Nursing acutely ill adults, high dependency assignment

All nurses should possess critical care skills to enable them to impact positively on their patients care. The Higginson and Jones (2009) state, in BJN, that the initial assessment of the critically ill patient vary but should follow a pattern based on assessing A, B, C, D and E, in other words airway, breathing, circulation, disability and environment.

This essay is concerned with the altered physiology of Jim's (for confidentiality a pseudonym has be used, NMC 2008) respiration, due to a spontaneous, non-traumatic subarachnoid hemorrhage and the nursing care he received while in the Intensive Therapy Unit (ITU) will be discussed. The pathophysiology of the haemorrhage Jim suffered will be explored and why it caused Jim's airway to be altered. His airway and its management will be the priority for nursing staff.

In order to maintain a patent airway, suctioning of the airway will be the priority followed by oral care to prevent infection, although other nursing needs such as nutrition and pressure areas will be discussed briefly. Jim was admitted to ITU with an endotrachael tube (ETT) which had been placed in A&E after his consciousness dropped due a subarachnoid haemorrhage, see appendix one. According to Kumar et al (2005) a subarachnoid haemorrhage, which occurs in the subarachnoid space, can usually be attributed to a rupture of a saccular aneurysm, also known as a ' berry' aneurysm.

Kumar et al (2005) continues to explain that two of the possible predisposing factors contributing to the formation of a saccular aneurysm growth are smoking and hypertension. Although Jim had no past medical history, according to the Stroke Association ' almost a quarter of people in the UK are

unknowingly suffering from undiagnosed high blood pressure. ‘ Hypertension is one of the single biggest risk factor for causing a stroke and therefore could have, at least contributed to the haemorrhage. Jim’s conscious level was 14 on admission and within three hours had dropped to 8.

His conscious was measured by the Glasgow Coma Scale (GCS). GCS is a neurological tool that measures eye, verbal and motor responses. In general, a GCS of 8 or less, as with Jim, is classified as a severe brain injury (Adam, Osbourne 2005), and was caused as a direct result of his subarachnoid haemorrhage which caused his intracranial pressure (ICP) to increase. ICP can be explained with reference to the Monro-Kellie hypothesis, which states that because the cranium is a fixed structure it cannot expand in size.

Within this fixed structure are three main components; cerebrospinal fluid (CSF), blood and brain tissue. The hypothesis goes on to explain that if there is an increase in any one of these components then this must be compensated by a decrease in the volume of the other two otherwise ICP will increase. Brain tissue is not easily displaced therefore CSF volume is displaced into the spinal cord and, or the dura can expand slightly to increase absorption and create a downward displacement of venous blood (Book, Porth 2000).

These two compensatory mechanisms enable the body to keep ICP within normal range at least in the short term. CSF and blood are therefore able to adjust to some extent to enable ICP to remain normal, when brain tissue is displaced, such as herniation or ‘ coning’, damage to the brain occurs and then death. The haemorrhage Jim suffered caused a space occupying lesion,

which caused the volume of blood in his brain to increase, which had to be compensated for in order to keep ICP within normal limits.

The compensatory mechanism is temporary and maintains a normal ICP, however, when the compensation system has been fully exhausted and if lesion volume continues or secondary injury (swelling) occurs, ICP consequently increases. As Jim’s ICP increased he began to vomit and, caused his conscious level to fall. It also steadily increased his blood pressure because cerebral perfusion pressure (CPP) became compromised.

CPP became compromised when the mean arterial pressure equaled or exceeded mean arterial blood pressure (Shardlow, Jackson 2008) and was detected by an increase in carbon dioxide within the central nervous system CNS. The body’s natural response to prevent cerebral ischemia is based on a positive feedback mechanism. Therefore, blood pressure increases and cerebral blood vessels dilate in order to try an increase oxygenation to the brain, which consequently increases cerebral blood volume, CPP continued to be compromised and thus a positive feedback mechanism was initiated (Tortora, Derrickson 2009).

Although it was undesirable for Jim’s blood pressure to increase as this causes ICP to rise, it is a difficult situation to manage. Medication such as Propanaolol can be used to reduce blood pressure but this also reduces ICP, which may consequently reduce CPP and cause cerebral ischemia which will eventually lead to damage (Book, Porth 2000). An increase in ICP increases the pressure within the cranium, and means that the respiratory centre (RC)

was one part of Jim’s brain that was affected and this caused his respiration and GCS to be altered.

As Jim’s conscious level fell, his ability to protect and maintain his airway became increasingly questionable, as this requires an effective swallow, control and muscle tone (Rajagopal, Paul, 2005). Jim’s conscious level also affected the levels of oxygen and carbon dioxide in his blood and this needed to be closely monitored due to inadequate supply of oxygen to the brain, known as ischemia. Ischemia also interferes with the delivery of glucose and the removal of waste products which leads to hypercapnia (Book, Porth 2000).

Hypercapnia or higher than normal levels of carbon dioxide in the blood, cause cerebral vessels to dilate, increasing the flow of blood to the brain. Inadequate oxygenation also forces brain cells to produce energy using anaerobic metabolism which produces lactic acid and lowers pH, also dilating blood vessels exacerbating the problem and, again, both cause ICP to increase further (Bucher, Melander 1999). Therefore, it is vital for Jim to have an adequate airway, breathing and oxygenation in order to prevent, as much as possible, the damage to his brain.

The respiratory centre (RC) is found in the brain stem, the brain stem consists of the midbrain, pons and the medulla oblongata, and is responsible for vital body functions such as respiration, heart rate and blood pressure, it is also involved in the cough, gag and swallow reflexes (Tortora, Derrickson, 2009). Although many other complicated components influence respiration,

its pattern, rate and its depth, for the purpose of this essay the chemoreceptors and their role in respiration will be discussed.

The RC is located in the medulla oblongata which is the lowermost part of the brain stem, and this is the basic yet most vital part of Jim’s brain that became compromised as ICP increased. Tortora and Derrickson (2009) explain that the RC is located within the brain stem, the neurons are in the pons and the medulla, which generate spontaneous breathing, they receive controlling signals of a neural, chemical and hormonal nature and these control the rate and depth of respiratory movements of the diaphragm and other respiratory muscles.

Amongst other things, the RC is regulated by receptors in the peripheral and central nervous system. Chemoreceptors in the peripheral and central nervous system are sensory neurons that respond to chemical changes such as the concentration of carbon dioxide and oxygen of which, affects the acidity of the blood. In the central nervous system (CNS), chemoreceptors are located near the medulla oblongata and respond to carbon dioxide concentration changes in the CSF.

Peripheral nervous system chemoreceptors are located in the aortic arch and in the bifurcation of carotid arteries in the neck, which monitor concentrations changes of oxygen and carbon dioxide in Jim’s blood (Tortora, Derrickson 2009). It is these peripheral chemoreceptors that respond to a deficiency in oxygen (Bucher, Melander 1999). Inserting the initial ETT allowed medical staff to monitor and to manipulate the levels of oxygen and

carbon dioxide in Jim’s blood, which is extremely important for patients, like Jim, with brain injuries.

Rising levels of carbon dioxide in the brain stimulate Jim’s central chemoreceptors in his brain to contribute to further increases in ICP, as previously discussed blood pressure rises to try and increase cerebral perfusion to ensure adequate oxygenation to the brain to prevent ischemia. A subarachnoid haemorrhage is usually attributed to a saccular aneurysm. In 85% of all cases a saccular aneurysm is known to rupture under conditions associated with sudden rises in blood pressure, see appendix one (Van Gijn et al 2007).

Brisman et al (2006) describes a saccular aneurysm as a ‘ true aneurysms. ‘ In other words they are an extension of the artery where a dilation of a vascular lumen occurs due to a weakness of all vessel wall layers. Outpouching or ballooning usually arises at arterial bifurcation points, such as the Circle of Willis. The circle of Willis is a circle of arteries at the base of the brain; the arteries branch out to all parts of the brain from this circle and are responsible for providing its blood supply.

The anatomy of these junctions where the arteries come together can form weak spots and, or, damage to the artery walls caused by atherosclerosis can cause abnormal blood flow at these junctions, which can be accentuated by hypertension (Urden et al 2010). Jim possibly suffered from abnormal hemodynamic stress on the walls of large cerebral arteries caused by changes in the direction of the blood flow from systole and diastole which over time damaged the intima of the artery.

Maximum hemodynamic stress can be found at bifurcation points and therefore are the area’s most likely to develop saccular aneurysms and possibly aid there progression (Sandve et al 2007). A normal artery wall consists of three layers: the intima, which is the innermost endothelial layer; the media, which consists of smooth muscle; and the adventitia, the outermost layer, which consists of connective tissue. The elasticity of the internal membrane is reduced or absent, and the media ends at the junction of the base of the aneurysm neck and the associated vessel (Tortora, Derrickson 2009).

The subarachnoid haemorrhage Jim suffered caused his airway to be compromised, for an extended period of time. Five days after arriving in ITU Jim had his ET replaced with a percutaneous tracheostomy due to his need for prolonged and assisted breathing support. A percutaneous tracheostomy was preferential for Jim in the long term as it reduced the work of breathing as was shorter than the ETT and the airflow resistance was lower due to the circumference of the tube (Sole et al 2009).

Jim’s work of breathing was also decreased due to the reduction of physiological dead space, which is the amount of each inspired breath that does not participate in gaseous exchange and therefore less effort was required by Jim to breathe (Bucher, Melander 1999). Jim had his tracheostomy inserted in ITU rather than in theatre, which meant that he was in a familiar environment surrounded by staff that Jim and his family were familiar with, as opposed to a in a theatre environment ().

The tracheostomy provided more comfort for Jim as Woodrow (2006) explains, that a tracheostomy helps to reduce anxiety and increases comfort, as it allowed Jim to come off sedative drugs, such as Propofol, Midazolam and Morphine, which were used to help him tolerate the ETT (Singer, Webb 2009). Without sedation, the medical team were in a better position to be able to establish Jim's neurological condition, and when he could be ' weaned' off the ventilator. Weaning is the gradual process of enabling Jim to breathe for himself again. The sedation being turned off also meant that Jim could communicate more easily by using non-verbal signs.

A communication board was not appropriate for Jim due to severe weakness in all his limbs and possible disturbances in his vision, therefore nursing staff were able to communicate with Jim by asking him to move his tongue and squeeze their hands (Serra 2000). A tracheostomy also improves airway suctioning which offers more efficient airway care, it also improves oral hygiene and provides a more secure airway. The tracheostomy, and ETT, bypassed Jim's upper airway which is fundamental in the warming, moistening and filtering of inspired air, so that clean, warm, oist air is delivered to the lungs, by the time air reaches the alveoli it is between 95% and 100% saturated. Jim's normal filtering, humidification and warming is bypassed and cold dry gas reaches the lower respiratory tract which diminishes cilary activity and can eventually leads to micro-atelectasis, which is diminished volume in the lung (Kumar et al 2005) and therefore has to be replaced artificially. The priority of Jim's care is to ensure that his airway is maintained. The role of the nurse will be discussed, focusing on

maintaining Jim’s airway with the use of suctioning and oral care to prevent infection.

Jim’s other care needs need to be considered holistically therefore, his physiological, psychological and social factors will need to be discussed briefly, such as the medication he received, nutrition, pressure area care and tracheostomy dressing care. The main purpose of Jim’s tracheostomy was to provide and maintain an airway for respiratory support, to enable aspirations of tracheobronchial secretions and to eventually aid his ‘ weaning’ from mechanical ventilation, when appropriate (Dougherty, Lister 2006).

Mechanical ventilation was not to treat the underlying pathophysiology Jim suffered but to support him with adequate oxygen until appropriate treatment was given and healing had time to occur (Bucher, Melander 1999). An ineffective cough and swallow was caused by the subarachnoid haemorrhage Jim suffered and because the tracheostomy increased the likelihood that he would aspirate secretions. Maintaining Jim’s airway was prioritised above all other nursing interventions, which meant the appropriate use of suctioning.

The main aim of suctioning is to maintain a clear airway with normal breathing sounds and patterns without causing hypoxia or trauma for Jim (Parsons, Wiener-Kronish 2007). The complications of tracheostomy suctioning include tracheal mucosal damage, hypoxia or even death (Griggs 1998). For Jim, the nurses used a closed circuit suction catheter that was attached to one end of the tracheostomy. Closed circuit suction was considered more appropriate for Jim as he was mechanically ventilated and

he could be hyperoxygenated before and during suctioning to prevent hypoxemia (Kjonegaard et al 2010).

The closed system comes in several sizes with the smaller systems potentially causing less trauma to Jim’s airway, however the smaller system removes fewer secretions especially as his sputum was particularly thick. Due the trauma and discomfort suctioning causes it should only be done when indicated and not routinely. Suctioning was indicated when Jim attempted to cough, coarse breath sounds or noisy breathing, decreased saturations and if he had copious secretions. The normal functioning of a cough is to bring up secretions and then to swallow them or to excrete them via the mouth (Sole et al 2009).

However, Jim was unable to do either of these and his ineffective cough would cause his blood pressure to increase which was undesirable due to the risk of further injury to Jim’s brain. Suctioning had be used with caution due to the injury to Jim’s brain, and after each time the suction catheter was passed Jim was allowed to fully recover haemodynamically before any other nursing interventions were attempted (Johanna Briggs Institute). Suctioning creates an urge to cough and can cause a burning sensation in the lungs, which Jim found most unpleasant, however, this only lasted for a short time.

Therefore it was performed as briefly and effectively as a possible to maximise efficiency and minimise trauma (Adam, Osbourne 2005). Jim acquired pseudonomis, a ventilation associated pneumonia (VAP), which is a nosocomial infection. Jim was at risk of developing a VAP due to having an artificial airway, Sole et al (2009) explains that when the normal upper

airway defense mechanism is bypassed VAP is usually caused by the aspiration of colonised gastric and oropharngael secretions.

Poor oral hygiene, aspiration, contaminated artificial respiratory equipment, inadequate humidification, poor handwashing by care givers and inappropriate use of aseptic technique can all contribute to acquiring a VAP (Feider 2010). Jim’s inability to produce an effective cough was due to his artificial airway of VAP. Pseudonomis is an opportunistic pathogen and is associated with positive pressure ventilation (Woodrow 2006) and therefore, Jim required regular suctioning due to the copious purulent secretions produced and because he was unable to clear his own secretions (Griggs 1998).

Consequently nursing staff would usually have to carry out suctioning on Jim frequently, while also considering his brain injury, as he would get a build up of thick secretions in his chest and throat and the bubbling in his chest was often audible. Suctioning often causes discomfort and irritation and the nursing staff ensured used their communication skills throughout to reassure Jim by ensuring they explained what they were doing thoroughly before and during he procedure, using eye contact and appropriate use of touch. The regular suctioning ensured the patency of the tracheostomy tube and kept the tube free from secretions, a blocked tracheostomy could potentially cause a respiratory arrest (Woodrow 2002). Patients, like Jim, with tracheostomy’s are pre-disposed to respiratory tract infections due to the bypassing of the upper airway which is fundamental in the warming, moistening and filtering of inspired air.

By the time air reaches the alveoli it is usually humidified and between 95% and 100% saturated, as Jim was mechanically ventilated this was bypassed and could have caused a reduction in cilary activity, increased secretions and, an already ineffective cough (Adam, Osbourne 2005). Humidification had to be replaced artificially and was achieved with a heat moisture exchange filter and saline nebulisers were used before suctioning to help loosen his thick secretions (Woodrow 2006).

Jim did not receive antibiotics for his VAP therefore nurses used appropriate suctioning and the physiotherapist visited daily. The physiotherapists used several techniques to help ensure the maintenance of Jim’s airway such as vibration, where the chest wall is shaken throughout exhalation to loosen and move secretions into major airways for coughing or suctioning. Postural drainage was also used which aims to move secretions with the use of gravity, such techniques helped to improve the clearance of secretions (Adam, Osbourne 2005).

Reducing the risk of further infection was another key area of Jim’s nursing care, as he had already acquired VAP. Reducing infection can be achieved by oral hygiene carried out by nurses and the student nurse (SN). The presence of a foreign body in the airway increases the likelihood of an infection, which may be caused because the tube bypasses cilia and mucous membranes and bacterial colonisation can enter the lungs from secretions of the upper airway and regurgitated into the lungs if the cuff of the tracheostomy in the larynx is not a perfect fit (Woodrow 2006).

Jim was critically ill and was therefore more vulnerable to oral disease due to the bypassing of the mouth. Jim was also therapeutically dehydrated to maximise respiratory function, which caused drying of mucosal membranes (Feider, 2010). Oral decontamination can prevent the spread of oral to respiratory infections however, oral trauma can also occur due to oral suctioning with a yankauer catheter, which could allow pathogens to enter the bloodstream. Therefore it is important for nurses to be extremely careful in order to prevent such trauma (Sole et al 2009).

The SN provided oral care for Jim, initially under the supervision of registered nurses, and consisted of a daily oral assessment of Jim’s lips, mouth and tongue. The assessment allowed nursing staff and the SN to give Jim the most appropriate oral care, as he was at high risk of developing a further infection, therefore oral care was given every two hours (Garcia et al 2009). The SN ensured Jim’s bed was elevated to thirty degrees to prevent aspiration, his teeth were then cleaned toothpaste to prevent the build-up of plaque.

After two hours his teeth were then brushed with an antiseptic agent Chlorhexidine gel to eliminate bacteria in the mouth, and also by using mouth swabs with Chlorahexidine mouthwash, cleaning his tongue each time and applying Vaseline to his lips to prevent cracking when indicated. Sole et al (2009), explains that brushing the teeth and oral suctioning is an effective intervention for preventing VAP, and reduces oropharyngael colonisation and dental plaque (Feider et al 2010).

The nursing care Jim received was not solely concerned with the treatment of his illness. He also needed to be supported and cared for in a holistic way, and therefore physiological, psychological and social factors of Jim's condition rather than just treating the disease will be discussed (Mcfarren, Martin 2004). Jim received medication while he was in hospital, when he was sedated with an ET tube he received Morphine, Midazolam and Profolol, however, he no longer required sedation after his tracheostomy was placed.

Jim was prescribed salbutamol nebulisers which is a sympathomimetic bronchodilator, which relaxes muscles surrounding his bronchioles (Henry 2004). Although Jim did not receive a lot of medication it is the duty of nursing staff to ensure that the medications are given as prescribed, at the correct time and documented correctly in the medication chart as stated in the trusts policy. He was also given Furosemide to treat his oedema, which often occurs in some lung disorders, as well as pulmonary oedema (Henry 2004).

Another aspect of Jim's care was nutrition which was an important aspect of his care in order to aid the healing process. After the haemorrhage Jim's body used more energy as his body metabolised at a higher rate and therefore his nutritional requirements increased (Perel et al 2006). Nutrition is therefore especially important to give the body all the nutrients required to repair itself, such as protein. A naso gastric (NG) tube had been inserted in A and was used to enable Jim to get the correct level of nutrition, after being assessed by the dietician.

NG feeding was considered safest for Jim in order to avoid the risk of Jim aspirating his food due to his ineffective swallow and cough reflex as a result of the tracheostomy and the damage caused to his brain. An effective cough relies on full closure of the glottis and this is prevented with a tracheostomy (Adam, Osborne 2005). Despite Jim having a weak cough reflex, it would be difficult if not impossible for him to be able to clear his secretions or any aspirated food clearly (Woodrow 2002).

Communication was important for all nurses and the SN involved in Jim's care, they needed to be aware of their own communication skills both verbal and non-verbal and used touch to calm and reassure him, as well as a calm tone of voice. Using the correct eye contact was also very important as Jim was unable to speak, these communication skills were also used when speaking to his family, as it was important the communication was effective to ensure their understanding of Jim's condition and to keep them updated (Bach, Grant 2009). As Jim was immobile he was at a high risk of developing pressure sores.

On admission to ITU the SN, with supervision, carried out a Malnutrition Universal Screening Tool (MUST), to ensure he was receiving adequate nutrition including trace elements and protein, if he was lacking in any of these, he would be more susceptible to pressure sore development (Nicol et al 2008). The SN also completed a Waterlow assessment, which was update weekly or when then was a change in Jim's condition, which considers all aspects of Jim's condition, such as his immobility, being mechanically ventilated and areas of broken skin already on his sacrum.

Due to Jim’s high risk he was supplied with a pressure relieving air mattress and his position was changed every two hours to prevent further damage and allow the broken areas to heal. Jim had his tracheostomy dressing changed daily, and more frequently when indicated, for example if the dressing was obviously soiled which helped to prevent infection (Woodrow 2002). To change Jim’s tracheostomy dressing required two people, as is the case with all patients with tracheostomy’s, in order to prevent displacement of the tracheostomy or it being accidentally removed.

The stoma area was cleaned and re-dressed using an aseptic technique, the nurse and SN would observe any signs of infection including inflammation, colour and exudate. This is because the area around the tracheostomy site is an ideal site for micro-organism colonisation (Woodrow 2002). In conclusion the SN was able to participate in maintaining Jim’s airway under supervision and prioritised suctioning and oral care however, it is important to consider the other important factors of Jim’s care. Maintaining his airway was prioritised as it is essential to maintain life.

At the beginning of this assignment the SN did not realise exactly how important oral care was at preventing life threatening infections of the respiratory tract and did not understand the importance of prioritising oral care. Woodrow (2006) explains that hygiene is a fundamental activity of living, yet oral health remains largely neglected qualified nurses are often lacking adequate knowledge to perform mouth care and therefore the SN ensured it was carried out correctly. Protection from infection, micro-organisms may by pass low pressure ETT, ETT tapes are often heavily contaminated with bacteria.

Prioritising of care in any acute area is very important, especially in an area such as ITU, where the patients' conditions are frequently changing. The nursing care should always prioritise airway first, following the ABC method. The SN has gained a valuable experience providing high quality and controlled care. Appendix One Name: Jim Bennett (a pseudonym has been used for confidentiality purposes) Age: 56 Sex: Male Marital Status: Married Social: Two bedroom home owner Occupation: Unemployed, engineer Allergies: None Known Past Medical History: ?

Hypertension? Arrived: 10/05/2010, 0800 Complaint: Spontaneous, non-traumatic, sub-arachnoid haemorrhage Mode of Arrival: Ambulance Source of Referral: Himself/wife History: Jim was due to attend an interview the morning of his admission, he complained of a sudden headache and collapsed at home, his wife explained he became easily stressed. Paramedics noted a blood pressure of 210/100 and left sided facial drooping. On arrival to A his GCS was 14, when his GCS dropped to 12 he began to vomit and a nasal gastric (NG) tube was inserted.

Within 3 hours Jim's GCS had dropped to 8, the results of a CT scan showed this was caused by a spontaneous, non-traumatic, subarachnoid haemorrhage. With a GCS of 8 Jim was intubated with an endotracheal tube (ETT) in A&E to allow him to be safely transferred to Hurstwood Park ITU where a percutaneous tracheostomy was inserted on the 15. 05. 2010 and monitoring of his CPP, he was then transferred to Princess Royal Hospital ITU after his haemorrhage was no longer consider critical, to continue treatment and begin the weaning process. Reference List Adam, S. , Osborne, S. 2005.

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