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Surgical Success, Post-Op Mess: Nursing Management of the Critical Post-Op Patient

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SURGICAL SUCCESS, POST-OP MESS: NURSING MANAGEMENT OF THE CRITICAL POST-OP PATIENT

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All post-operative patients require careful monitoring to ensure the patient has a successful recovery from surgery and anesthesia. Those patients considered critical require advanced nursing care in order to maximize the potential for a positive outcome. It is important for the veterinary technician to have a global approach to these patients and be able to consider multiple factors at the same time.

Several factors contribute to a patient being classified as "critical". The vital signs may be unstable, or not within normal limits, the patient may have altered mentation or consciousness, and indicators may be unfavorable for that patient. Some common surgical emergencies that often result in having an unstable post-operative patient include; septic abdomen, hemoabdomen, cholecystectomy, abdominal or thoracic mass removal, gastric dilatation volvulus (GDV), gastro-intestinal (GI) foreign body removal or other GI obstruction, and diaphragmatic hernia repair.

Recovery from Anesthesia

Anesthesia inherently causes respiratory depression. The critical patient may be affected much more severely. During the post anesthetic period, close attention must be given to the ventilatory status of the patient. Patients should remain intubated with a cuffed endotracheal tube as long as possible until the swallow reflex fully returns, as vomiting and/or regurgitation of stomach contents is a strong concern during the post-operative timeframe. If the patient regurgitates prior to extubation, the oropharynx should be judiciously suctioned prior to extubation to reduce the risk of aspiration pneumonia. After extubation, the patient should be carefully observed for respiratory quality and effort, as well as respiratory rate. Animals who have undergone prolonged procedures are at risk of developing lung atelectasis and may show signs of hypoventilation during the recovery period. Anesthetic agents such as anesthetic gases and opioids can potentiate this risk. End-tidal CO2 measurements can be taken non-invasively while the animal is still intubated during recovery. If the patient is found to be hypercapneic, intermittent breaths can be given manually via the anesthetic machine or with an Ambu bag.

While intubated, 100% oxygen should be delivered to the patient recovering from anesthesia to prevent hypoxia. Pulse oximetry readings should remain above 95%. Hypoxia is a known risk associated with those patients who have underlying lung disease, cardiac disease, thoracic trauma, pneumonia, or atelectasis. Following extubation, oxygen levels should continue to be monitored via pulse oximetry or by arterial blood gas analysis. Supplemental oxygen should be provided in the arterial blood gas analysis. Supplemental oxygen should be provided in the immediate post-operative period of any critical patient and can be delivered by mask, oxygen cage or via nasal cannulas. Critical patients often are at risk for hypotension. An anesthetic episode to a critical patient will increase the risk for hypotension, which further exacerbates oxygen delivery causing hypoxemia. The patient's blood pressure should be carefully monitored during the post-operative period to assess the need for intervention. In the critical patient, it is ideal to have an arterial catheter in place to obtain constant, direct, blood pressure measurements. If this is not available, Doppler or oscillometric machines can be utilized. The technician should pay close attention to cuff size to ensure accuracy and, ideally, the blood pressure should be taken at the same sight so that trends can be identified. Many factors can be the cause of hypotension in a critical patient. Careful consideration of the patient's underlying problem(s) can help identify potential causes and guide in the selection of treatment. Anesthetic drugs can worsen the potential for hypotension with their vasodilatory and cardiac depressant effects.

Vital Signs

Temperature, Pulse, Respiration and Blood Pressure are all considered "vital signs" in that they must all be considered to be within normal limits for that species in order for that patient to be considered normal. It is important to understand normal differences between species. In addition, the recognition of subtle changes of vital signs must be paid close attention to in this population of patients as a small change in one or more parameters may indicate bigger global changes in that patient. Pain is considered to be the "Fifth Vital Sign" and the impact of pain on physiologic parameters is now better understood.

Temperature

Critical and anesthetized patients have strong potential for thermoregulatory issues. Strong efforts should be made to prevent hypothermia before it occurs. The patient should be protected from cold surfaces such as exam tables

during the surgical prep time. The use of circulating warm water blankets, forced air patient warmers, such as the Bair Hugger, veterinary specific patient warming blankets, such as the HotDog, should be used pre, intra and post-operatively. Warm water bottles, heating pads and electric blankets should never be used, as there is a strong potential for thermal burns, especially in this patient population. The patient's temperature should be taken frequently upon recovery and hourly until stable. Hypothermic patients may take longer to recover, as elimination of anesthetic gases is slower. Core body temperature is the measurement of tissues whose temperature remain relatively unchanged, such as organs found in the thoracic and abdominal cavities as well as the cerebrum. The peripheral body temperature can vary significantly and is affected by environmental influences, activity level, and vascular responses. Hypothermia can have cardiovascular effects such as bradycardia, hypotension, and cardiac dysrhythmias. Hypothermia can have cardiovascular effects such as bradycardia, hypotension, and cardiac dysrhythmias. Respiratory effects include decreased respiratory rate and depth (effort), lung tissue injury, and hypoxia. Hypothermia can have neuromuscular effects, cause acid-base derangements, impair coagulation, effect renal and hepatic function, and impair immune function. Re-warming should be done cautiously with rate and technique dependent on the severity of the hypothermia and with the patient's condition in mind. There can be complications associated with re-warming. Re-warming shock occurs when the surface re-warming causes peripheral vasodilation which may cause hypovolemia and hypotension. Core body temperature can actually drop due to colder peripheral blood returning to the core. Re-warming acidosis occurs when lactic acid is carried back to the core from the periphery.

Passive External Warming: Passive external warming is used for mild hypothermia cases when the shivering reflex is still present. The goal is to minimize the loss of the patient's own heat generation by the use of blankets, etc. This also assists in the prevention of further loss.

Active Re-Warming: Active re-warming involves active external warming with exogenous heat applied to the skin via methods such as forced air or resistive heating. The use of radiant heat should be avoided.

Active Core Re-Warming: Active core re-warming is done by applying exogenous heat to the core organs by a variety of methods such as warmed, humidified air, heated infusions or warm peritoneal or thoracic lavage.

The goals of hypothermia correction is to prevent further decreases in CBT using a safe and steady re-warming rate while continually evaluating the stability of cardiopulmonary parameters.

Human medicine has explored the use of therapeutic or permissive hypothermia with the goal being to have neuroprotective effects especially in post cardiac arrest situations. More evidence is needed to determine therapeutic efficacy in veterinary patients.

Heart Rate

Heart rate and pulse are often used interchangeably, but they can be different. In addition, the subjective assessment of pulse quality can be helpful information in patient assessment. Normal heart rate in dogs is 70-120 bpm. Cats, 140-200bpm.

Bradycardia: Bradycardia is unusual in the critically ill. A heart rate <120 bpm in a cat is cause for strong concern. Decreased cardiac output and poor perfusion are associated with bradycardia. Bradycardia can be a clinical sign of electrolyte imbalances such as hyperkalemia, or increased ICP. It can also be associated with cardiac conduction disturbances such as A-V block or sick sinus syndrome. In the case of a post-operative patient, bradycardia may be a drug side effect from anesthetic or analgesic drugs.

Tachycardia: Tachycardia is more common in the critical patient and can be caused by a variety of factors such as decreased blood volume, pain, anxiety, hypoxemia, systemic inflammation, and hypotension. The body increases its heart rate in an effort to increase cardiac output and increase oxygen delivery. This is only sustainable to a point due to the fact that eventually stroke volume is decreased due to limited diastolic filling.

Pulse Quality (Pulse Pressure): Pulse pressure is the difference between systolic and diastolic blood pressure. What is thought to be "good" pulse quality is not necessarily an indicator of adequate perfusion. Both femoral and dorsal pedal pulses should be felt for comparison. A palpable dorsal pedal pulse indicates a systolic blood pressure of equal to or greater than 80mm/Hg. Since critical post-operative patients are at increased risk for cardiac arrythmias, patients not on a continuous ECG monitor should have simultaneous pulse palpation with thoracic auscultation. The presence of pulse deficits, irregular pulses, or asynchronous pulses with ausculted heartbeat is an indication for an ECG. Weak pulses are indicative of decreased cardiac output and/or peripheral vasoconstriction.

Respiration

Respiratory rate should be closely monitored in the post-operative critical patient. Normal respiratory rate is considered to be 12-30 bpm. In addition to respiratory rate, the respiratory effort, pattern, and character should also all

be assessed. A respiratory effort scale (1-4) can be used in this assessment. Respiratory patterns and character can be used to help determine the location of respiratory impairment.

Obstructive Respiratory Patterns: Obstructive Respiratory Patterns are associated with upper airway disease such as laryngeal paralysis, brachycephalic syndrome, or tracheal collapse. Long, slow inspiratory time along with an increased breathing effort is associated with this pattern. The patient may have an abdominal component to its breathing effort and they may exhibit orthopnea.

Lower Airway Disease: Expiratory distress is associated with lower airway disease, such as feline asthma and bronchitis. There is often normal inspiration, with exaggerated, prolonged exhalation.

Parenchymal Disease: There is no specific pattern which indicates parenchymal disease and, in fact, other respiratory patterns may be present. The patient may have signs of severe respiratory distress, and cyanosis. Examples include pneumonia, heart failure, non-cardiogenic pulmonary edema, pulmonary contusions, or pulmonary hemorrhage.

Restrictive Pattern: Short, shallow, rapid breaths may be indicative of pleural space disease such as pneumothorax, pleural effusion, diaphragmatic hernia, or rib fractures.

Kussmaul's Breathing: Kussmaul's breathing is generally not due to respiratory disease. It is associated with diseases such as DKA, renal failure and metabolic acidosis. Long, slow, deep inspiration and expiration are associated with this breathing pattern and is due to an effort to correct hypercapnia.

Many factors can contribute to respiratory distress including shock, anemia, hyperthermia, pain and stress. Auscultation skills are important. Cardiac and thoracic auscultation should be done frequently- at least 2 times per shift. Subtle changes may indicate fluid overload, or other pulmonary dysfunction. Fluid overload can be associated with stertor and wheezes in the upper airways with quiet crackles in the lungs. Crackles can be heard with pneumonia, pulmonary edema, pulmonary hemorrhage, and small airway disease. The absence of lung sounds or diminished lung sounds are associated with pleural space disease, pulmonary consolidation, pneumothorax, or pleural effusion. There is often the challenge of differentiating abnormal lung sounds versus upper airway referred sounds such as with brachycephalic breeds. It is important for the veterinary technician to be able to confidently auscult the critical patient.

Evaluation of Oxygenation

Arterial blood gases and pulse oximetry are tools used to assess oxygenation of the patient. Pulse Oximetry is the measurement of oxygenated hemoglobin with the goal of an SpO2 of >95%. The limitations of pulse oximetry are that the difference between normal oxygenation and hypoxemia is only a few saturation percentage points. Small changes in SpO2 represent large changes in PaO2. When hypoxemia is suspected, an arterial blood gas is the best tool to use to assess oxygenation and the potential need for intervention or ventilatory support. Arterial catheters allow for arterial blood sampling for blood gasses. Arterial catheters are associated with some degree of risk such as bleeding, infection, and thrombosis.

Blood Pressure

Blood pressure is an important parameter to measure in the critical patient. It is relatively easy to obtain and provides very useful information in patient assessment.

Direct Blood Pressure: Direct blood pressure requires arterial catheterization and a pressure transducer. Often arterial catheters are placed pre-operatively and can be a very useful tool for the post-operative monitoring period as well. Continuous readings are obtained and there is a much greater degree of accuracy. Having an

Indirect Blood Pressure: Indirect blood pressure measurement is readily available, less invasive and less expensive. It can be obtained via an oscillometric machine or a Doppler. Doppler ultrasonography is more sensitive in smaller patients (<10kg) but only provides a systolic measurement. In cats, there is evidence that the measurement may be more of an indicator of mean arterial pressure instead of systolic. Oscillometric Sphygmomanometry provides systolic, diastolic, and mean arterial pressure readings. There is less patient handling required for this method that can be advantageous when dealing with a critical patient. It does tend to be less accurate with smaller patients and is less accurate with patient motion and arrythmias.

Hypotension: Hypotension is a common complication seen in critical post-operative patients. Early recognition is vital for successful intervention. A patient is considered to be hypotensive if the MAP is <80mm/Hg (oscillometric) or a systolic BP of <90-100 mm/Hg (Doppler). It is important to know that tissue perfusion is impaired with a MAP of 60-65mm/Hg. Signs of hypotension include tachycardia, pale mucous membranes and prolonged capillary refill time, cool distal extremities, weak peripheral pulses, and altered mentation. In cats, bradycardia may be present. In general, there are three major causes of hypotension; Reduction of pre-load (hypovolemia), reduction of cardiac function, and reduction in systemic vascular resistance. Hypotension can be treated with the administration of crystalloid and/or colloid fluids, and vasopressors.

Pain Management

The veterinary technician plays an important role in being the patient advocate, especially when managing pain. Dysphoria and pain can often produce the same clinical signs and it is important to be able to differentiate between the two. Inadequately managed pain is known to have detrimental effects on wound healing as well as having the obvious detrimental effects on patient quality of life. Poorly managed pain can also affect the patient's physical parameters such as blood pressure and heart rate as well as respiratory rate and effort, to the degree that it can even cause hypoventilation. If the patient's pain is believed to be adequately managed, and the patient still exhibits signs of anxiety and agitation, anti-anxiety or mild sedative medications should be considered in conjunction with analgesics. Initially, analgesics should be administered on a scheduled basis and not on an as needed basis as it is often difficult to alleviate pain once it becomes severe. Severe or break through pain may require higher doses to manage, which can consequently cause a greater degree of undesirable sedative and depressant effects of the analgesic drugs.

Nutritional Support

Early nutritional support is crucial to support healing and recovery of the critical patient. Critical patients have increased and specific nutritional needs. There needs to be a daily reassessment of the patient's nutrition plan. Enteral nutrition is preferred whenever possible to prevent enterocyte destruction which can lead to an increased risk of sepsis due to bacterial translocation. Parenteral nutrition may be indicated exclusively or in conjunction with enteral feeding. Airway protection is an important factor when considering a nutritional plan, as aspiration pneumonia is a common complication in recumbent, critical patients. Nasoesophogeal and nasogastric feeding tubes are easily placed immediately post-operatively. An NG tube allows for gastric decompression and residual emptying. NE and NG tubes are limited to liquid diets. Radiographic confirmation of correct placement is required. Providing the patient with several different food types and textures can encourage the initiation of eating on their own. Some animals may need to be hand fed and fed with encouragement until their full appetite returns. Force-feeding is undesirable and increases the risk of aspiration along with the development of food aversion.

Critical patients require an above and beyond mindset from the nursing staff. Vital sign parameters should be measured frequently and trends should be observed. The technician should be able to critically think beyond "normal" values and investigate if one deviating parameter may actually indicate a different or concurrent developing problem. Expensive medical monitoring devices provide vital parameters and information that is extremely useful in guiding the veterinary team; however, there is no substitute for excellent nursing care. Patients must be monitored frequently for contamination of surgical incision sites, catheter sites, and wound sites for evidence of soiling due to urination, defecation, or other contact with possible contaminated environments. Gloves should always be worn when caring for any wounds, catheter sites, or incisions. I.V. injection ports should always be swabbed with alcohol prior to administration of drugs.

Critical patients may be unable to move on their own making them susceptible to lung atelectasis, pneumonia, and pressure sores. Patients should be turned every 4-6 hours and ideally propped as close to sternal position as possible. Non-ambulatory animals should have passive range of motion and massage therapy performed on them to promote tissue perfusion through increased circulation.

Critical patients require a keen commitment to attention to detail post-operatively. It is very important that the patient continues to be monitored closely after the immediate anesthetic recovery period and well down their road to recovery. The commitment to excellent nursing care can significantly impact morbidity. Early detection of developing issues and intervention before they become problematic, can drastically improve patient outcome.

References available upon request.

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