available for each type of mask and should be used accordingly.
Venti Mask
With these masks there are various attachments which can be used to give a more specific percentage if prescribed. The required flow of oxygen for the prescribed percentage is given for each attachment, which may be colour co-ordinated.

Nasal Cannula
These are light plastic tubes inserted into each nostril, shaped to fit over the ears to maintain their position. Patients find them less claustrophobic than a mask. They are not suitable for all patients as lower percentages of oxygen are not accurately obtained, and at higher percentages humidification is inadequate.

Endotracheal Tube
A plastic tube, different sizes which ensures the patency of the airway is maintained, preventing airway obstruction. Eg. making sure the tongue doesn’t fall back into the pharynx. It also prevents stomach contents (aspirate) from entering the lungs, this could cause serious lung function complications. Airways which provide this function have a ‘cuff’ or balloon surrounding the tube, which when inflated with air forms a seal within the trachea thereby preventing any aspirate entering the lungs.

Trachestomy Tube
A tracheostomy tube is an artificial airway consisting of a plastic or metal tube, which is surgically implanted just below the larynx in the trachea, bypassing the mouth and upper airway. This procedure is usually a temporary measure.

Minitracheostomy
An uncuffed tube, inserted into the trachea for suctioning purposes only.

Emergency Situations
During resuscitation, oxygen may be given via an ambu-bag and resuscitation mask.

Maintaining a Safe Environment
Observe patient’s general condition to identify any deterioration or improvement in their hypoxic state e.g. degree of drowsiness, level of orientation, level of consciousness.
Observe the colour and condition of the patient’s skin for sweating, cyanosis or clamminess.

Oxygen is a gas which readily supports combustion, so in areas where it is used the risk of fire is greatly increased. Explain the dangers of smoking to the patient and their visitors.

Alcohol based solutions, oils and grease should not be used in areas where oxygen is administered. These substances are flammable and the presence of oxygen will increase the risk of fire.

Health Authority policy in association with fire precautions should be familiar to all staff.

Be aware of cross infection, replace equipment when necessary, washing hands before and after this practice.

**Considering Patient Comfort**

If the patient finds a mask claustrophobic, low concentrations of inspired oxygen can be given through a nasal cannula; this should be discussed with the patient’s named nurse or mentor prior to administration.

It is important to remember to communicate with the patient and explain what is happening to the patient at all times, if the patient is restless then the nurse may need to stay with them during initial treatment. This in turn will help alleviate the patient’s anxiety.

**Pulse Oximetry**

**What is Pulse Oximetry**

A pulse oximeter is an electrical machine designed to provide continuous measurement of arterial blood oxygen saturation, \(\text{SaO}_2\), and pulse rate. Usually portable it is a non-invasive monitor that measures the absorption of certain wavelengths of light passed through living tissue.
**What is meant by SaO\(_2\)?**
Oxygen is carried in two ways within the blood. It may be dissolved in plasma or combined with haemoglobin in red blood cells (RBC). The pulse oximeter measures the proportion of oxyhaemoglobin present in the blood.

**What is Oxyhaemoglobin?**
Oxyhaemoglobin is the bright red substance formed when the pigment haemoglobin in RBC combine, reversibly, with oxygen. Oxyhaemoglobin is the form in which oxygen is transported from the lungs to the tissues.

**How is SaO\(_2\) defined?**
The oxygen saturation is defined as the ratio of the concentration of oxyhaemoglobin to the concentration of desaturated or reduced haemoglobin, (haemoglobin that cannot be oxygenated), and is expressed as a percentage. The normal level is 97-99%, however this may not be the case when a patient is suffering from a breathing complaint.

**Resources**
Probes- oximeter probes are available in adult, paediatric and neonate sizes. The sensor clips onto a finger, toe or earlobe and are re-useable.
**Recording Oxygen Saturations**

Check equipment is in good working condition
a) Damaged equipment can give inaccurate readings.

Assess the patients respiratory status and observe their colour, respiratory rate, rhythm, chest movements, breath sounds, pulse and BP

Explain the procedure to the patient
a) Informed consent
b) Makes patient fully aware of what is about to happen

Clean oximeter probe with alcohol swab
a) It is important to maintain hygiene and prevent cross-infection.

Before attaching probe remove any substances that may affect light absorption, (nail polish, dried blood etc.), This may affect the accuracy of readings.

Attach the probe to selected site avoiding close proximity to sphygmomanometer cuff or arterial/venous lines. This may affect the accuracy of the readings.

In some circumstances the probe may need to be secured. If so avoid taping too tightly. This can inhibit venous pulsation giving a false low reading and cause pressure damage. Attach the probe lead to the pulse oximeter.

Turn on the pulse oximeter and check the oxygen saturation. The pulse rate and the plethysmography wave will also be displayed. Set the alarms within the locally agreed limits according to the patient’s condition.

Record oxygen saturation, \( \text{SaO}_2 \) on appropriate chart remembering to record the percentage oxygen therapy the patient is receiving and report reading to patient’s named nurse. This allows a continuous record to be kept of patients \( \text{SaO}_2 \) so any changes can be identified immediately.
Arterial Blood Gases

In many clinical areas arterial blood gases are taken to aid the medical diagnosis or to assess the effectiveness of treatment programmes. In non-clinical areas this is normally done by an arterial stab, however in critical care departments many patients have arterial lines instead. The arterial line allows for the painless acquisition of blood specimens for a variety of tests, in addition continual blood pressure measurement. The most common site for an arterial line is the radial artery followed by the brachial and femoral arteries.

During blood gas analysis there are four main result areas. These are pH, respiratory function (oxygen, carbon dioxide, and saturation), metabolic measurements and electrolyte levels.

The first area is the main one which is looked at during analysis, the electrolyte levels are a useful addition, however are to be used as a guide. In order to ensure that the result acquired is as accurate as possible, the patient’s temperature should be recorded. As the patient’s temperature affects the dissociation of gases; many blood gas analysers have a default temperature set at 37 degrees.

The pH is a measure of acidity/alkalinity of any solution. The pH scale measures moles per litre and its range is from 1-14. A pH of 1 is strong acid, whereas a pH of 14 is total alkali. Chemically a solution is neutral when its pH is 7, the pH of blood is between 7.35 – 7.45 which is slightly alkaline in nature. This normal reading for blood is referred to physiologically neutral, where a reading below 7.35 it is referred to as acidotic, above 7.45 it is alkalotic.

Blood as analysis measures the partial pressure of arterial Carbon Dioxide (PaCO\textsubscript{2}), the partial pressure of arterial Oxygen (PaO\textsubscript{2}) and oxygen saturation (SaO\textsubscript{2}).

The usual level of carbon dioxide is 4.5 – 6.0 kPa. Carbon dioxide is a by product of cellular respiration and metabolism. The respiratory centre in the brainstem responds primarily to the levels of arterial carbon dioxide, this leads to an increase in the rate and the rhythm of breathing. Low levels of carbon dioxide reduce the stimulus to breathe.
The usual level of oxygen is 11.5 – 13.5 kPa. Oxygen is essential to life, however too much oxygen can cause toxic damage. All the cells in the body need oxygen to survive as they may become hypoxic and eventually die. Contrary to widespread belief only 10 – 15% of patients with COPD become apnoeic if given more than 28% oxygen (Bateman and Leach 1998)

The normal level of oxygen saturation without supplementary oxygen is around 97%. The differences in reading from pulse oximetry and arterial blood gases is negligible.
Types of Respiratory Failure

Respiratory failure occurs when there is a malfunction in the respiratory system. This leads to inadequate gaseous exchange.

Respiratory failure is divided into Type 1 and Type 2 can be acute or chronic.

Type 1 is hypoxia, and is usually treated with supplementary oxygen.

   Acute – pulmonary oedema, pneumonia, bronchial asthma, pulmonary embolism ARDS (adult respiratory distress syndrome)

   Chronic – lung fibrosis, can go on to become type 2

Type 2 is hypoxia combined with high level of carbon dioxide and may require additional ventilatory support.

   Acute – severe acute asthma, upper airway obstruction, major chest injury, neurological lesions, muscle/neuromuscular problems.

   Chronic – chronic obstructive airways disease, terminally ill in progressive respiratory disease, severe chest deformity, gross obesity, sleep apnoea syndromes.

Equipment required for intubation

Endotracheal tube male size 8/9, female 7/8
Laryngoscope long and short blade
Aqueous Gel
Guaze
10 ml Syringe
Bouges gum elastic and satin slip tape

Drugs required for Intubation

Suxamethonium
Vecuronium
Thiapentone
Propafol
Midazolam
Atracrium
Alfentanil.

Ventilated patients
Patients with weak or absent spontaneous respiration require mechanical support e.g:

Post cardiac/respiratory arrest.
Chest infection.
Neurological insult.
Trauma.
Drug overdose.
Post-op anaesthesia.

Positive Pressure Ventilation:
This is inflating the lungs by pushing air into them.

Standard Modes of Mechanical Ventilation

IPPV (Intermittent Positive Pressure Ventilation):
Initiation & control of both volume & frequency of breaths. The patient cannot initiate or spontaneously breathe.

**SIMV (Synchronized Intermittent Mandatory Ventilation):**
Breaths given by the ventilator have preset rate & volume given in synchrony with spontaneous effort from the patient.

**BIPAP (Biphasic Airway Pressure Ventilation):**
This allows the patient to inspire as much or as little volume as they like within preset parameters.

**ASB (Assisted Spontaneous Breath):**
The ventilator applies a small amount of over pressure with each spontaneous breath to assist the flow of gas into the lungs.

**PEEP (Positive End Expiry Pressure):**
Enables the patient’s airway pressure to be maintained above atmospheric pressure at the end of expiration.

**CPAP (Continuous Positive Airway Pressure):**
Uses the same principles as PEEP but without mechanical backup rate from the ventilator.

**Manual Ventilation. (Hand Bagging) :**
Nurse or doctor administers breaths via a re-breathe bag.

**HFOV – high frequency oscillating ventilator :**
A high tech mode of ventilation giving maximum gaseous exchange.

**Ventilator Observations**

**Oxygen:**
Percentage of oxygen administered
**Tidal Volume:**

The total volume of air expired in one breath.

**Minute Volume:**

The total volume of air expired in one minute.

**Peep:**

Positive end expiratory pressure

**Pmax:**

Maximum pressure

**Compliance:**

The dispensability of the lungs and thorax. The lungs become stiffer resulting in a reduction in lung size. For example: During inspiration/expiration. Pulmonary congestion (i.e. Pulmonary oedema), Deficiency in surfactant (i.e. ARDS).

**Resistance:**

The pressure required producing airflow, mostly affected by the condition of the airways. The resistance will increase: During expiration, When bronchi are constricted, i.e. Asthma, When the airways are obstructed, i.e. Secretions or chronic bronchitis.

Anatomic dead space is the areas of the respiratory tract where gas exchange does not occur. The estimated volume is approximately 150mls.

**Physiotherapy**

**Physiotherapy within Critical Care**

Chest physiotherapy reduces the risk of sputum retention, chest infection and consolidation. The physiotherapist and nursing staff therefore play vital roles in implementing specific physiotherapy interventions related to respiratory care.
It is important that the nurse liaises with the physiotherapist as to what interventions are suitable for a particular patient and how to safely carry them out:

Physiotherapy care on the CCD includes:

Deep breathing and coughing exercises
Suctioning
Incentive spirometry (Tri-flows)
Mobilisation

If a patient is to undergo surgery, instruction on deep breathing and coughing exercises should ideally be given pre-operatively by a physiotherapist. Coughing and deep breathing post-operatively is often thought of as the foundation of good pulmonary care, and patients should be encouraged every hour to 30 minutes depending on the patient's physical and psychological condition.

**Coughing Exercises**

Encouraging the patient to cough as a routine aspect of care is one method of facilitating clearance of airway secretions. Each patient should therefore be assessed on an individual basis by a physiotherapist in relation to whether the patient needs to be encouraged to cough as a routine aspect of their care.

If the physiotherapist decides that the patient needs to be encouraged to cough it is extremely important that effective coughing is taught, primarily by the physiotherapist. Once the patient understands the procedure the nurse should continue to encourage and assist.

The patient should be placed in a sitting position (where possible) to reduce tension on the abdominal muscles. If the patient has a wound site (abdominal or chest) then splinting of the wound with a pillow, rolled-up towel or crossed arms should also be encouraged.

**Deep Breathing Exercises**

In order to prevent pulmonary complications for those patients at risk of developing respiratory failure it is important that the nurse encourages the patient to take regular effective deep breaths. The following technique can be used:
Take a slow deep breath in
Hold breath for at least 3 seconds
Exhale (breathe out)
Repeat at least 3-6 times per hour.

As with coughing, patients should be assessed by a physiotherapist to determine whether the patient is capable of undertaking deep breathing exercises. If they are, then the patient should be placed in a sitting position, chest upright, to enable them to expand their lungs.

On CCD Incentive spirometry (triflows) are used to help patients with deep breathing, again the physiotherapist will initially assess the patient prior to commencing exercises with a triflow.

**Triflows**
This device requires the patient to take a maximal breath in via the mouthpiece in order to displace upwards the balls in the three separate chambers. The strength of the inspiration (breath in) will determine how many of the balls are moved and how high they go within the chamber(s). This should be encouraged 3-6 times per hour.

**Mobilisation**
Mobilisation is an important aspect in the care of post-operative patients. Benefits of early mobilisation include decreased venous pooling thus reducing the risk of deep vein thrombosis (DVT) and pulmonary emboli, decreased deconditioning related to bed rest e.g. muscle weakness, also a decreased risk of the patient developing pressure sores.

Deciding when and how the patient should be mobilized should be done on an individual basis in conjunction with the patient’s named nurse, doctor and physiotherapist. The student nurse will not be expected to initiate or assess a patient’s mobility only assist with a qualified nurse or physiotherapist.

**Tracheostomy Care**
What is a Tracheostomy?
A tracheostomy tube is an artificial airway consisting of a plastic or metal tube, which is surgically implanted just below the larynx in the trachea, bypassing the mouth and upper airway. This procedure is usually a temporary measure.

Reasons for a Tracheostomy
Firstly, an individual needs a tracheostomy to maintain an open, functional airway and are often used to bypass an airway obstruction. Airways may be obstructed by tumours or a foreign body, tracheal or larynx injury, or soft tissue swelling. When obstruction cannot be relieved through less invasive means, temporary or permanent tracheostomies are used to maintain oxygenation.

Secondly, to remove secretions, as suctioning clears the airway of patients with a poor cough effort. These people may be unable to effectively expectorate increased amounts of sputum or thick secretions. Therefore suctioning aims to minimise sputum retention, ensure adequate gaseous exchange and prevent infection.

Types of Tracheostomy Tubes
There are a variety of tubes available, varying in size, composition, number of parts and shape. Which tube is selected by the physician depends on the patient’s specific needs.

Most commonly used on CCD are cuffed tracheostomy tubes. When inflated, this tube seals the airway and prevents the aspiration of oral or gastric secretions. If the tube is uncuffed then the patient must have an effective cough and gag reflex to protect them from aspirating on diet and oral fluids. Therefore it is extremely important to notify a qualified member of nursing staff prior to giving any patient with tracheostomies diet or oral fluids.

Duties undertaken by Students Nurses on Critical Care
Student nurses allocated placement to the C.C.D are not responsible, or expected, to suction or deliver tracheostomy care to a patient unsupervised. However, suctioning may be undertaken if you are supervised by your mentor and you feel confident in carrying out the procedure. You may also be asked to set up a trolley
with the equipment required for suctioning. This trolley will be placed at the patient’s bedside at all times. Suction units by patient’s bedsides must also be checked daily to ensure the working order of each unit. Any faults must be reported to the nurse in charge.

Checking Suction Units
Discuss with your mentor:

Appropriate equipment required for suction units.
Different suction pressures available e.g. high and low suction.
Checking working order of suction equipment.

Tracheostomy Equipment Required for Suctioning
Equipment to be placed on a trolley and kept at the patient’s bedside at all times:

Suction catheters (double size of tracheostomy in situ then deduct 2)
10ml syringe (for cuff inflation/deflation)
Tracheostomy dilators
Replacement tracheostomy tube (One size smaller than tracheostomy in situ)
Sterile water
Sterile gloves
Aprons
Face masks and goggles
Tracheostomy oxygen masks
Lyofoam tracheostomy dressing
Tracheostomy tube holders
Lubricating jelly
Pressure gauge for cuffed tracheostomies
Suctioning Technique

1. Assess the patient’s ability to clear their airway by coughing; if coughing is unsuccessful suctioning is required.
2. Note baseline pulse or heart rate and if this is regular or irregular.
3. Explain to the patient why we need to suction.
4. Explain what the procedure entails, e.g., possibly pre-oxygenation, airway irritation, shortness of breath, very quick procedure.
5. Position patient in the most effective position for suctioning.
6. Wash hands, wear a clean apron, gloves, face-mask and goggles.
7. Check suction unit is switched on and in good working order.
8. Select the correct size suction catheter.
9. Ensure water is at hand for flushing suction tubing after procedure.
10. If applicable, either pre-oxygenate for 1 minute using a 100% oxygen source, or ask the patient to take a few deep breaths.

(Assume right hand is dominant);
11. Open one end of the suction catheter wrapper to reveal suction port, while maintaining sterility of the rest of the catheter.
12. Connect suction port to suction tubing and hold in left hand.
13. Don a sterile glove on the right hand.
14. Let the suction catheter wrapper fall away to reveal the catheter itself.
15. Grasp catheter with sterile gloved hand near the tip.
16. Open the airway if necessary and advance the catheter gently WITHOUT applying suction.
17. Stop advancing the catheter if it reaches any resistance.
18. Withdraw the catheter about 1cm, then apply suction and remove the catheter from the airway in one smooth continuous motion.
19. Do not suction for more than 10 seconds. The entire procedure should take no more than 15 seconds. (Fiorentini. 1992)
20. Remove the catheter completely and return the airway as before.
21. If applicable, either re-oxygenate for 1 minute using a 100% oxygen source, or ask the patient to take a few deep breaths.
22. Reassess the patients pulse or heart rate and whether it is regular or irregular, noting and reporting any changes to medical staff.
23. Wrap suction catheter around right hand and pull sterile glove over catheter and offhand, discard into a clinical waste bag.
24. Flush suction tubing with water so tubing is visually free of any sputum.
25. Turn off suction unit and replace tubing to its place.
26. Observe, assess, record and report the volume, type and thickness of secretions.

Note;

Bacteria can be introduced during suctioning if a contaminated suction catheter is used, catheters should, therefore, remain sterile until used and not be used to suction oral secretions first. (Griggs, 1998) Research regarding the single use of catheters is ongoing; guidelines may therefore be altered in the future.

Once only suction catheters (closed circuit) are now used on the unit however the above technique is still practiced on the wards.

It is at the discretion of each practitioner how often it is deemed necessary to perform suctioning. However, routine suctioning is unnecessary; it should be tailored to individual patient needs.

Complications

Trauma
The introduction of suction catheters into the airway can cause damage to the epithelial and mucosal lining.
This can be minimised by:
  a) suctioning only when necessary but continuing in regular assessment of the patient
  b) introducing the catheter smoothly and stopping when any resistance is felt,
  c) removing the catheter 1cm before applying suction,
  d) if possible, ensuring suction pressure is kept at a minimum.

Arrhythmias
Especially bradycardias, are caused by the movement of artificial airways and also by the introduction of the suction catheter, by way of vagal nerve stimulation.
This can be minimised by discontinuing suctioning until the heart rate has returned to normal.
**Hypotension**
This is usually secondary to a diminished heart rate. This can be minimised by discontinuing until the heart rate and blood pressure return to normal.

**Hypoxia**
This is worsened by applying suction. This can be minimised by if possible, pre-oxygenating prior to suctioning, ensuring suctioning is applied for no more than 10 seconds.

**Larynospasm**
This may be caused by the stimulation of, or trauma to, the larynx. Emergency treatment is required if this occurs in a patient who is not intubated, as air flow will cease. This can be minimised by aiming for ‘gentle’ insertion and withdrawal of the suction catheter, discontinuing suctioning if problems occur.

**Atellectasis**
This is the inward collapse of alveoli caused by increased pressure when suctioning, or the presence of thick ‘sticky’ sputum. This can be minimised by if possible, ensuring suction pressure is kept at a minimum ensuring application of suction is less than 10 seconds each time. Regularly assessing the need for suctioning, to prevent sputum retention and humidifying oxygen to facilitate the removal of secretions.

**Pneumothorax**
This can be caused either by the suction catheter tip perforating a bronchial segment, or by mechanical hyperinflation of the lungs. This can be minimised by introducing the catheter smoothly and stopping when any resistance is felt and restricting the use of hyperinflation.

**Raised Intra Cranial Pressure**
Hypercapnia (raised CO2), hypoxia and hypertension can affect intra-cranial pressure, particularly during suctioning. This can be minimised by if possible, pre-
oxygenating prior to suctioning. Assessing the need for suctioning regularly, especially skin colour and informing the patient of the need to perform suctioning.

**Retor-Lentalfibroplasia**
Usually only related to prolonged hyperoxygenation in children. The enriched oxygen supply can encourage new vessel growth in the eye which may in turn, become sclerosed. This can be minimised by keeping the time spent pre-oxygenating to a minimum and if tolerated, using less than 100 oxygen source.

**Sepsis**
The potential for introducing infective pathogens to the respiratory tract is increased as the catheter bypasses the normal defence mechanisms. This can be minimised by using an aseptic technique when suctioning changing and/or cleaning suction equipment regularly and adhering to individual department infection prevention and control policies.

**Incomplete Tube Clearance**
Suction does not always clear the tube entirely, and 'plugs' of mucus may be dislodged. This can be minimised by using humidification whenever possible, performing suctioning again.

**Continuous Positive Airway Pressure (CPAP)**

**What is CPAP?**
CPAP is used in the treatment of acute respiratory failure in when the patient is profoundly hypoxaemic. The aim of CPAP therapy is to increase oxygenation by improving the functional residual capacity and the lung dynamics. Oxygenation is improved by the positive pressure generated by CPAP which prevents the alveoli from collapsing at the end of expiration.

The treatment is appropriate for those patients in acute respiratory failure who are having problems with oxygenation, largely due to acute infectious problems e.g. pneumonias, pulmonary oedema.
CPAP is delivered to patients via a close-fitting mask and the technique is only suitable for those who are conscious and alert and are able to clear secretions and protect their own airway. CPAP may also be delivered via a tracheostomy and this is common in those patients being weaned from a mechanical ventilator following extubation.

CPAP therapy requires a large volume of gas to flow through the circuit continuously which may cause problems with tolerance and is sometimes poorly tolerated by patients. Monitoring the patient, providing reassurance and observation generates a significant amount of nursing work in an attempt to promote compliance and maximize the benefits of the treatment.

Regular monitoring of oxygenation levels is required whilst a patient is receiving CPAP therapy. Arterial blood gas (ABG) analysis provides the most accurate assessment of patient’s response to the treatment and is helpful in determining the flow of entrained oxygen. ABG’s are usually obtained via an arterial line, it is the responsibility of qualified nursing staff to obtain ABG’s samples and arterial lines must never be used by student nurses. ABG samples can be analysed by blood gas monitoring equipment on ITU, training must be given prior to using the machine.

Student Nurses role with CPAP
CPAP is used on both level 2 and level 3; the use of CPAP on a patient will be at the discretion of the anesthetic staff. CPAP will be set-up and applied by qualified members of nursing staff only.

Monitoring and application are not expected by student nurses, however, you may assist with both if you are supervised by your mentor. You may also be asked to collect the appropriate equipment to deliver CPAP.

Equipment Required

- Face mask
- Headstrap
- Fisher paykell humidifier
Oxygen tubing and elephant tubing, for fisher paykell system.
Water bags for humidification
Filter
Oxygen analyser

**Non Invasive Ventilation**

Non-invasive positive pressure ventilation i.e the patient is not intubated and therefore it can be used before a patient goes to CCD or as part of the weaning process after being on CCD.

There are three types:

1. Continuous CPAP.
2. Intermittent (NIPPV)
3. Bilevel (BiPAP)
The student nurse observes and participates in the delivery of the critically ill patient with respiratory failure

<table>
<thead>
<tr>
<th>Action</th>
<th>Student</th>
<th>Mentor</th>
<th>Date</th>
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<tbody>
<tr>
<td>Describes the importance of: Oxygen therapy</td>
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<td>Humidification</td>
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<tr>
<td>Participates in maintaining a clear airway: Types of airway,</td>
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<tr>
<td>Suction technique, Tracheostomy Care, Physiotherapy, Positioning</td>
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<tr>
<td>Can list types of patients with respiratory failure</td>
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<tr>
<td>Can list equipment requires for intubation</td>
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<tr>
<td>Can briefly describe the function of a ventilator: Mode of ventilation</td>
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<td>Oxygen Concentration, Respiratory Rate, Tidal Volume, Minute Volume</td>
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<td>Airway Pressure</td>
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<td>Can record the hourly observations on chart accurately and report any abnormality</td>
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<tr>
<td>Have a brief understanding on blood gas analysis: Acidosis, Alkalosis</td>
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<tr>
<td>Understands the patients physiological and psychological state in relation to weaning</td>
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<td>Describe the methods of weaning</td>
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<tr>
<td>Discuss the indications, procedure and equipment required for extubation</td>
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<tr>
<td>Observe extubation of a patient</td>
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**The Cardiovascular System**

The cardiovascular system is a continuous, closed, blood filled circuit equipped with the heart, which maintains two separate circulations:

**Pulmonary**
- A low pressure system taking blood to the lungs.

**Systemic**
- A high pressure system conveying blood around the remainder of the body.

**The Systemic Circulation**
Receives oxygenated blood pumped by the left ventricle, through the aorta and into the major arteries. The blood is distributed to the capillary beds by the muscular arterioles. The blood is eventually collected by the venous system and returned to the right atrium. Whilst the blood vessels ensure proper distribution of the blood, it is the capillary beds where the major function of the cardiovascular system takes place. This is the process of metabolic exchange, whereby oxygen and nutrients are delivered to the cells and waste products are removed. Tissue perfusion is directly proportional to the rate of blood flow which is ensured by the maintenance of an adequate blood volume and blood pressure.

**The Pulmonary Circulation**
This runs in series with the systemic circulation. It receives deoxygenated blood from around the body into the right atrium. This then passes into the right ventricle which propels it into the pulmonary arteriole network. The pulmonary artery eventually conveys blood to both lungs. The blood passes through the pulmonary vasculature, and following gaseous exchange in the alveoli, is gathered into the pulmonary venous network which delivers the oxygenated blood to the left atrium.
The Chambers and Valves of the Heart
There are four chambers, two atria above and two ventricles below. Both atria and ventricles contract at the same time. The right and left sides of the heart are separated by a septum.

There are four heart valves, which are designed to allow blood to flow only in a forward direction through the heart. The valves which lie between the atria and the ventricles are known as atrio-ventricular valves. The semi-lunar valves are outflow valves from the ventricles and lie at the origins of the aorta and the pulmonary artery.

Blood Flow through the Heart
Deoxgenated blood enters the right atrium from the systemic circulation. Most of this blood in the right atrium then passes into the right ventricle as the ventricle relaxes following the previous contraction. When the right atrium contracts the blood remaining in the atrium is pushed into the ventricle.

Contraction of the right ventricle pushes blood against the tricuspid valve, forcing it closed, and against the pulmonary trunk to be conveyed to the lungs. Oxygenated blood returning from the lungs, enters the left atrium, through the four pulmonary veins. The blood passing from the left atrium completes left ventricular filling.

Contraction of the left ventricle pushes blood against the mitral valve, closing it and against the aorta semi-lunar valve, opening it and allowing blood to enter the aorta to be conveyed to the rest of the body.
**Blood Pressure**

**What is Blood Pressure?**

It is the pressure of circulating blood against the walls of the arteries it is measured at two points;

SYSTOLIC (high point): the pressure when the heart contracts to empty the blood into circulation

DIASTOLIC (low point): the heart is relaxed to refill with blood from returning circulation i.e. resting between beats

Read as systolic pressure
diastolic pressure

**Factors affecting Blood Pressure**

**Patient**
Cold, full bladder, recent meal/cigarette, arm not supported in correct position, tight clothing, blood volume, age, sex (higher in men), weight, salt intake, and some drugs (contraceptive pill, HRT, high dose steroids).

**Observer**

Bias due to expectation, digit preference (rounding up numbers), incorrect position of equipment, undue haste, rapid deflation of cuff, inaccurate recording.

**Equipment**

Mercury not at zero, machine tilted, dirty, not at heart level, not calibrated, tubing leaking, valve sticking.

**Normal Blood Pressure**

Rises with age due to arteries losing elasticity that absorbs the force of contraction.

<table>
<thead>
<tr>
<th>Age</th>
<th>Systolic</th>
<th>Diastolic</th>
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<tbody>
<tr>
<td>30 years +</td>
<td>120/80</td>
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<tr>
<td>40 years +</td>
<td>140/85</td>
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</table>

**Hypertension**

Raised blood pressure—Systolic greater than 60mmHg and diastolic greater than 95mmHg (WHO). The British Hypertension Organisation recommends treatment commences after 3 consecutive readings of Diastolic greater than 100mmHg.

**Hypotension**

Low blood pressure, may indicate haemorrhage
Systolic less than 80mmHg usually = SHOCK

**Conditions when Blood Pressure may need Careful Monitoring**

**Hypertension:**

never diagnosed by a single reading, needs monitoring.

**Post operative & Critically Ill:**
to assess cardiovascular stability a pre operative blood pressure is vital for post operative comparison. A falling systolic pressure may indicate hypovolaemic shock.

**Blood Transfusions:**
incompatibility may lead to a fall in blood pressure.

**Intravenous Infusions**
Circulatory overload can lead to a raised BP. Large quantities of blood can alter clotting and lead to an increased risk of bleeding.

**Measuring Blood Pressure: Guidelines**

**Equipment**
sphygmomanometer: regularly calibrated, mercury visible & rests at zero, cuff fully circles the arm, valve keeps mercury at constant level
stethoscope: good condition, well fitting ear pieces.

**Procedure**

<table>
<thead>
<tr>
<th>Action</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain procedure to patient</td>
<td>Ensure understanding &amp; consent</td>
</tr>
<tr>
<td>Measure under same conditions each time (where possible)</td>
<td></td>
</tr>
<tr>
<td>Patient in desired position, sphyg at heart palm of hand upwards</td>
<td>Arm dangling =&gt; 11-12mmHg level higher than when at heart level</td>
</tr>
<tr>
<td>Large cuff</td>
<td>to obtain correct reading: too small=&gt; false high</td>
</tr>
<tr>
<td>Apply cuff 2.5cm above anticubital fossa tubing at top</td>
<td>Avoids interference with stethoscope</td>
</tr>
</tbody>
</table>
Inflate cuff until no brachial pulse is felt

Inflate further 30mmHg
Prevents blood flowing through artery

Place stethoscope over brachial artery
Just enough pressure to keep in place

Deflate cuff 2-3 mmHg/sec
Slow rate => venous congestion
Fast rate => mercury falls too quickly => low reading

Record systolic & diastolic pressure & compare. Irregularities should be brought to attention

Remove equipment & clean
Prevent spread of infection

Non invasive blood pressure monitoring
Ensure monitor is switched on and module in place, cuff should be secured to lead & module. Locate brachial artery & position cuff above elbow with arrow pointing to artery. A standard adult cuff will fit most patients, but other sizes may be used where necessary. Blood pressure can be once only (stat), or timed to automatically record. If the blood pressure does not require close monitoring, the cuff should be removed for the comfort of the patient.

Invasive monitoring - Arterial Lines

What is an arterial line
An arterial line is a cannula which is placed into an artery, (usually radial, brachial or femoral). It provides continuous monitoring of systolic, diastolic and mean arterial pressure. The arterial line reflects changes in the systemic pressure from
the site where it is placed. Whilst monitoring arterial pressure a wave-formation is visible on the space-lab monitor, the top of the wave is systolic pressure and the bottom represents diastolic. A dicrotic notch is visible in between the top and bottom wave this represents closure of the aortic valve and the backsplash of blood against a closed valve.

Arteries distribute oxygenated blood from the heart around the body; therefore an arterial line may also be used when a patient requires frequent arterial blood gases (ABG). Blood sampling from arterial lines must only be taken by a qualified member of nursing staff.

**Equipment required for insertion of an arterial line**

- Skin prep (betadine)
- Local anesthetic (bupivicaine)
- Syringes and needles
- Dressing pack
- Arterial line
- Sutures
- Stitch cutter
- Semi-occlusive dressing

**Equipment for arterial line monitoring**

- Drip stand
- 500ml sodium chloride 0.9% (to be prescribed by dr)
- Invasive monitoring giving set
- Transducer and leads
- Red caps

**Potential complications associated with Arterial Line monitoring**

The arterial system supplies oxygenated blood to the body, therefore there are risks involved in using arterial lines.

Risks include:

- infection
- disconnection/accidental removal
haemorrhage
haematoma formation
impaired circulation
vascular spasm
loss of digits/limbs
nerve damage
inadvertent injection of intravenous drugs
incorrect reading leading to inappropriate treatment

Central Venous Access Devices (CVAD)
A catheter that is inserted into one of the central veins, (the superior or inferior vena cava), the two main veins of the body which return blood into the right atrium and have the largest blood flow of any veins in the body.

Reasons for CVAD’s
To monitor central venous pressure (CVP)
To administer large amounts of fluid.
Long-term access.
Drugs (especially those that can cause damage to peripheral veins.)
Total Parenteral Nutrition. (TPN)
Difficult venous access

Common Insertion Sites
Internal jugular.
Subclavian vein
Brachial vein - usually used for peripherally inserted central catheters (PICC)
Femoral vein

Equipment needed for insertion
Dressing trolley
Epidural Tray
Central venous catheter
Skin cleaning solution (usually Cholraprep 2%)
Sterile gloves
Local anaesthetic
Assorted syringes and needles
Scalpel
3 way taps
0.9% Sodium Chloride
Suture
Occlusive dressing

Medical staff under, aseptic conditions carry out insertion of central lines with the patient in the trendelenburg position to reduce the risk of air embolus. The line is then secured with sutures and a transparent dressing applied. Following insertion a chest x-ray is carried out to confirm correct position to exclude pneumothorax. No fluid is administered via the line until this has been done. The patient is observed for signs of discomfort or distress, monitoring B.P. Heart rate, Temperature and Respiration.

Complications
Pneumothorax – due to the close proximity of the lungs. Air embolus. – All unused lumens should be securely clamped/covered with a bionector. If the catheter is inserted too far into the heart abnormal rhythms can occur.

Infection. – Observe for signs of redness and inflammation, a raised temperature. Ensure the site is kept clean. Where gloves and handle the line aseptically.

Dislodgement - If this occurs infusions should be stopped and a Dr. informed
If drugs are to be inserted into a line not being used blood should be drawn back first to ensure the catheter is still in the vein.

Central vein thrombosis - A flush should not be forced through to try and unblock it.
Occlusion - Ensure flush system is maintained to keep the line patent.
If a lumen is blocked it should be clearly marked and reported.

Equipment needed for removal
Sterile dressing pack
Sterile gauze
Sterile gloves
Stitch cutter
Sterile dressing
Sterile scissors
Sterile container

Procedure

Procedure is explained to the patient, the patient is to be laid flat. Remove dressings and sutures.
The patient should be asked to take in a deep breath and hold to reduce the risk of air embolus.
Whilst they are holding their breath, the catheter should be removed and sterile swabs placed over the site (ensuring the catheter tip does not become contaminated) and apply gentle pressure.
The tip of the catheter is placed into a sterile pot and sent for culture and sensitivity. When bleeding has stopped a sterile dressing should be applied.

Central Venous Pressure (CVP)

The pressure of blood returning to, or filling the right atrium. Venous pressure reflects the venous return to the heart. CVP is the pressure in the superior and inferior vena cava as they enter the heart, (Hudak and Gallo 1994)

Typical normal CVP in adults are between

+1 and +7 mmHg or +2 and +6 cmH_{2}O

Sometimes a CVP measure may require to be maintained at a higher or lower reading depending on condition. Parameters are often set by Drs at which CVP is to be maintained.

CVP is determined by 4 factors:
Circulating blood volume
Cardiac function
Vascular tone
Viscosity of fluid

**Indications for CVP Monitoring**
When a patient’s heart is functioning normally but their circulatory blood volume is disturbed. Patients who need fluid replacement and drugs and when cardiac function needs monitoring

**Some Indications for low CVP:**
Fluid loss, through hemorrhage, trauma, surgery, excessive diuresis or poor venous return. Peripheral vasodilatation; as a result of septicemia or certain drugs.

**Some Indications for High CVP**
Hypervolaemia – excessive fluid infusion
Cardiac failure – Right ventricular failure, pulmonary embolism, mitral valve failure
Lumen occlusion/obstruction

**Equipment Required for Monitoring CVP**
Monitor and cable, a bag of normal saline connected to transducer giving set placed into a pressure bag with 300mmHg pressure applied. Transducers set and stand. Bionector caps

**Monitoring CVP**
Ensure all connections are tight and the line primed by the flush, including stopcocks. Check there is no air in the line. Ensure level of stopcock is level with right atrium or mid axilla. Zero the Monitor.
Assess trace on monitor. CVP should then be displayed.
Pulse.

Normal Pulse.
Is a wave of distension felt in the artery wall due to contraction of the left ventricle, against a bony prominence.

Information gained from the pulse includes:-
Rate, Rhythm, Volume/strength.

Factors affecting pulse include:-
- Position,
- Age,
- Sex,
- Exercise,
- Emotion.

Taking a pulse.
Support patient’s hand and arm, place two fingers above thumb and inner wrist to feel pulsation of the radial artery, note the rate, rhythm, volume, count for one minute.

Common Abnormalities.

Tachycardia: pulse rate above 100 beats per minute
Bradycardia: pulse rate below 60 beats per minute.

Recording a 12 Lead ECG

Patient Preparation.
Explain procedure to patient, make patient comfortable, remove clothing covering chest and legs. The skin to be dry & hair shaved to place electrodes if necessary.
The limb leads to be placed on arms and legs, then the chest leads applied as shown on diagram. Document patient name, date of birth, date & time of recording, and reason for recording, e.g. chest pain.
Inaccurate recordings

Check:

electrodes are firmly attached, plug is firmly connected, for dirt/corrosion of the electrodes, patient is warm and relaxed
Conduction System of the Heart

PQRST Complex
ECG Recordings

- Sinus rhythm
- Sinus bradycardia
- Sinus tachycardia
- Ventricular fibrillation
- Paced rhythm
- Pacing spike
- Atrial ectopic beat
- Ectopic beat
- Ventricular ectopic beat
- Ectopic beat
- Atrial fibrillation
- Myocardial damage - ST elevation
- Deep Q wave
- Myocardial damage - ST depression
- Supraventricular tachycardia
- Ventricular tachycardia
Shock

Shock:
An inadequate blood flow to cells, due to reduced blood in circulation, reduced blood pressure, and cardiac output. This leads to hypoxia. Therefore the cells receive inadequate nutrients and a build up of waste products.

Types of Shock

Hypovolaemic Shock:
Reduced volume of blood in circulation.

Causes:
- Severe haemorrhage
- Extensive burns due to loss of serum
- Severe vomiting and diarrhoea resulting in water and electrolyte balance.

Cardiogenic Shock:
Cardiac output is suddenly reduced e.g. M.I.

Septic Shock:
Similar to hypovolaemic shock, but more difficult to treat. It is caused by severe infections where endotoxins are released from dead gram-negative bacteria. This results in vasodilation, leading to insufficient blood volume, reduced venous return, and cardiac output.

Neurogenic Shock:
This originates within the nervous system. It can be caused by sudden acute pain and severe emotional experiences. There is a reduced heart rate leading to reduced cardiac output, this leads to reduced blood supply to the brain, which leads to fainting.
Peritoneal Shock:
This is due to a break in wall of abdominal organ and contents enter peritoneal cavity. The peritoneum becomes inflamed, blood vessels dilate, and excess serous fluid is excreted.

Common causes include:
- perforated duodenal ulcer
- haemorrhagic pancreatitis
- perforation of uterine tube
- rupture of the spleen, liver, or uterus.

Signs of Shock

The body attempts to restore adequate blood circulation. If shock persists there may be irreversible damage.

Immediate Changes: Vasoconstriction, increased heart rate, reduced urine output.

Moderate Shock: blood supply to heart and brain is maintained. If severe it will lead to cardiac arrest.

Additional Signs of Shock: pallor, cold sweating extremities, rapid respiratory rate, thirst, scanty concentrated urine.

Treatment of Shock

- inform medical staff
- record blood pressure, pulse and temperature
- fluid replacement, blood if actively bleeding
- urea and electrolyte management
- oxygen therapy
- arterial blood gases to detect hypoxia
- determine cause
- reassure patient.
Limb Observations

Conditions requiring Limb Observations

Limb observations are normally carried out where there is a perceived risk to the flow of blood within the limb. Limb observations are recorded to assess pulses within the limb, and detect any changes in the circulation.

Limb observations are normally carried out where the following conditions are present:

- Aortic Aneurysm Repair
- Thrombolysis treatment
- Surgery to the vascular system e.g. femoral-popliteal bypass graft
- Deep vein thrombosis
- Following surgical embolectomy
- Fracture to limbs

This list is not exhaustive, and there may be other conditions assessed as requiring limb observations.
Wilson, K.J.W. (1990:83)(7th Ed) *Anatomy & Physiology in Health & Illness*
Churchill Livingstone
Venous System

Collins Educational
The student nurse will be able to assess the patient's cardiovascular status and participate in treatment regimes to optimise cardiovascular function

<table>
<thead>
<tr>
<th>Action</th>
<th>Student</th>
<th>Mentor</th>
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<tbody>
<tr>
<td>Accurately records haemodynamic parameters;</td>
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<td>Blood pressure</td>
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<td>Heart rate</td>
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<td>CVP</td>
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<td>And describes the relevance and inter – relationship of each</td>
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<td>Participates in the care of patients with an arterial line insitu.</td>
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<td>Understands principles of invasive monitoring</td>
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<td>Equipment for insertion</td>
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<td>Complications</td>
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<td>Care of lines</td>
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<td>Sampling from an arterial line</td>
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<td>Participates in the care of a patient with a central venous line insitu.</td>
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<td>Understands reasons why line inserted</td>
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<td>Sites for location</td>
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<td>Equipment for insertion</td>
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<td>Complications of</td>
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<td>Care of lines</td>
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<tr>
<td>Interpret CVP readings in relation to patients overall condition.</td>
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<td>Discuss reasons for low CVP and possible treatments</td>
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<tr>
<td>Discuss reasons for high CVP and possible treatments</td>
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<td>Understand the different types of shock</td>
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<td>Neurogenic</td>
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<td>Cardiac</td>
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<tr>
<td>Peritoneal</td>
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| Discuss the use of inotropes, benefits and side effects. |

<table>
<thead>
<tr>
<th>Identify life threatening arrhythmias</th>
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<tbody>
<tr>
<td>Discuss treatment for Ventricular tachycardia</td>
</tr>
<tr>
<td>Ventricular fibrillation</td>
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<tr>
<td>Asystole</td>
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<tr>
<td>Bradycardia</td>
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<tr>
<td>Narrow complex tachycardia</td>
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<tr>
<td>Complete heart block</td>
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</tbody>
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| Demonstrate proficiency in basic life support |
Renal and Metabolic System

The Urinary System

The urinary system consists of the two kidneys, the paired ureters, the bladder and urethra. Blood at arterial pressure enters the kidneys via the renal arteries, branches of which go to each of more than 1 million nephrons in the cortex of the kidney. In the nephron, blood is filtered and passes down the tubule of the nephron where water, salts and small molecules are reabsorbed into surrounding capillaries. Waste passes down into collecting ducts which empty into the pelvis of the kidneys.

The bladder acts as a storage reservoir for urine. It has a fibro-elastic wall, within which stretch receptors are that signal when the bladder is reaching capacity. A combination of voluntary and involuntary actions culminates in the sphincter of the bladder opening and the urine voiding through the urethra. In health, about 1.5 litres of urine are produced each day, though the amount varies considerably with the intake of fluid.

Disease of the urinary system

Bladder cancer, together with cancer of the ureter and renal pelvis, accounts for approximately 7% of all male cancers and 2.5% of all female cancers. The presenting signs and symptoms include haematuria, frequency or burning on micturition. In advanced disease the patient may have suprapubic pain or evidence of obstruction; such obstruction produces stagnation, which infection is likely to spread to the kidney and result in damage. The tumours are usually treated by radiotherapy or diathermy, but in severe cases cystectomy (removal of the bladder) and diversion of the urinary system may be necessary.
In critical care it is very important to be aware of any problems or potential problems which may arise and affect the renal system. Renal failure is commonly seen in the critical care environment. Acute renal failure or acute tubular necrosis can be described as a sudden decrease in renal function manifested by rapid accumulation of waste metabolites in the patients body. (Colchesy et al, 1994)

**Causes of Renal Failure**

Pre-renal: due to reduced blood flow into the kidneys, e.g. hypotension, haemorrhage, hypovolaemia.

Renal: due to the actual kidney tissue being damaged, e.g. ischaemia due to profound hypotension, drugs or chemicals, massive blood transfusion.

Post-renal: due to urine flow being obstructed, e.g. blood clots, tumour.

The daily monitoring and management of electrolytes and fluid management is vital when nursing the critically ill patient. Observing and taking action on the results may enable the medical staff the opportunity to prevent the patient from going into some form of renal failure.

Please see section on electrolyte imbalances and fluid management within this pack for more information.

**Electrolyte Imbalance and Blood Results**

The acutely ill patient's potential for developing electrolyte imbalances is ever present. The wide variety of presenting clinical features associated with electrolyte imbalance can further complicate the complex clinical scenarios of highly dependent patients. Electrolyte imbalances can occur without obvious
presenting problems. Two of the most commonly encountered electrolyte disorders in acutely patients are those of potassium and sodium balance.

**Potassium**

The normal range is 3.5-5.0 mmol/l. Abnormal ranges of potassium can affect nerve and muscle function, particularly cardiac muscle. Potassium is required for carbohydrate metabolism and is essential for conversion of glucose to glycogen, and its storage. Serum potassium levels are maintained through the kidneys’ reabsorption and secretion of potassium ions. This is closely related to reabsorption of sodium and H+ ions. The kidneys adjust the urinary concentration in relation to potassium intake.

**Hypokalaemia** (serum potassium <3.5 mmol/l) is a common electrolyte disturbance. It requires prompt treatment because of its potential effect on cardiac muscle. Possible causes of reduced potassium include:

- Reduced potassium intake associated with anorexia, malabsorption and alcoholism
- Excessive loss due to excessive diarrhoea and vomiting,
  - Urinary loss in diuretic therapy, diabetic ketoacidosis
  - Increased levels of aldosterone
  - Associated with chrohn's disease
- Found in cardiac and liver failure, and as part of stress response

Assessment for hypokalaemia includes identification of patients at risk—specifically those receiving digitalis. Hypokalaemia greatly increases its toxicity, and both reduce the excitability of the myocardial membrane. Slightly reduced levels can precipitate toxicity resulting in slow irregular pulse, anorexia, diarrhoea and vomiting. Assessment of sources of potassium intake e.g. replacement fluids/feeding and sources of loss, e.g. urinary or from the gastrointestinal tract. Identification of signs and symptoms of hypokalaemia. These will relate to the level potassium deficit, and rarely occur until levels are below 3.0 mmol/l.
Nursing Intervention.

This will depend on prescribed treatment, which will relate to severity of the potassium deficit. Replacement may be given orally or intravenously. If it is feasible to increase intake orally, a potassium enriched diet with supplements will suffice. Intravenous replacement needs to be administered cautiously if renal function is compromised as hyperkalaemia can result if there is inadequate excretion. Specific interventions include administering prescribed potassium intravenously, in a dilute volume e.g. 1 litre normal saline. In urgent situations a more concentrated solution will need to be given via a central line (concentrated solutions can be irritant). Ensure correct rate is calculated and infused via infusion pump. Observe cardiac rate and rhythm, frequently assess serum potassium levels and monitor urine output.

Hyperkalaemia (serum potassium level >5.0 mmol.

Possible causes of hyperkalaemia include:

- Increased potassium intake
- Increased supply-hypercatabolic states
  e.g. MI, cardiac arrest,
  massive injury/infection, resulting release of potassium from the cells
- Reduced urinary loss in chronic renal disease,
  inadequate excretion of potassium into urine

As with hypokalaemia this affects cardiac muscle and necessitates prompt treatment. Signs of hyperkalaemia include ECG changes as potassium levels rise peaked T-waves, widening of QRS complex, cardiac arrhythmias and bradycardia, risk of cardiac arrest when levels rise above 7.0 mmol/l. Neuromuscular weakness, GI symptoms.

Assessment for hyperkalaemia includes identifying patients at risk e.g. those with compromised renal function. Identification of signs and symptoms of raised potassium, will relate to the level of excess.
Nursing Intervention

This will depend on the level of serum potassium and resulting cardiac effects. Options include calcium gluconate, sodium bicarbonate, glucose and insulin, calcium resonium, potassium losing diuretics. Emergency management involves the options mentioned, choice will depend on the individual's underlying condition level/cause of raised potassium. If potassium levels persist and remain dangerously high e.g. in renal failure, haemodialysis or haemofiltration would need to be considered.

Sodium

The normal range is 135-145 mmol/l. Serum sodium levels do not necessarily reflect total body sodium, but the relative content of sodium and water in the extracellular fluid.

Hyponauraemia (<135 mmol/l)
This is common in acutely ill patients. It may result from a loss of sodium or a gain of water, is due to a relatively greater concentration of water than sodium. Causes of reduced sodium levels may be dietary due to restricted sodium intake, GI losses due to diarrhoea and vomiting, GI suction, surgery. Perspiration in fever or in high environmental temperatures, also from the skin surface in burns.

Signs and symptoms include:

  headaches, confusion, muscle cramps,
  nausea and vomiting, coma, convulsions.

Nursing Intervention

If associated with fluid volume deficit, 0.9% sodium chloride will replace sodium and water deficit. In fluid volume excess, fluid restriction and occasionally hypertonic 3% or 5% sodium chloride is prescribed.
**Hypernatraemia** (>145 mmol/l)
This is less common, caused by excessive water loss or sodium retention. Also due to over infusion of sodium containing fluids. Severe diarrhoea and vomiting (water loss greater than sodium). Renal insufficiency retention of sodium ions. Response to increased sodium level can increase thirst. Treatment may include replacement of water e.g. 5% dextrose, restricted intake of sodium and use of diuretics.

**Urea and Creatinine**
Measured in blood, urine and occasionally in other fluids such as abdominal drain fluid (e.g. ureteric disruption, fistulae)

**Urea** (2.5-6.5 mmol/l)
A product of the urea cycle resulting from ammonia breakdown, it depends upon adequate liver function for its synthesis and adequate renal function for its excretion. Low levels are seen in cirrhosis and high levels in renal failure. Uraemia is a clinical syndrome including lethargy, drowsiness, confusion, pruritis and pericarditis resulting from high plasma levels of urea.

**Creatinine** (70-120 mmol/l)
A product of creatnine breakdown, it is predominantly derived from skeletal muscle and is also renally excreted. Low levels are found with malnutrition and high levels with muscle breakdown (rhabdomylosis) and impaired excretion (renal failure).

**Serum Albumin**
Albumin helps to maintain intravascular volume by maintaining colloid osmotic pressure. If serum albumin is reduced, fluid moves from the vascular compartment to the interstitial space, creating peripheral oedema and reducing effective blood volume.
Fluid Management

There are certain things which should be borne in mind when looking after the post-surgical patient. It is important to establish the amount and type of fluid that has been given and lost in theatre as this can have a bearing on the patients overall condition. Colloid will only normally be given if there has been significant blood loss in theatre. Generally crystalloid such as Hartmann’s solution is given as necessary to maintain the patient’s blood pressure, replace insensible losses and to rehydrate them following a period of fasting.

Post-operative fluid regimens are dependent on factors such as weight, age, measured blood loss and the anticipated time before oral fluids will be taken. It is now fairly standard practice following major surgery to give fluid based on measurement of central venous pressure and urine output, where appropriate rather than simply giving a certain volume over a period of time. This approach is often safer, more effective and better geared to the individual.

Following major surgery it is common for the patients to have an indwelling urinary catheter. This allows better assessment of fluid requirements and cardiovascular status. The urine output may be low following surgery. This is often due to the fact that no fluids have been taken for up to 16 hours as it is still common practice, although unnecessary, to allow nothing by mouth from midnight on the day before the operation. If the urine is very concentrated or volume is small, it is usually no real cause for concern as long as the patient is not cardiovascularely compromised. It is likely that it will improve as the patient starts to take oral fluids or is rehydrated intravenously. It may be necessary to increase the rate of intravenous fluids or give a fluid challenge if the urine output is very low. As a rule, a urine output of 0.5-1.0 ml/kg/hr is aimed for.
When there is no urine output at all it is best to check for mechanical problems before pouring fluid into the patient. Position of the catheter should be checked to make sure it is correctly sited. A bladder washout with saline can be performed in case a blood clot or debris is blocking the catheter lumen. If fluid can be injected but not aspirated it indicates there is some form of obstruction. This may be caused by the retaining balloon and removing a few mls of water from it may improve the situation. If the problem persists then the catheter may need changing.

If the urine output remains poor despite the patient being adequately filled, with a reasonable blood pressure and a patent catheter, a dopamine infusion at a rate which will improve renal perfusion should be commenced. Diuretics such as frusemide should only be used if there is evidence of fluid overload or retention or signs of heart failure. Using diuretics simply to improve the figures on the chart without resolving the cause results in a dehydrated patient who will stop passing urine later on.
“The student nurse will be able to assess the patient’s renal status and participate in treatments to optimise renal function”

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<thead>
<tr>
<th>Action</th>
<th>Student</th>
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<tbody>
<tr>
<td>Describe the causes of renal failure</td>
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<td>Renal</td>
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<td>Pre-renal</td>
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<td>Post-renal</td>
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<td>Discuss the reasons why the critically ill patient is susceptible to acute renal failure</td>
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<td>Discuss why it is important to monitor</td>
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<td>Urine output</td>
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<td>CVP</td>
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<td>Blood Pressure</td>
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<td>Fluid Balance</td>
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<tr>
<td>Describe the differences between colloid and crystalloid</td>
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<td>Give examples of each</td>
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<tr>
<td>Discuss the use of diuretics</td>
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<tr>
<td>Accurately records and calculates hourly and cumulative fluid balance</td>
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<td>Discuss the relevance of monitoring electrolytes</td>
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<td>Participates in caring for the patient with an indwelling catheter insitu</td>
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Central Nervous System

Brain dysfunction or damage can occur due to traumatic head injury, ischemic injury, metabolic disorders and or seizures. The underlying principle of the nursing care of a patient with a neurological problem is to prevent secondary brain injury.

Neurological Assessment

Neurological assessment is carried out using the Glasgow Coma Scale (G.C.S.). The GCS is expressed as a score out of 15, the maximum score is 15 and the lowest is 3.

The scale focuses on three important components:
- Eye response
- Motor response
- Verbal response

Eye Response

Spontaneous eye opening: 4
If the patients eyes are open when you approach them. Some unconscious patients can have their eyes open to some of the time, therefore only chart further eye openings in this instance.

Eyes open to speech: 3
Initially use a low and familiar voice. Call the patients name, if no response, then a louder voice may be required.

Eyes open to pain: 2
If approach and voice are unsuccessful, then painful stimulation is required. This is where standardisation is important. Central pain is caused by using the trapezius pinch to gain response. This is done by pinching the trapezius muscle on the shoulder using the forefinger and thumb for less than 20-30 seconds.

No eye opening: 1
No response in eye movement to pain.
Motor Response
Assessing limbs can also reflect the function of each hemisphere of the brain.

Obey commends: 6
The patient can follow simple verbal commands e.g. stick out their tongue, wiggle their fingers/toes. Avoid the hand squeeze as it may be grasp reflex.

Localising to pain: 5
Arms purposefully move towards source/site of pain, wound etc.

Flexion: 4
Movement of the arms, usually brisk, bending of arm at elbow bringing hand/wrist to chest/nipple. This indicates that part of the brain is functioning. This is known as Decortical response.

Abnormal flexion: 3
Spastic like movements not quite reaching the chest level but reaching the lower abdomen, known as the sub-cortical response.

Extension: 2
The arms become straight and rigid sometimes with adduction/rotation of the limb. This indicates that only the brain stem is functioning, known as Decerebrate response.

No response: 1
No movement displayed. This indicates that brain stem function is depressed.

Verbal Response
Assessing comprehension/transmission of sensory input.

Orientated: 5
The patient gives correct answers to questions relating to time, place and person.

Confused: 4
Answers one or more questions wrongly or disjointed. Always consider any barriers to communication e.g. deafness.
**Inappropriate words:** 3
The patient can only offer one or two word answers to questions.

**Incomprehensible sounds:** 2
The patient grunts or groans only.

**No verbal response:** 1
This is only noted as deterioration in the neurological state if the patient is not intubated.

**Pupillary Response**

Pupil size may change if there is a compression on the parasympathetic nerve that is responsible for pupil constriction. A sluggish or non-reactive pupil response can be indicative of raised intracranial pressure as the third cranial nerve (occulomotor) is compressed. If the patient has an artificial eye the pupil will be a fixed size and may lead to inaccurate records.

**Intercranial Pressure (I.C.P.)**

Intracranial pressure can be described as the pressure exerted within the skull and meninges by brain tissue, cerebrospinal fluid and blood.

When nursing a patient with a head injury the care should be focused on preventing rises in intracranial pressure that could cause brain damage or death. The following measures can be taken to minimise this occurring:

- Patient position, slight head elevation.
- Head and body alignment
- Minimising suctioning
- Temperature control
- Avoiding distress to the patient

Nursing management also focuses upon preventing the onset of seizures and the complications that may occur during a seizure.
A procedure that is commonly used to diagnose such conditions as a cerebral bleed or meningitis is a Lumbar Puncture. This is when a cannula or catheter is placed into the lumbar spine to measure the pressure of cerebrospinal fluid surrounding the brain to indicate if the intracranial pressure is raised.

**Brain Stem Death**

Brain stem death occurs when structural brain damage is so extensive that there is no potential for recovery and it can no longer maintain its own homeostasis (Manfield, H. 1993).

Diagnosis of the cause of coma is essential before brain stem death tests can be carried out. Any contributory cause must be ruled out and all levels such as temperature, urea and electrolyte levels must be within therapeutic range. All drugs that may impair conscious level should also be withdrawn.
“The student nurse will be able to assess and participate in the care of a patient with impaired neurological status”

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<tr>
<th>Action</th>
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<tr>
<td>Assess the neurological state of the patient using the Glasgow Coma Scale</td>
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<td>Discuss the physiological effects of raised intracranial pressure</td>
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<td>Participates in measures to optimise intracranial pressure</td>
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<td>Discuss the principles of brain stem testing</td>
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<td>Aware of the local organ donation policy</td>
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<td>Understands the role of the transplant co-ordinators</td>
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Whilst working within the C.C.D. you will come across patients undergoing major abdominal surgery.

The following operations are among the most common seen within the unit.

**Hemicolecotony;** removal of either the right or left side of the large colon.

**Sigmoidcolectomy;** removal of the sigmoid colon.

**Anterior Resection;** removal of the descending colon and sigmoid colon either with or without an ileostomy.

**Total/ Sub-Total colectomy;** removal of all or part of the large colon.

**Abdoperineal Resection;** excision of the rectum with formation of a colostomy.

**Panproctocolectomy;** excision of the anus, rectum and large colon with the formation of an ileostomy.

**Small Bowel Resection;** removal of part of the small intestine.

**Carotid Endarterectomy;** removal of atheroma or plaque from the carotid artery.

**Abdominal Aortic Aneurism Repair;** repair of a weakness in the wall of the aortic artery.

**Aortofemoral Bypass;** to bypass an occluded artery and repair with the use of a graft, either synthetic or the patient's own vein.

**Femoral Poiteal Bypass;** to bypass an occluded femoral artery with the use of either synthetic graft or the patient's own saphenous vein.

Another common condition dealt with is Pancreatitis. This is an inflammation of the pancreas caused by either increased alcohol consumption or obstruction of the bilary tract e.g. gallstones.
Any form of surgery can present with post-operative complications. The most common are:

- Increased pain.
- Haemorrhage
- Chest infection.
- Wound infection.
- Deep vein thrombosis.
- Paralytic ileus.
- Graft Occlusion following vascular surgery.
- C.V.A. following carotid endartectomy.

You must be aware of the position of any wound drains and the importance of recording the amount and the type of output on the fluid balance chart.

When nursing patients that have undergone formation of a stoma as part of their surgery you must also be aware of the importance of observing the stoma for colour, oedema and activity. A healthy stoma should be red in appearance with a good blood supply. Regular inspection for signs of ischaemia or necrosis is necessary. The stoma will be oedematous initially but this will settle. The quantity, type, consistency and appearance of any stool passed should be recorded on the fluid balance chart. An ileostomy will put out 2-3 litres of fluid per day. This output will lessen as the patients condition improves.
Essence of Care of care is currently being replaced by work stream initiatives

Essence of Care came about from a commitment in “Making a Difference” (1999), to explore the benefits of benchmarking in order to help improve the quality of what can be considered as the fundamental and essential aspects of care.

Essence of care contains benchmarking tools related to aspects of care, representing areas identified by patients, their relatives and clinical professionals. These are:

- Principals of self care
- Food and nutrition
- Privacy and dignity
- Personal and oral hygiene
- Continence and bladder and bowel care
- Pressure ulcers
- Record keeping
- Safety of clients/patients with mental health needs

Benchmarking is a tool to support nurses in improving quality of care. It is a process by which best practice is identified and continuous improvement sought, through comparing and sharing with those from other areas. There is staff on the ward continuously involved in Essence of Care and Benchmarking. Files are also kept in the office with more information and work that has been done.

**Self Care**

The choices people make and the actions they take, in the interest of maintaining their health and well-being. Care can be delivered by the person themselves, family, friends, carers, other professional bodies and the wider community.

What can affect how people care for themselves?

- Environment and lifestyle
- Age and capabilities
- Awareness of health related issues
Being able to make your own decisions
Knowledge of treatment, care or rehabilitation.

How can we promote self-care on the unit?

Have an awareness of individual religious, cultural or special needs, keeping patients /family informed. Ensure patients are included in decisions regarding their care, (where possible). Explanation of procedures prior to carrying them out. Allow patients to carry out their own care (where able), continuously assessing capabilities. Identify possible risks and be aware of manual handling techniques and equipment used. Involve other members of the multidisciplinary team.

When a patient is admitted into hospital an assessment is carried out with the patient (where possible) By doing this we are able to establish what a patients normal routine, lifestyle, and capabilities are, and how their illness/problems have possibly affected this. It can also help identify any fears and anxieties the patient may have.

When a patient is admitted to the unit a further assessment is carried out. This is so care can be planned according to individual needs, to enable self-care as much as possible. On admission there are various tools, where scores are carried out to help identify any possible risks for the patient. One of these tools is a falls risk assessment. This is carried out on admission and recorded in the nursing care plan. Whilst a patient is on the unit it is carried out daily, (usually in the morning). Assessment is a continuous process that is evaluated, and care planned appropriately as required.

**Personal Hygiene.**

A physical act of cleansing the body to ensure that the skin, hair and nails are maintained in an optimum condition. (Essence of care).

How can we enable patients to maintain their personal hygiene?

Give assistance as required, but be able to assess continuously, individual needs and encourage independence where possible. Keep the patient informed of what
you are doing if you are carrying out any hygiene needs on their behalf. Ensure our own hygiene is consistent with good recognized hygiene practice. Give appropriate education if required. Allow patients to choose the washing facilities, materials and toiletries where able or available, according to their own personal beliefs and preferences. Make sure the temperature of the water is safe for the patient. Ensure that toiletries, materials and equipment are accessible and safe for use. Ensure privacy and dignity of the patient is maintained. Leave the buzzer within easy reach in case assistance is required. After use, ensure the washing facilities are clean and ready for further use. Ensure all waste products are disposed of according to hospital policy.

**Oral Structures**

The mouth is the first part of the gastro-intestinal tract and is an essential structure to maintain adequate food and drink intake.

The mouth contains the following structures:

- **The tongue** muscle covered by mucous membrane and taste buds.
- **Hard and soft palate** found in the roof of the mouth.
- **Uvula** a hanging finger-like projection at the back of the mouth.
- **Periodontium** the connective tissue between the teeth and the sockets.
- **Tonsils** lymphatic tissue found either side at the back of the mouth.
- **Mucous membrane** lining of lips, cheeks and other oral surfaces.
- **Gingiva** the gum.
- **Teeth** 32 adult permanent teeth.
- **Salivary glands** produces saliva to assist in breaking down food.
- **Nerve endings**
- **Blood vessels.**
- **Lymphatic drainage**
There are 500 different types of bacteria which colonise the oral cavity. If the immune system is compromised by illness, or poor oral hygiene is maintained, problems occur.

Gingivitis inflammation of the gums and possibly mild bleeding.
Mucositis inflammation of the mucosa.
Periodontitis can cause dislodgement of teeth if left untreated.
Ulcers small lesions that are viral in nature and can be very painful.
Thrush common following antibiotic therapy, radiotherapy and also in diabetes.
Xerostomia dryness of the mouth due to a failure of the salivary glands.

Oral Hygiene

Effective removal of plaque and debris to ensure the structures and tissues of the mouth are kept in a healthy condition. (Essence of Care). When a patient is admitted to the unit (as well as hospital admission), an assessment is carried out using observation and a tool to help determine the frequency at which oral hygiene/mouth care is required. This enables us to plan appropriate care depending on individual needs, and is reassessed daily.

Mouth Care.

A toothbrush, toothpaste and water are used to help the patient maintain the cleanliness of their teeth or dentures and encourage the flow of saliva to maintain a healthy mouth. Using a toothbrush loosens and removes debris trapped in the spaces, and prevents the build up of bacteria. It stimulates the blood circulation in the gums and helps to keep the soft tissue healthy. The teeth should be brushed firmly with strokes away from the gums, including the inner aspects of the teeth. The mouth should be well rinsed during and after cleaning teeth. The majority of patients will be able to maintain their own oral hygiene however, there may be times when people require mouth care to be performed more frequently either themselves or for them.
These are:

A patient who is nil by mouth.
A patient with poor oral intake.
A patient who has nausea or vomiting.
A patient receiving oxygen or nebulisers.
A patient undergoing radiotherapy, chemotherapy.
An unconscious patient.
Someone has lost the use of the arm they would use to carry out mouth care.

**Equipment used to maintain oral hygiene.**

- Toothbrush.
- Toothpaste
- Gloves
- Tissues
- Fresh water
- Denture pot and appropriate cleaning agent
- Mouth wash (occasionally)

**Performing mouth care.**

Where possible allow the patient to maintain their own oral hygiene using their own toiletries. Discuss with the patient the most suitable and acceptable mouth care equipment they would like to use. If performing mouth care explains to the patient what you are doing (if able) and to gain consent.

Examine the patient's mouth using a torch to observe for ulcers, sores or change in mouth condition.

If the patient has dentures, allow them to remove them if they wish and steep them in an appropriate solution ensuring they are rinsed thoroughly before placing back in the patient's mouth.

If carrying out mouth care for a patient a small, soft toothbrush should be used. (i.e. a child's.)
If unconscious, position is very important. They should be positioned on their side with no pillow, but their head supported to prevent secretions being inhaled. Suction equipment should be at hand. Suction may also be required to clear any debris, after mouth care has been carried out.

If a patient has problems with their teeth they can be referred to a dentist. A patient may also require moisture for their lips and can be provided by the use of products such as lip balm or soft paraffin.

Ensure all waste is disposed of appropriately.
Pressure Damage

Assessment and Prevention

Pressure sores result from areas of previously healthy tissue becoming devitalised, resulting in localised tissue death. Pressure sores develop in a number of ways.

As a result of direct, unrelieved pressure of soft tissue against bone. Where friction occurs between the patient and the surface of a bed or chair. This can happen if the patient is moved and the skin is dragged over a sheet. As a result of shear force which frequently accompanies both direct pressure and friction. Shear forces develop in tissues that are distorted and pulled, so that the blood supply is disrupted.

As even the most unlikely individual may become at risk of developing a pressure sore, all patients should be assessed on admission.

The following types of patient's are at risk of developing pressure sores:

- Elderly
- Post surgical patients
- Patients with sensory changes ie comatose, paraplegia
- Patients with systemic diseases
- Those having a range of drug therapy e.g. steroids, cytotoxics, anti-inflammatory's
- Individuals with continence issues
- Malnourished individuals
- Individuals with high or low Body Mass Index

Several scales and scoring systems have been devised to assess risk. Gateshead Health Foundation NHS Trust uses an adapted version of the Waterlow Pressure Ulcer Risk assessment, this is standardised across all departments. The adapted Waterlow score takes many of the above factors into consideration. The scoring system can be completed by student nurses under their mentor’s supervision, it is easy to use and only takes a few minutes.
A risk assessment tool is only useful, however if it is used regularly, on admission and again each time the patient’s condition changes. The scores need to be accurately documented and then used to determine the most appropriate pressure relieving devices on which to nurse the patient.

**Discuss with your mentor the Waterlow scoring tool.**

Once patients have been identified as at risk they should be nursed on the most appropriate surface. This includes not only the bed mattress but any chairs in which they may use. ON Critical Care pressure relieving mattress may be ordered from Hill-Rom, advisers are available for which mattress is appropriate for the identified patient. Seat cushions are also available and training should be given prior to using the mattress or the seat cushion.

In prevention and management of pressure sores, patient’s have an important role to play. The young, chronically disabled patient can be taught various methods of regularly relieving pressure by change in position. Patient’s who are not able to take such an active part in their own management can be taught the value of and the need for the changes of position that nurses carry out for them. Compliance increases when the patient’s understand why intervention is necessary.

Nutrition and fluid balance also need attention. It has been estimated that dehydrated patients and patients in a negative balance are more likely to experience tissue breakdown.

**Discuss with mentor the devices and techniques available to relieve pressure.**
Pain and Analgesia

Pain
Pain is an unpleasant sensory and emotional experience with actual and potential tissue damage.

Why assess pain?
To minimise physiological problems
To ensure psychological well-being

Severe pain can cause disruptions to an individuals’ activity of daily living. It is morally and ethically unacceptable to leave a patient in pain. Severe pain can lead to several problems;

- Reduced mobility
- Sleeplessness
- Loss of appetite
- Depression
- Anxiety

Pain can originate from many different sources and each will present in a different manner. Some of the most sources seen in Critical Care are as follows;

- Inflammation
- Muscular
- Neuropathic
- Bone/ stump pain
- Ischaemia-tissue damage
- Infection

Harmful effects of pain

Respiratory System:
- Reduced lung volumes, sputum retention, hypoxia, chest infection,.respiratory failure.

Cardiovascular System:
- Increased sympathetic nervous system activity
Gastrointestinal System:
Reduced gastric emptying/nausea and vomiting, Paralytic ileus.

Neuroendocrine System:
Activation of ‘stress response’- release of a number of hormones.
Hyperglycaemia, Increased coagulability, Increased protein breakdown,
Impaired wound healing and immune function, Decreased resistance to infection.

Musculoskeletal System:
Muscle spasm- wound, immobility-increased risk of DVT/pressure sores.

There are many factors which influence each individual’s experience of pain.
Theses include but are not limited to;

   Individuality
   Expectations/ pre-operative information
   Anxiety/ Stress
   Cultural Aspects

**Accurate pain assessment is vital**

Identify the site
Identify the intensity and extent of pain
Identify factors which will exacerbate or relieve pain
Psychosocial problems.

**Key questions when assessing pain**

   Where is the pain?
   What does the pain feel like?
   Can you describe your pain?
   How severe is your pain?
   How long does it last?
   What makes your pain better?
   What makes your pain worse?
Observe the patient
Assess functional ability e.g. deep breathe, cough etc.
Check for non-verbal signs of pain.
    Posture
    Position
    Facial expressions.

Key factors in pain assessment
Believe the patient
Obtain all information from the patient
The use of assessment tools
On-going assessment is vital and should be re-evaluated.

Discuss with mentor the use of assessment tools on HDU/ITU.

Types of Analgesia

The most common pain relieving measure is drug administration to achieve analgesia. Analgesics such as morphine are commonly used and act centrally.

It is the responsibility of qualified nursing staff to administer analgesics and these must be prescribed by medical staff. Non-narcotic analgesics such as paracetamol and aspirin act peripherally, their effectiveness is often underrated. A combination of narcotic and non-narcotic analgesics is often helpful as they relieve pain in different ways.

Analgesics are administered via a number of routes. The choice of route should be made after a careful consideration of the comparative risks and benefits of the various routes possible.

Patient Controlled Analgesia (PCA)
PCA refers to the administration of analgesia by an appropriate and safe route over which the patient has control. It usually refers to the self-administration of intravenous boluses of a narcotic analgesic via a specifically designed pump. There are pre-set lockout intervals on these machines, so that the patient cannot
administer more than a certain dose in a given time. The patient has to be able and willing to use this method. Its advantages lie in the fact that the patient can have an analgesic dose whenever they need it, which gives them more control over their pain and greater confidence that they will obtain relief.

**Epidural Analgesia**

For the purpose of epidural analgesia/anaesthesia, epidural catheters are placed in the epidural space. This lies between the inner wall of the vertebral canal and the dura mater (the outermost of the three membranes that surround the brain and spinal cord). No cerebrospinal fluid circulates in this space and it is filled with blood vessels, fat and connective tissues which serve as a cushion around the spinal cord.

An epidural catheter is placed into the epidural space by a trained anaesthetist in order to provide patient analgesia by either a continuous infusion or analgesia boluses. Catheters should ideally be placed when patients are awake so they can inform the anaesthetist of any sensations experienced during the procedure. The technique must always be undertaken using a sterile procedure.

Drugs frequently administered via this route are Diamorphine and Fentalyn. Patients receiving epidural infusions must be closely monitored by qualified nursing staff. Parameters should be measured on a regular basis, (as per Trust protocol), these include:

- Patients sedation score
- Pain score
- Respiratory rate
- Pulse, blood pressure
- Fluid management
- Temperature
- Level of block.

Due to the positioning of the epidural catheter some patients may experience numbness in their legs known as motor block. It is therefore important to assess patients prior to mobilising. Always make the patients named nurse aware prior to any mobilisation.

**Student Nurses Role**
Student nurses on Critical Care are not responsible or expected to administer, intravenous analgesia including both PCA and epidural administration. Epidural pumps and PCA’s must only be set and monitored by qualified nursing staff. Oral, intramuscular and subcutaneous medications may be given by student nurses, however, only under the supervision of qualified nursing staff. Some non-pharmacological interventions may also be administered, however, always notify the patients named nurse or your mentor prior to administering. These interventions include:

- Information / talking and discussing feelings
- Relaxation
- Breathing exercises
- Distraction e.g. TV, music, reading, talking
- Complimentary therapies
- Cold packs.

**Care of a patient following death**

**Last Offices**

This is covered by the Trusts Standard of Practice No 47, this is currently awaiting review (August, 2010). Due to the close of the nurse/patient/family contact within Critical Care environments the faith group of the dying patient is usually well known. Some groups/faiths have certain procedures to follow, and these are not to be carried by non members of the faith group. When the staff are unable to ascertain these requirements the chaplaincy department may be able to help along with leaders from the faith group.

1. As soon as possible after the death, lay the patient flat with their arms by their side and close their eyes.

2. Collect equipment:
   - Bowl
   - Toiletries
   - Night-dress, pyjamas
2 Sheets
Counterpane
Pillowcase
Linen Skip
Rubbish bag
Trolley
Bandage
Tape
Bereavement pack
Body Bag

3. If the patient wears dentures clean the dentures and replace.

4. Discuss with the patients named nurse prior to removing any drips, catheters, NG’s etc. These should be left in place if the cause of death is unknown and a post-mortem may take place.

5. Wash the patient and dress in night-dress, pyjamas.

6. Shave the patient if male.

7. Re-dress leaking wounds with absorbent pads.

8. Remove any jewellery unless requested not to by relatives, and document all property including those left on the patient (as per Trust policy).

9. Flowers may be placed in the room and enough chairs for the relatives to sit and have time with the patient.

10. Once the relatives have left the department write out identification cards and place on the wrist and one on the ankle stating the patients:

    Name
    Age
    Date of birth
    Religion
11. Wrap the patient in a sheet ensuring everything is covered.

12. Tape any loose ends of the sheet and place the dead patient into a body bag. Place final identification card on the outside of the body bag.

13. Tidy up and dispose of equipment into correct areas (as per Trust policy).

14. Contact porters to come and take the deceased patient to the mortuary.

15. Ensure the privacy and dignity of the patients on the unit when the porters arrive to take the deceased, as they may find this distressing.

If the patient has an infectious disease, follow the relevant Trust policy for this.

“The student nurse participates in the general nursing care of a critically ill patient, ensuring individualised, holistic care in conjunction with the multidisciplinary team”

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<th>Action</th>
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<tbody>
<tr>
<td>Participate in maintaining the patients personal hygiene</td>
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<td>Discuss methods to maintain skin integrity</td>
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<td>Discuss and demonstrate the importance of Mouth care Eye care</td>
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<td>Work alongside the physiotherapist and participate</td>
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<td>Discuss the importance of nutrition for the critically ill patient</td>
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<td>Baseline assessment</td>
<td>Full holistic assessment recorded and what is normal for the patient is identified and evidence of ongoing assessment.</td>
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<td>4. Significant others involved</td>
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<td>5. Unambiguous and explicit.</td>
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<tr>
<td>Evaluation</td>
<td>Has all the following:</td>
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<td></td>
<td>1. Reflects planned objectives.</td>
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<td>2. Dates set for evaluation.</td>
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<td>3. Evaluation performed on dates.</td>
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<td>4. Action after evaluation stated.</td>
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<tr>
<td>Sharing of information</td>
<td>Information shared with patient/ carers and all professional bodies.</td>
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</table>
**Risk Management**

You may associate risk management with risk assessment and health and safety issues, thinking that it has no major impact on your daily work. Under the Health and Safety Act 1974 it is both your and your employer’s responsibility to maintain a safe environment. Vincent (1975) identifies risk management as a particular approach to improving equality of care, which places special emphasis on occasions in which patients are harmed or disturbed by their treatment.

It is now commonplace to review the structure process and outcome or treatment and an incident updating system (DATIX) is simply a hospital wide audit to review adverse outcomes in-detail. Risk management is also about ensuring patients receive a safe level of service, with policies and procedures on place to prevent mistakes and accidents.

The main message for you to take away from this is if in doubt report anything you consider a risk and don't allow yourself to get into any situations you are uncomfortable with.

**References:**

**Communication**

Record observations clearly and promptly.
Report any changes in patient’s condition to relevant staff.
Regularly update nurse in charge.
Keep an accurate fluid balance chart, understanding the importance of the fluid balance in terms of the patient’s condition and treatment.
“The student nurse will demonstrate effective communication skills with the critically ill patient and identify barriers to effective communication. The student nurse will also demonstrate effective communication skills with relatives and within the multidisciplinary team”.

<table>
<thead>
<tr>
<th>Action</th>
<th>Student</th>
<th>Mentor</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>Able to identify barriers to communication.</td>
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<tr>
<td>Describes the effects of sensory imbalance in the critically ill patient.</td>
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<tr>
<td>Employs methods to minimise: sensory overload Sensory deprivation</td>
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<tr>
<td>Demonstrates effective listening skills with relatives</td>
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<tr>
<td>Show an empathetic and caring nature when communication with relatives.</td>
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<tr>
<td>Ensure all written communication is accurate and countersigned by a trained nurse.</td>
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<tr>
<td>Informs trained nurse of any details regarding patient care promptly.</td>
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<tr>
<td>Communicates effectively with all the members of the multidisciplinary team utilising interpersonal skills.</td>
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</table>
Drug Therapy

Inotropic drugs commonly used in Critical Care-their uses and possible side effects

Inotropes (inotropic sympathemimetics) mimic the characteristics of chemicals which occur naturally in the body. They are pharmacological agents which act upon cardiac and vascular smooth muscle and thereby the myocardium.

Inotropic agents should ideally improve cardiac function to obtain clinical improvement, without altering heart rate or diastolic blood pressure. Inotropes are generally used in cardiac failure and shock to maintain an adequate cardiac output and blood pressure. In low doses, some specific inotropes can be used as vasodilators to improve renal perfusion and therefore influence urine output e.g. dopamine and dopexamine. In critically ill patients, response to various doses are individual and variable.

Commonly used inotropes include:

PHENYLEPHRINE

Used to treat severe hypotensive states, for example circulatory failure during spinal anaesthesia, or drug induced hypotension. Acts on alpha-adrenergic receptors to constrict peripheral vessels, but at the expense of perfusion of vital organs such as the kidney.

Side effects hypertension may be associated with bradycardia, arrhythmias, urinary retention, dyspnoea and disturbances in glucose metabolism.

NORADRENALINE (Norepinephrine)

Used in acute hypotension to raise blood pressure by acting upon alpha receptors to constrict peripheral vessels. The danger of this vasoconstriction is that blood pressure is raised at the expense of perfusion of other organs such as the kidneys.

Side effects hypertension may be associated with bradycardia, arrhythmias.

ADRENALINE

Mainly used in cardiac arrests or to treat anaphylactic shock. Can also be used to treat septic shock. Adrenaline affects beta receptors at low doses, increasing heart
rate and decreasing peripheral vascular resistance. At higher doses alpha receptors are stimulated which results in vasoconstriction.

Side effects Arrhythmias, hypokalaemia, hyperglycaemia and decreased renal perfusion.

**DOBUTAMINE**

Used for inotropic support in infarction, cardiac surgery, cardiomyopathies, septic and cardiogenic shock. Cardiac stimulants which act on beta 1 receptors in cardiac muscle, increases contractility with little effect on heart rate.

Side effects Tachycardias, tachyarrhythmia, nausea and vomiting, hypertension.

**DOPEXAMINE**

used in chronic heart failure and heart failure associated with cardiac surgery, by increasing fluid output. It acts on beta 2 receptors in cardiac muscle to produce its positive inotropic effect and increase renal perfusion. It is reported not to increase vasoconstriction.

Side effects Tachycardia, arrhythmias, nausea and vomiting, angina pain, headaches and tremor.

**GTN**(glyceril trinitrate)

a potent coronary vasodilator. Principal benefit follows from a reduction in venous return which reduces left ventricular work. Indicated for prophylaxis and treatment of angina.

Side effects Throbbing headache, flushing, dizziness, postural hypotension, tachycardia.
Contra-indications for use of inotropes

Inotrope infusions should only be prescribed by anaesthetic staff. Following conditions need consideration when commencing Inotrope infusions:

- previous drug hypersensitivity
- care with patients following acute MI
- hyperthyroidism
- uncorrected tachyarrhythmias
- patients receiving IV Phenytoin
- pregnancy and breast feeding

All patients receiving inotrope infusions should have continuous monitoring of their haemodynamic and cardiovascular systems. Consideration of the side effects of inotropic drugs should be given whilst carrying out nursing observations.

Infusions giving support to blood pressure need to be weaned off gradually, never just stopped and the patient should be closely observed following the withdrawal of the infusion.

Other drugs are used within the Critical Care Department; discuss these with your mentor.
“The student nurse will have an understanding of the range of drugs used within the Critical Care Department, and the role of the nurse in ensuring patient safety”

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<tr>
<th>Action</th>
<th>Student</th>
<th>Mentor</th>
<th>Date</th>
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<tbody>
<tr>
<td>List and discuss the use of common sedative drugs used.</td>
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<tr>
<td>List and discuss the use of the common analgesics used and methods of administration.</td>
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<tr>
<td>List and discuss the use of: inotropic vasoactive drugs</td>
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<td>Observes the trained nurse in the administration: IV drugs IV infusions</td>
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<tr>
<td>Is aware of the side effects of drugs Measures to minimise risk to the patient.</td>
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</table>
**Student Evaluation**

The aim of this questionnaire is to evaluate your placement, and to assess if your mentor and other members of staff adequately supported you during your time on C.C.D.

Were you orientated to the area on your first day?

Did you feel adequately supported by your mentor during your placement?

Did you feel part of the nursing team during your placement?

Did you find having the introduction package useful before you started your placement?

Did you have access to all of the learning resources available on C.C.D.?

Could you identify anything that would have improved this placement for you?

When competed please return to Julie Platten
Reflective Journal

WEEK 1

WEEK 2

WEEK 3

WEEK 4

WEEK 5

WEEK 6

WEEK 7

WEEK 8