

Post-operative prevention of pulmonary complications



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Introduction

Based on scenario 1, Mr Man is now in post-operative day-1 for triple Coronary Artery Bypass Grafting (CABG) due to triple vessel disease with preserved left ventricle function.

Firstly, patient complained about incisional pain during cough. There will be raise in intrathoracic pressures(300mmHg) and expiratory velocities(800km/h) during vigorous cough. (Polverino M. et. al, 2012). Thus, the high pressure created will cause pain over the incision site. Coughing keeps the lungs clear and work optimumly. Normal ciliary action works to maintain patency of airways. The amount and thickness of bronchial secretions will be increased due to the effects of anaesthesia. (Davis J. R., 1973). So, coughing is important after thoracic surgery to prevent pulmonary complications by removing secretions.

Secondly, patient has diminished thoracic movement after the surgery which might be caused by pain. Postoperative pain increases the risk of the patient to develop many complications especially dysfunctions of the respiratory system. Pain causes reflex muscular tension which leads to difficulty in carrying out activities of daily living or even immobilizes patients. (Zubrzycki M. et. al, 2018). The patient experienced pain over the incision site and it causes reflex muscular tension which results in diminished thoracic movement. The diminished thoracic movement will lead to dysfunctions of respiratory system. Osborne (2009) argues that the change in thoracic volume is caused by muscle contraction. It then changes the alveolar pressure that assist air flow into the lungs by pressure difference. So, when

patient has diminished thoracic movement, there will be reduced air flow into lung.

Thirdly, patient is having shallow breathing with increased respiratory rate (25bpm). Coronary bypass surgery usually takes between three to six hours and general anesthesia (GA) is required. (Mayo Clinic, 2018). GA causes respiratory impairment and also affects oxygenation and removal of carbon dioxide. (Saraswat V., 2015). Pharmacological agents used in anaesthesia affects the contraction of respiratory muscles, it might even last for some time after the end of the operation. (Siafakas N. M. et. al., 1999). Patient's shallow breathing pattern can also cause by incisional pain. (El-Kader S., 2011, p. 51). A research was carried out in 1991 by Tulla H. et. al found that after surgery in supine position, there is an increase in the contribution of rib cage to tidal volume suggesting reduced motion of the diaphragm. The shallow breathing in combination with increased ventilatory demand, impaired gas exchange and the surgical trauma may lead to postoperative respiratory complications.

Lastly, patient also complain of slight pain and swelling over the affected peripheral limbs. This causes patient to be reluctant to move his limbs. Pain is caused by the damage done to tissue by the incision and the procedure itself. When patient does not move the limb, movement of water from the interstitium into the capillaries or lymphatic vessels will be decreased thus results in edema. In a research carried out by Suehiro K. et. al. in 2014 found that venous stasis is the main cause of leg edema in immobile patient due to the immobility. A lower extremity deep vein thrombosis (DVT) is a common complication after musculoskeletal injury or surgery. This is because of <https://assignbuster.com/post-operative-prevention-of-pulmonary-complications/>

prolonged immobilization, or bed rest after the surgery or injury and is attributed to venous stasis, injury to and inflammation of the walls of a vein, or a hypercoagulable state of the blood. (Kisner C. and Colby L. A., 2012, p. 359). On the other hand, reduced upper limb movement will cause shoulder stiffness and sore as well. Thoracic movement will also be restricted due to the tight scar tissue. (UPMC, 2011).

Main Body I & II

According to the case scenario, the first problem I prioritized on is incisional pain during cough. Several treatment methods can be used to prevent secretion retention like supported cough, suction and flutter. Supported cough is the most appropriate method to overcome this problem. Suction is sometimes used in hospital to help in keeping patient's lungs clear but coughing is more effective. (verywellhealth, 2018). Supporting the wound helps to stabilize thoracic cage and reduce stress on the osseous, cartilaginous and other connective tissues manipulated by surgeon thus, reduce pain during coughing. Mentally, it provides confidence for the patient to cough. (Julio F Fiore et. al., 2008). In addition, the support prevents dehiscence (opening of the incision site). (verywellhealth, 2018). The supporting can be done by the physiotherapist or actively by the patient. This is done by placing unoperated arm across the front of the thorax and over the incision and drain sites. Then, apply firm pressure over that region during coughing. Towel can also be used in support coughing by passing it from the back of the patient and pull across the front to provide firm pressure. (Dyson A., 2011, p. 208-209).

Next, to increase thoracic movement, segmental breathing is the most appropriate treatment method. Segmental breathing exercises are used to improve localized lung expansion of specific segments. It helps to increase and redistribute ventilation, improve gas exchange, aid in re-expansion of air spaces, mobilize the thoracic cage, and increase the strength, endurance, and efficiency of the respiratory muscles. (Rodrigues J. & Watchie J., 2010, p. 316-317). A research was carried out to evaluate the effectiveness of deep breathing versus Segmental Breathing Exercises on Chest Expansion in Pleural Effusion in 2015 by Sambhaji B. Gunjal et. al.. The result obtained in this study indicates that, segmental breathing is more effective than deep breathing exercise. For the subjects who had done deep breathing exercise showed significant improvement of chest expansion at middle and lower lobe of lung. While for the subjects who did segmental breathing showed highly significant improvement in all the lobes of the lung, especially middle and lower lobes. There are several types of segmental breathing like, lateral costal expansion, posterior basal expansion, right middle lobe or lingula expansion and apical expansion. Dr. Shehab M. Abd El-Kader (2011) noted that in the first and second day after thoracic surgery, unilateral lower thoracic expansion for both sides of the chest should be emphasized.

Thirdly, to overcome rapid shallow breathing pattern, physiotherapy techniques like breathing control, incentive spirometry and positioning of the patient can be applied. Breathing control and positioning is the most appropriate method for this patient. Positioning of the patient before facilitating any breathing pattern brings better outcome of the treatment.

Positioning patient in certain position in bed helps to maintain bronchial

hygiene and improve ventilation potential. Upright posture (sitting, standing) can maximize the patient's mechanical advantage of breathing. (Massery M. & Frownfelter D., 1987, p. 383-384.) Diaphragm can be raised and can even help in facilitating its contraction during inspiration in sitting or standing leaning position. This effect can also be seen in the side lying and high side lying positions. (Barbara W. A. & Pryor J. A., 1998, p. 138). Breathing control is normal tidal breathing using the lower chest with upper chest and shoulders relaxed. It is commonly known as diaphragmatic breathing. It helps to decrease the work of breathing and improve efficiency of respiratory muscles. It can be used to teach the patient how to respond to and control breathing. It also enables patients to feel self-control and confidence in managing the condition. (Massery M. & Frownfelter D., 1987, p. 389-391). Inspiration is the active process by contracting the muscle. Whereas expiration is a passive process which the diaphragm relaxes. Both inspiration and expiration should be barely audible. Inspiration through the nose allows warming, humidifying and filtering of the air while inspiring through the mouth will reduce the work of breathing as resistance to the flow of air is reduced. (Barbara W. A. & Pryor J. A., 1998, p. 137-138).

Lastly, to prevent poor lymphatic and blood circulation, I suggest active exercises and elevation of limbs. According to WHO, immobility is one of the factors that may lead to the development of a blood clot in a deep vein. To prevent DVT, Kisner C. and Colby L. A. (2012) have stated that elevating the legs and initiating ambulation as soon as possible after surgery can help in preventing DVT. Active "pumping" exercises (active dorsiflexion, plantarflexion, and circumduction) performed regularly throughout the day in

supine position can also help to prevent DVT. Active free exercises not only help in preventing DVT, it also helps to prevent edema. Goddard Ayanna A. et . al. found that calf muscle pump (CMP) stimulation does help in treating peripheral edema in a research carried out in 2008 to evaluate reversal of lower limb edema by CMP stimulation. Besides that, a research was carried out in 2015 by Ahmadinejad M. et. al. found that raising upper limb could be efficient to reduce hand edema. When limbs are elevated slightly above the level of the heart, extra fluid move back towards the heart for circulation to the rest of the body. This can be done by elevating the foot of the hospital bed or by using pillows. While to prevent stiffness to the affected upper limb, active exercises like shoulder shrug and raising arms to the shoulder level can be done to maintain the mobility of the shoulder joint. Apart from that, these can help to mobilize the wound and prevent tissue tightness. (UPMC, 2011).

Main Body III

To assess the effectiveness of cough, auscultation is the outcome measure that can be used. Auscultation assesses airflow through the trachea-bronchial tree and helps to distinguish between normal and abnormal breath sounds which might indicate some pulmonary conditions. (Sarkar M. et. al., 2015). It is the process of listening to and interpreting the sounds produced within the thorax. So, it must be carried out in a quiet room, with the chest exposed to prevent any interruption to ensure the accuracy. The patient is instructed to take deep breaths through an open mouth, to prevent interference with the breath sound by turbulence within the nose. There are many variations in the intensity of breath sounds (normal, diminished, <https://assignbuster.com/post-operative-prevention-of-pulmonary-complications/>

wheezing, rhonchi and crackles) depending on chest wall thickness. In the case of fluid retention, scattered or localized crackles, with or without wheezes can be heard and it may move with coughing. (Middleton S. & Middleton P. G., 2001, p. 17-19).

Next, to assess the effectiveness of segmental breathing, I suggest chest excursion. It is assessed by palpation as observation provides poorer accuracy. When doing this, the patient will be instructed to expire slowly and breathe out as much as possible. At residual volume the examiner's hands are placed at the posterolateral segments of both bases, with the thumbs touching in the midline posteriorly. The patient is then instructed to breathe in slowly and the movement of both thumbs is observed and measured. If both sides move equally, with 3-5 cm of distance between two thumbs, then the patient's lung expansion is considered normal. This technique can be used anteriorly to measure basal movements. In all cases, diminished movement and unequal movement is abnormal. (Middleton S. & Middleton P. G., 2001, p. 15-16)

Lastly, I suggest measurement of respiratory rate (RR) to assess the effectiveness of breathing control and positioning. RR, or the number of breaths per minute, is a clinical sign that represents the movement of air in and out of the lungs. A change in RR occurs when the body tries to maintain oxygen delivery to the tissues which indicates that there is some problem with patient's pulmonary function. Other aspects of respiration like the depth, pattern and effort of breathing should be interpreted as well along with RR. (Kelly C., 2018). There are several types of breathing patterns for

example, eupnoea (12-20bpm), tachypnea (> 20bpm) and bradypnoea (<12bpm). (Wheatley I, 2018).

Conclusion

In conclusion, I found that prevention of pulmonary complications is vital post-operatively. According to few studies, pulmonary complications like atelectasis and pneumonia are prevalent in post cardiac surgery. So, physiotherapy management should be started as early as possible after surgery. The treatment approaches I suggested (supported cough, segmental breathing and breathing control) are mainly to prevent pulmonary complications by removing secretion, improve chest wall movement and improve Mr. Man's breathing pattern. To check the efficacy of the treatment approach, I will assess Mr. Man with the outcome measures I suggested before and after the treatment session. Lastly, I will advise Mr. Man to move his upper limbs to aid respiration.

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