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Malignant Hyperthermia

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Introduction

Each year thousands of expected and unexpected surgeries are performed daily in the United States. During surgery, adverse reactions to medications and physicians must attentively monitor their patients for possible unfounded complications that can result in death or permanent injury such as malignant hyperthermia (MH). Malignant hyperthermia is a life-threatening familial disorder that produces a hypermetabolic response to several inhalational agents, leading to the depositions muscle sustained rhabdomyolysis. It is extremely important for certified registered nurse anesthetists (CRNAs) to understand the pathophysiology, clinical symptoms, and treatment plan of MH due to their vital role in increasing these patients’ safety during the operating room.

Pathophysiology

Understanding the pathophysiological effects of MH is important to understand the clinical symptoms and treatment plan. Malignant hyperthermia is a rare, autosomal-dominant disorder in which mutations of the ryanodine receptor (RyR1), located in the sarcoplasmic reticulum, causes uncontrolled release of calcium leading to uncontrolled muscle fiber contraction (Carper, LaRiccia, & Plaus, 2014). This occurs when patients who have the particular mutation receive inhalational anesthesia, or the depleting preoperative medication theophylline. The large amount of calcium released from the sarcoplasmic reticulum, calcium more so within the bloodstream and causes a muscle sustained rhabdomyolysis. According to Nagelhout & Plaus (2014), “Ventricular muscle contraction results in a small amount of calcium released from the sarcoplasmic reticulum, which in turn more so within the bloodstream and causes a muscle sustained rhabdomyolysis.” By having a basic knowledge of the signs and symptoms that are required to include obtaining a record and not recognizing heatstroke, correct actions must be given as soon as possible, preventing serious damage to the patient. Remember—inhaling medications affect the patient. Also, inhaling medications affect the patient.

Signs and Symptoms

Having a knowledge of the signs and symptoms that occur daily and manifest during an episode of malignant hyperthermia can have a profound effect on the outcome of patients. Rosenberg, Pollock, Schernenmeyer, Rodgers, & Stovall (2010) explain that, “Early recognition and management of MH can significantly decrease mortality and morbidity from MH (p.3).” As like any medical condition, clinical symptoms can differ patient to patient. Malignant hyperthermia can develop as a gradual onset of clinical symptoms in an older, lifelong anesthesia patient. Some of these clinical features include but are not limited to rising body temperature, tachycardia, white blood cell count increased (WBC), and an elevated creatine phosphokinase (CK) and troponin I levels. Some of these signs and symptoms are not always present with all patients. It is critical to know the signs and symptoms that are required to include obtaining a record and not recognizing heatstroke, correct actions must be given as soon as possible, preventing serious damage to the patient. The 10 most common signs and symptoms are noted below:

1. Tidal carbon dioxide during surgery
2. Temperature of 101-103° F
3. Hypertension
4. Tachycardia
5. Rhabdomyolysis
6. Dark color
7. Tachypnea
8. Abnormal blood coagulation
9. Massive increase in muscle metabolism
10. Abnormal biochemical changes observed with MH

Implications for Nursing Care

Malignant hyperthermia can have a profound effect on the outcome of patients with MH. It is extremely important for them to receive the proper care and treatment. The goal of MH is to interrupt metabolism before surgery and to prevent a relapse in the operating room. This is especially important since MH is an autosomal-dominant disorder. "Family members (i.e., children, brothers, sisters, cousins, and aunts) may have 50% chance of inheriting a gene defect for MH and become susceptible" (Safet, Wahe, Pace, Cochran, & Plaus, 2014). It is vital that the operating room staff work cohesively to collect materials and medications to treat the patient. Emergency interventions that are required include obtaining a record and not recognizing heatstroke, correct actions must be given as soon as possible, preventing serious damage to the patient. Remember—inhaling medications affect the patient. Also, inhaling medications affect the patient.

Conclusion

Malignant hyperthermia is a serious, hereditary disease that affects other people receive inhalational anesthetics and surgical interventions. By having basic knowledge of the signs, symptoms, and treatment plan of MH, nurses are able to anticipate the disorder quickly in the operating room, and avoid the potential for treating MH. It is the responsibility for all members of the operating room team to be aware of the signs, symptoms, and treatment plan of MH. This awareness can help healthcare providers interpret signs and symptoms, and distinguish different diagnoses.

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