University Hospital Southampton
NHS Foundation Trust

Respiratory HDU Student Pack

Name:

Nominated person:

Practice Assessor:

Welcome to Respiratory High Dependency Unit

This induction pack provides a general overview of Respiratory HDU. It also highlights potential learning opportunities and expected learning outcomes for you whilst you are on your placement, which will assist you in completing your student portfolio.

Placement Profile

RHDU is part of Division B directorate. This unit comprises of nine level 2 beds, which ideally is 1 nurse to 2 patients, as well as a nurse in charge. We specialise in acute and chronic management of various respiratory diseases. Primarily these include chronic obstructive pulmonary disease, interstitial lung diseases, asthma, pneumonia and cystic fibrosis.

The unit is equipped to deliver and manage Non-Invasive Ventilation (NIV) via either BIPAP or CPAP and High-Flow Nasal Oxygen Therapy. The NIV is provided by both acute, hospital-based machines and domiciliary (home) machines.

Patients can be admitted to be established on home machines and this is set up by our Physiotherapy team, linking closely with The Respiratory Centre team, who will then oversee this group in the community.

A significant percentage of our work is respiratory weaning from NIV. This is commonly done via a tracheostomy, so there is a great learning opportunity for the care and management of patients with a tracheostomy. It is not uncommon for some of these patients to spend several weeks on RHDU, so we are continually developing our approach to cater for longer stay patients and improving our rehab facilities.

Ward Manager: Simon Jacob

Band 6 team: Rachel McEnery
Victoria Jones
Victoria Newberry
Samantha Torkington
Lorna Magboo

Clinical Educator: Joelle Salje

Ward Contact Number: 02381204376/02381208595

Student Link Nurse: Joelle Salje

Philosophy of Care:

RHDU aims to be a friendly, approachable and supportive team. We are a warm and welcoming environment for staff, patients and visitors alike. We strive to show respect for all patients and aim to plan their care to meet their individualised needs, and to do so in a clean and tidy environment. We pride ourselves on being a competent and knowledgeable team and are dedicated to continuous professional development and learning, to ensure we can provide up to date evidence based practice care to our patients.

Shift Patterns

The unit in line with division B operates both 7.5 and 11.5 hour shifts. We endeavour to give you a week of short shifts when you start the unit, in order to give you maximum exposure. After this, you will be allocated to work Mondays, Wednesdays and Fridays for the long days. In accordance to the CLiP model, you will work alongside 'practice supervisors'. Please see below for further information on CLiP. Your shifts will be on healthroster, the hospitals erostering application – make sure this is correct and up to date if you need to make changes as this is how your hours will be counted.

Shift Times:	**Breaks:**
Early: 07:30-1530	30 minutes
Late: 1200-2000	30 minutes
Long Day: 0730 – 2000	1 hour
Night Shift: 1930 – 0800	1 hour

On the first week, you will be asked to do short shifts. After that, you will be allocated long days every Monday Wednesday and Friday.

CLiP

RHDU runs the CLiP model of mentoring students, in accordance to the NMC 'Standards Framework for nurses and midwives' (2019).

Each student is allocated:

- A nominated person – with whom the student can discuss any concerns or queries.
- A practice assessor – who meets the student periodically in order to ensure they are meeting their competencies, to sign their university competencies and to discuss any concerns/ queries. Practice assessors will not work with the student. As a result, it is the students responsibility to ensure that they keep records of their activities and learnings in practice, in conjunction with the practice supervisor. This documentation will be the proof that the objectives set out by the university are achieved.
- Daily practice supervisors – A practice supervisor will be allocated each shift. They will help guide you through the day, and document any learnings/ teachings in your daily log, at your request.

<u>What to expect</u>

On the first week, you will have the chance to get to know the ward and routine. After that you will be expected to undertake the days tasks, within your abilities. Namely, up to four students are allocated two patients. The students will be asked take handover, and plan their day together. Usually its two students to one patient. You will need to plan turns, breaks, and time to study/ give a presentation between you. It's about how you work together, and what you can learn from each-other. Practice supervisors are there to coach you, rather than actively teach you.

<u>Daily log</u>

You will be required to document your learning daily, and make learning objectives. These are ultimately your choice, however we advise you to put an objective in line with a critical care objective, in order to prove you have met these to your practice assessor. You can also put something which is particular to your patient if this is something that interests you. Other students have chosen to use one patient as a case study, and learn everything they can from them. We often have long term patients. You will need to allocate time in your day to research and teach your

objective to the other students and practice supervisor. We recognise that this cannot occur every shift. Please ask your practice supervisor to record these teachings.

Infection prevention

Infection prevention and control is of vital importance within the critical care environment. Most patients who are critically ill are vulnerable to infection and are immune-compromised. Therefore, it is an essential and legal requirement that all nursing and medical staff take the correct precautions to prevent cross-infection.

Plastic aprons and gloves are available at each bed space. Hand washing and the use of alcohol gel is essential prior to and following patient contact. Alcohol gel/handwashing should be used before outing on gloves, after removing gloves and entering and leaving the unit. Remember the five key moments of hand hygiene!

Procedures and guidelines files

These are available on the unit and on STAFFnet to provide guidelines on local practices, administration of drugs and policies/procedures that are directly relevant to critical care. You will also find a student file and many other useful resources within the unit.

Emergencies

<u>Fire</u>

Please familiarise yourself with the location of the fire extinguishers and exits, along with the fire alarm break points.

If an intermittent fire alarm rings, ensure that all doors and windows are shut. If it is continuous, ensure windows and doors are shut and ask relatives to leave, and await further instructions from the nurse in charge.

<u>Emergency Buzzer/Cardiac Arrest</u>

Even though the patients are continuously monitored, emergencies still happen. There is a red emergency buzzer located by each patient's bed and in the bathrooms. This should be pulled if there is a problem with a patient that requires immediate assistance. On RHDU in the event of a cardiac arrest or medical emergency, raise the alarm and put out a cardiac arrest call – ring 2222 stating the nature of the call: 'cardiac arrest' and your location.
Please make yourself familiar with the emergency trolley and transfer bag. They contain equipment, which you may be asked for in a crisis situation.

Security emergency

If a situation arises and you are asked to call security in an emergency, you will need to ring 3333. Tell them your location and brief details. Otherwise for non-emergencies security call 4122

Please remember

If an emergency does occur, remember you are part of a team, not on your own. **If you see anything that you don't understand, please speak to your mentor/buddy once the emergency is over.**

Student nurse starting checklist

- Find out who your nominated person and practice assessor are
- Complete ward orientation – find out where all the equipment is kept
- Look through the student orientation pack
- Make any requests for shifts with your mentor/student link/sister team
- Make sure at your initial, interim and final interviews that your self-evaluation is completed as this will help to shape your meetings
- Make sure your interview is completed in your first week
- Have a look at the student board for helpful posters and general information
- Arrange some visits with the MDT – there are lots of opportunities!
- We offer a patient deterioration session, which occurs periodically over the year.

Remember that if you need help, have questions or concerns, please don't hesitate to discuss these with the student link, nominated person, practice assessor, or any of the sister team.

If at the end of your placement you have anything that you think would be helpful to add to this student pack, or how we can make your learning experience better please let me know.
Good luck in your placement and I hope you enjoy it!

Regards,

Rachel McEnery
Sister (RHDU)
(Rachel.Mcenery@uhs.nhs.uk)

Potential learning experiences available on RHDU

- We offer patient deterioration sessions, which are available to all students
- Division B education team offer peer clinical supervision, as well as teaching sessions
- Prepare and assess bed area – checking oxygen and suction, emergency equipment
- Monitors – zeroing, parameters, reading observations and waveforms
- Physical assessment of the patient
- Respiratory
    - Auscultation
    - Physio
    - Positioning of the patient
    - Suctioning
    - Nebulisers
    - Oxygen therapy
    - Non-invasive therapy: CPAP, BIPAP
    - ABG's

- Cardiac
    - Identifying normal sinus rhythm
    - Identifying abnormal rhythms
    - Obtain ECG's
    - Normal blood result ranges

- Renal
    - Normal values for U&E’s
    - Fluid balance
    - Fluid management
    - Different types of fluids
    - Blood products
- Neurological
    - GCS
    - Sedation

- Nutrition
    - Parenteral
    - Enteral

- Pain management
    - Oral drugs
    - Opioids
    - Syringe driver
- Basic nursing care
    - Mouth care
    - Eye care
    - Skin integrity
    - Positioning
    - Passive exercises
    - Rehabilitation
    - Washing

- Caring for the critically ill
- Monitoring of the unwell adult
- Care of the patient with a tracheostomy
- Observing practice of management of lines
    - Arterial lines – transduced, waveform and care of
    - Central lines – transduced, waveform and care of
    - Peripheral cannulas
    - Drains
    - Feeding tubes
- Drug administration
- Infusions
- Working alongside the MDT – including physiotherapy, tissue viability nurses, dieticians and speech and language therapist

Arrange some visits (you don't have to do them all)

Place to visit	Date of visit
Asthma nurse specialist	
COPD specialist team	
Cystic fibrosis nurse specialist	
D6 ward (male respiratory)	
Dieticians	
Endoscopy	
IDU/ Cystic Fibrosis ward	
Palliative care team	
Physiotherapy team	
Pulmonary function testing	
Respiratory centre	
Speech and language therapy	
Tissue viability nurses	
Sickle cell Nurse	
Cardiac HDU	

Students Charter

Each student placed on the Respiratory High Dependency Unit can expect the following:

- To have an allocated nominated person and practice assessor at the start of the placement
- To have an initial interview within the first week of their placement.
- To have a mid-point and final interview scheduled at the appropriate intervals during their placement.
- To receive constructive feedback on progress at regular intervals.
- To have the opportunity to access learning experiences where possible to meet their learning needs.
- To have their supernumary status respected.
- To have learning contract completed.

Whilst students have the responsibility to:

- Ensure that they are on time for shifts and inform the ward and the University if they are unable to attend for any reason.
- Dress accordingly to the uniform guidelines and in a manner that promotes professional image, meet health and safety and infection control requirements.
- Have their assessments of practice completed at intervals throughout their placement.
- Ensure where possible to work the shifts allocated.
- Speak with their nominated person, practice assessor, ward manager or student link nurse at the earliest convenience if they have any concerns whilst on placement.
- To evaluate their placement so that good practice can be disseminated and corrective action being taken to improve the placement experience.

- Maintain a daily learning log, and ask practice supervisors to fill them out. These will prove that the required university objectives are completed.
- Undertake regular self study and give regular teachings to the other students and practice supervisors.

Standard Bedspace Set-Up

All bed spaces should be prepared and ready for use at all times.
Functioning bed with 2 pillows and linen

Monitor:
Observation monitor
ECG leads, 2 pressure cables, oxygen saturation probe, ETCO2 lead, NIBP cuff, sphygmomanometer in bed space

Pumps:
2 x syringe drivers – plugged in!
2 x IV pumps – plugged in!
1x feeding pump – plugged in!

Back of bed space:
Double oxygen ported flow meter with one nipple connector and one flat connector
Ambu bag
Wall suction unit with suction receptacle holder
Suction catheters

Miscellaneous:
Drip stand with transducer plate
Pressure bag

Safety Checks

Before completing a full top to toe assessment of your patient, you must carry out several safety checks to ensure everything is in order in case of an emergency.

Firstly, ensure that your patient is safe (airway, breathing and circulation) and is not at any immediate risk. Do they look comfortable?

Ensure that you explain to the patient and any family members/carers/visitors present what you are doing to alleviate any anxiety.

Oxygen should be connected in the white port and running at the prescribed rate. Suction should be connected and working. Ensure there is spare clean yankeur suckers (and suction catheters for the tracheostomy patients) and catheter suction units.

All **monitors** should be fully connected, plugged in and charging. Alarms should be checked and the parameters set for the individual patient.

Infusions should be compared to the prescription chart to ensure that the drug infusions are a) prescribed correctly and b) are running according to a correct prescription i.e. route, dose, solution, rate and that a doctor has signed the prescription. Check when infusions are due for renewal and ensure that the replacement infusion will be ready when needed.

Check that the **transducer** plates are positioned at the correct level in relation to the patient's position. A pressure bag should be attached and pumped to 300mmHg.

NIV settings should be checked. Alarms should be set for the individual patient and the circuit and humidifier should be checked and changed if needed.

Check that all the required **emergency equipment** is by the patient's bedside e.g. ambu bag, non-rebreather O2 mask, tracheostomy box.

Ensure patient has a **name band** and that it is displaying the correct information.

Do a visual inspection of the bedside and remove any equipment that is no longer being used and unused stock. This will help to maintain a clean, tidy and safe environment.

Top to Toe Assessment

At the beginning of every shift a complete top to toe assessment should be carried out on your patients. The aim is to provide you with a baseline, from which any changes can be detected in a prompt manner.

Assessment	Considerations
Airway	Is the airway patent? Any adjuncts? Is the patient maintaining own airway? Tracheostomy - type, size, date of insertion/change, dressing, cuff pressure, emergency equipment. Strength of cough, type and amount of secretions Nebulisers, inhalers, humidification.
Breathing	Mode of ventilation, NIV settings (IPAP and EPAP), O2 %, tidal volumes and trigger. SpO2, ABG results. General colour and appearance, respiratory rate, chest expansion, symmetry/movement, depth, work of breathing and breath sounds. Respiratory effort, recovery time from dyspnoeic episode. Signs of respiratory distress - use of accessory muscles, cyanosis, gasping, pursed lips, nasal flaring. Presence/patency of any chest drains, position, swinging/bubbling action, drainage, clamps available. Lung auscultation - abnormal sounds, air entry Secretions, suctioning requirements, type of sputum, has a specimen been sent? Check chest x-ray. Is there a weaning plan in place? Arterial line - site of insertion, site clean, dressing intact and well secured, return to flow, transduced. Any recent changes to the patients respiratory function?

Circulation	Record pulse rate and monitor for rhythm trends. Palpate manually to check. 12 lead ECG assessment if necessary. Measure the blood pressure (NIBP). Check against arterial blood pressure and record MAP. Record manually if needed. Check body temperature and blood results. Inspect the colour and temperature of the hands and digits for colour, warmth and signs of oedema. Check the capillary refill time. Check medications and past medical history. Any IV access - type of line (peripheral/ central), insertion site, check still required, VIPs paperwork present. Date of CVC insertion, CADI score, site observations. DVT prophylaxis - TEDS, heparin. Check blood results.
Nutrition	Is nutritional intake adequate/ inadequate? Any nausea/vomiting? Any feeding tubes? Type of tube, insertion date, length, size, position, site, feeding regime, aspiration. Tube site – dressing, pressure areas, redness, tenderness, drainage. Blood sugar levels (check minimum QDS on diabetic patients) - insulin, sliding scales. Any IV infusions? Maintain accurate fluid balance Weight, MUST. Feed regime and dietary requirements, menu choices, ensure diet grid is completed. Any referrals – SALT/Dietician Any diuretics given?

Elimination	Continent: Yes/No Mode of toileting. Urinalysis results. Urinary output, urine colour, appearance, volume. Fluid balance, insensible losses. Catheter - size, date and time inserted, is it short-term/ long-term, catheter care plan. Abdomen: soft/hard, any distention/pain. Are bowel sounds present? Last bowel movement? Type? Aperients given Stoma - does site appear healthy? is it active? Any nausea/vomiting? Monitor electrolytes blood results.
Comfort	Pain – location, is it acute, chronic, constant, intermittent. Description of pain, scale 0-10/10, what makes the pain worse, what makes the pain better? Pain relief prescribed/given? Evaluate effectiveness. Facial expression - do they look comfortable? Patient positioning. Periods of sleep/rest.
Fundamental Needs	Mobility - what ability does patient have? Mode of transfer? Do they use any mobility aids? Do they need physio, passive exercises, out to chair? Moving and handling and SIRFIT assessments. Normal function versus current Hygiene - catheter care, personal care, mouth care. MRSA screen and risk reduction. Treatment if needed.

Skin Integrity	Skin colour Is skin intact? Any signs of inflammation/infection? Any pressure sores? Grade/location. Any bruising or old scars/wounds? Wound chart in place if needed? Referrals. Nimbus/Aura installed if needed? Is turnaround in place? Ensure Braden score is completed.
<u>Head and neck</u> Hair	Condition of the hair - does it need washing, tidying, combing
Face	Skin condition, skin turgor, signs of weight loss
Ears	Ability to communicate, hearing impairment, aids,
Eyes	Condition - are they clean?
Nose	Skin damage, nasal bridge score, prevention (document prophylactic nasal bridge dressings). NG tube - type, position, aspirate, feeding regime.
Mouth	Condition of lips and mouth, oral hygiene, dentures.
CVP line	Insertion date, condition of site, is dressing intact? Lines should be labelled with date and time of commencement, CVC care plan.
<u>Trunk</u> ECG electrodes	ECG electrodes - check in the correct position, remove any electrodes not being used. Change every 24 hours.
Chest drain	Check dressing is dry and intact, no signs of infection.
Abdomen	Distention, ascites, signs of rash, wounds, drains.
<u>Limbs</u> Legs	DVT prophylaxis, signs of oedema/swelling.
Feet and heels	Limb strength, mobility. Signs of oedema, swollen heels, pressure areas, skin integrity.

Hands Arms Arterial line	Nails, rings, oedema. Limb strength/mobility. Site - any signs of infection?
Neurological	Is patient alert, orientated or confused? Communication/Speech Pupil size, shape, reaction. GCS/AVPU score. Any weakness, deformities or deficits.
Psychological	Maintain dignity and privacy of the patient. Family situation and involvement if appropriate. Discharge planning. Confirm no unmet needs. Spiritual, cultural and social needs, chaplaincy/PALS.
Communication	Any difficulties in communicating - hearing impairment, sight impairment, learning difficulties. Next of kin information. Updating patient and family on plan of care.
Assessments	Daily: PRESS, skin integrity, oral hygiene, sleep checklist Look at the due dates of: MUST SURFIT, Falls Risk Assessment and Bed Rail assessment Moving and Handling MRSA screen

Respiratory Assessment

LOOK, LISTEN & FEEL

DO WE KNOW ANY PATIENT HISTORY?

OBSERVATION

Cyanosis – Central cyanosis of tongue or lips usually means the patient has low oxygen or PaO2 in the blood. A very late sign!
Peripheral cyanosis of extremities or tip of the nose or ears may be due to diminished blood flow or polycythaemia.

Breathing – The use of accessory muscles (scalene and sternomastoid muscles).
Intercostal retractions – sucking in of skin and muscles between ribs during inspiration.
Use of the abdominal muscles during expiration – Paradoxical Breathing.
Whether the patient can speak a full sentence, SOB.
Increased diameter of anteroposterior chest – caused by overexpansion of chest, seen in COPD.

Posture – Patients with COPD often prop themselves up or lean over pillows to gain better expansion of lungs.

Position of trachea – Is it central or deviated?
Deviated away from affected side = pleural effusion, pneumothorax, haemothorax.
Pulled toward the affected side = atelectasis, fibrosis.

Respiratory rate – should be compared with patient's normal if known.
Depth of respiration
Fast and shallow may indicate severe respiratory distress.
Fast and deep may indicate compensation for a metabolic acidosis, i.e. Kussmaul respirations (seen in DKA).
I:E ratio – Normally 1:2
Expiration may be longer in patients with obstructive lung disorders.

General chest expansion – Is there equal expansion?
Unequal expansion may be a sign of atelectasis, mucus plug and flail chest. It could also mean the ETT is down too far, i.e. only ventilating one lung (auscultate, and then seek help immediately).

Do chest and abdomen rise and fall together? Unsynchronised respiratory effort increases work of breathing and may necessitate ventilation.

AUSCULTATION

Never listen through the patients clothing!

If the patient is self-ventilating (SV), ask them to breathe normally but through their mouth and to take some deep breaths while you are listening. If they are ventilated, breath sounds may appear louder as the air is pushed in. Ensure you listen to the whole respiratory cycle – inspiration and expiration. Listen for any additional sounds – crackles, wheezing.

- Start at the top, above the clavicles.
- Work your way down the chest, comparing left and right.
- If possible listen at the back, as the bases are heard best there.

Normal breath sounds

- Bronchial – trachea, high pitched loud, short inspiration.
- Bronchovesicular – lung apices, medium pitched, louder than vesicular.
- Vesicular – most lung fields, continuous, low pitch and volume, like rustling wind, short expiratory phase.

Abnormal breath sounds

- Crackles – fine/course – bubbling from fluid, exudates or secretions.
- Wheeze – sound of air squeezing through airways, due to bronchoconstriction.

- Stridor – airway obstruction, e.g. post extubation, due to laryngeal oedema, foreign object.
- Pleural rub – grating sound from friction between pleura.

Absent breath sounds to one side

- ? Pneumothorax – seek help immediately.
- ETT incorrectly positioned, seek help immediately.

PALPITATION

Feel for tenderness, temperature, deformities. Place hands on either side of chest and feel if there is equal expansion.

Feel for any secretions. If there are secretions, you will feel the vibration on inspiration.

Feel for a cracking sensation under your fingers – may be an indicator of surgical emphysema (air that has entered the subcutaneous tissue).

PERCUSSION

NOT ROUTINELY PERFORMED BY NURSES AS MOST HAVE NO FORMAL TRAINING.

Percussion of the chest results in motion of the chest wall and underlying structures, resulting in audible and tactile vibrations.

Place one finger flat on the chest and strike the knuckle with a fingertip from the other hand.

Normal is resonant, hollow.

Consolidation, effusions will cause dull sound.

Pneumothorax will sound hyper-resonant, very hollow.

Ventilator Observations

Depending on which ventilator mode is selected, will determine what ventilation observations are required to be documented.
Each single observation is as important as the next – they will tell you how well your patient is ventilating, therefore keeping your patient safe.

Set pressure limit (cm/H2O)
This is the set pressure limit of which the ventilator will permit, in gas delivery to the patient.

Set tidal volume (Vt)
Size of breath delivered to the patient (mls).

Expired tidal volume (Vt)
Amount of gas expired in one breath. Small Vt can indicate blockages in the system, leaks or a deteriorating respiratory function.

Measured minute volume (Mv)
Amount of gas inspired and/or expired in one minute (l/min)
Respiratory rate x tidal volume = Minute volume.
Minute volume can indicate over (too high) or under ventilation (too low) as well as problems with the circuit and changes in the patient's condition.

Set rate/total rate (per min)
Patient's measured respiratory rate, either spontaneous or set ventilator breaths.
Set rate: Checking to see the machine is delivering the breaths it is set to.
Spontaneous: Tells us how well a patient is coping with breathing spontaneously. If too high or low, seek help immediately to review your patient and their ventilator settings (tachypnoea – RR >30/min; bradypnoea – RR <8/min).
Additionally, you can check to see of your patient is making spontaneous respiratory effort in a mandatory mode. Seek help to review your patient and their ventilator settings if required.

Peak airway pressure (cm/H2O)

Peak Inspiratory pressure measured within the airways.

Low airway pressures may indicate leaks in the ventilation circuit. High airway pressures can indicate a blockage in the tubing or deterioration in the condition of the patient's lungs.

Pressure Support (cm/H2O)

Amount of pressure required to support the patient's spontaneous breath.

I:E ratio

Inspiration/Expiration ratio.

In normal respiration, the ratio is 1:2 (i.e. 10bpm = 6 seconds per breath = 2 seconds to inspire, 4 seconds to expire).

When lungs have been damaged, this ratio can be manipulated, depending on the condition of the patient.

PEEP/CPAP (cm/H2O)

A constant pressure maintained in the airways, throughout inspiration and expiration. Increases functional residual capacity and therefore increases time for gas exchange to occur.

IPAP (cm/H2O)

Amount of pressure required to support the patient's inspiration.

EPAP (cm/H2))

Amount of pressure maintained in the airways at the end of expiration.

FiO2

Fraction of inspired oxygen as a decimal (i.e. 60% = 0.6, 100% = 1.0)

Pulse oximetry

Peripheral saturation of haemoglobin by O2, detected with infrared light.

Humidifier temperature

Either HME (heat and moisture exchange) or Fisher & Paykel heated humidifier recorded in degrees Celsius.

PIP – Peak Inspiratory Pressure (cm/H2O)

This is the highest level of pressure applied to the lungs during inhalation.

Pressure support (PS)

A mode in which the patient is assisted to take a larger breath. It is used only when they are breathing spontaneously through a ventilator. Often used when 'weaning' patients from ventilation.

Non-Invasive Ventilation Modes:

Biphasic Inspiratory Positive Airway Pressure (BIPAP)

This mode provides a high flow of air and oxygen to a patient via a face mask or nasal mask to assist spontaneous breathing. As the patient breathes in, this mode delivers an inspiratory positive airway pressure (IPAP) to assist the patient to take a larger breath. This therapy also enables an expiratory positive airway pressure (EPAP) to be set, which inhibits end expiration at a set level to create back pressure in the lungs, thus keeping the alveoli open for gas exchange. This prevents or reverses atelectasis (alveoli collapse).

Continuous Positive Airway Pressure (CPAP)

This mode provides a high flow of air and oxygen to a patient via a face mask or nasal mask on inspiration which helps with work of breathing (but there is no inspiratory pressure/support). The patient the breathes out against a valve (PEEP valve) which inhibits end expiration at a set level to create back pressure in the lungs, thus keeping the alveoli open for gas exchange. This prevents or reverses atelectasis (alveoli collapse).

Arterial Blood Gases

Why do we measure arterial blood gases?

- To give an indication of the effectiveness of ventilation and gas exchange.
- To determine acid-base balance, the body's ability to maintain a balance between acids and alkalis.
- To clarify the cause for pH disturbance.
- Act as a guide for treatment and to evaluate response to treatment.

NORMAL PARAMETERS

pH	7.35 – 7.45
PaO2	10-14kPa
PaCO2	4.5-6kPa
HCO3-	22-26mmols/l
BE	-2 - +2
SpO2	95-100%
K+	4.0-5.0mmols/l

RESPIRATORY ACIDOSIS CAUSES	RESPIRATORY ALKALOSIS CAUSES
Opiate overdose	Hyperventilation
Respiratory failure	Anxiety
Hypoventilation	Respiratory failure
Coma	Pain

COMPENSATION

This is when the body attempts to correct acid/base imbalance to bring pH back to normal.

Compensation can be fast (respiratory) or slow (metabolic).

It can be seen when there is a normal pH, with deranged respiratory and metabolic values.

Non-compensation – alteration of only PaCo2 or HCO3-
Partial compensation – both PaCO2 and HCO3- are abnormal and because compensation is incomplete, the pH is also abnormal.
Complete compensation – both PaCO2 and HCO3- are abnormal and because compensation is complete, pH is normal.

GUIDELINES FOR ABG INTERPRETATION

Evaluate pH
<7.35 reflects acidosis
>7.45 reflects alkalosis

Evaluate ventilation
Partial pressure of arterial CO2
<4.5kPa indicates alveolar hyperventilation, respiratory alkalosis
>6.0kPa indicates ventilator failure, respiratory acidosis.

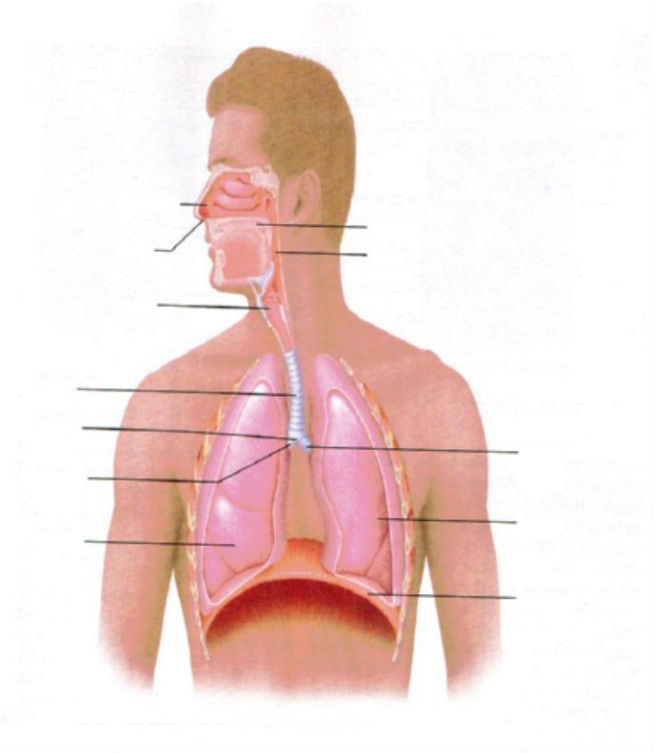
Evaluate metabolic processes
HCO3-<22mmols/l and/or BE<-2 reflects metabolic acidosis.
HCO3->26mmols/l and/or BE>+2 reflects metabolic alkalosis.

Is there compensation?
When both PaCO2 and HCO3- are deranged, one reflects the primary acid-base balance disorder, and the other reflects the compensating disorder.
To decide which, check the pH.
i.e. The ABG shows respiratory acidosis and metabolic alkalosis.
The pH is 7.25. The primary cause is respiratory.

Study Pack

Respiratory System

- Label the following diagram and state the function of each component:



- In your own words, explain how the air moves in and out of the lungs`.

- Where does gas exchange occur?

- Describe the process of the transportation of oxygen in the blood.

- Discuss the normal parameters for respiratory observations.

- List the sizes of these volumes and explain the terms:

Tidal volume

I:E ratio

Minute volume

PEEP/CPAP

IPAP

EPAP

PIP

FiO2

Inspiratory reserve volume

Expiratory reserve volume

Residual volume

Vital capacity

Total lung volume

- Explain what is meant by dead space?

- What is the function of the respiratory centre in relation to respiration? What effect would a rising CO2 level have on respiration?

- What does SpO2 measure? At what level would you become concerned?

- There are a group of patients where a low O2 level stimulates breathing. In your own words, explain how this mechanism works.

- Explain how a pleural effusion would affect ventilation.

- What is a pneumothorax? If a patient requires a chest drain, what is its purpose?

- Explain the following terms and name one condition that can cause them:

  Hypoxia

  Hypercapnia

- What are the normal arterial blood gas parameters for the following?

  pH:

  CO2:

  O2:

  BE:

  Bicarbonate (HCO3):

  Lactate:

- On assessment, you find your patient has a lung full of sputum. In your own words, explain how this will affect their ability to breathe? Will it affect gas exchange?

- Explain how non-invasive ventilation differs from normal ventilation?

- What is the difference between type 1 and type two respiratory failure?

- Explain the difference between BIPAP and CPAP.

- You may see a decrease in blood pressure in someone who is mechanically ventilated. In your own words, explain why this may happen.