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Patricia Rabinowitz

Otterbein University, patricia.rabinowitz@otterbein.edu

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Malignant Hyperthermia Preparedness For Labor and Delivery Nurses

Patricia Rabinowitz, CRNA ,MSN

Advisor: Regina Prusinski, DNP

Second Committee Member: Kacy Ballard, DNP

Community Member: Donna Doyle, DNP

Otterbein University, Westerville, Ohio

Abstract

Introduction

Problem Statement

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Malignant Hyperthermia (MH) is a rare, inherited, disorder of skeletal muscle triggered by general anesthesia (GA) in susceptible individuals. Operating room (OR) nurses receive extensive training in MH crisis management. On labor and delivery (L&D) units, neuraxial (spinal and epidural) blocks are the safest and most commonly used anesthetics during pregnancy. GA is utilized only when the life of the mother or infant is in jeopardy or when a neuraxial block is not possible. Under these circumstances, inhalational agents and succinylcholine, both MH triggering agents, are routinely administered.

Due to infrequent use of GA in pregnancy, L&D nurses are less likely to encounter a MH crisis than OR nurses and are at risk of being unprepared for this rare, life-threatening event. At a medium sized, central Ohio trauma center, nurses are required to complete an online MH learning module annually. This learning module outlines the causes, signs, and symptoms of MH. In addition to the online learning module, OR nurses participate in a MH simulation drill where they practice hands-on MH crisis management skills. L&D nurses do not receive this additional training and could benefit from a MH simulation.



MH is a life-threatening event that can occur following the induction of GA. Succinylcholine, a depolarizing muscle relaxant, and/or anesthetic inhalation agents, can trigger a hypermetabolic response in susceptible individuals. According to Rosenberg, et al. (2003), these individuals have a defective ryanodine (RYR1) receptor. The RYR1 receptor controls calcium release. MH triggering agents used in the induction of anesthesia cause uncontrolled release of intracellular calcium. This results in a cascade of events that causes critically high temperature, extreme muscle rigidity, metabolic acidosis and renal failure (Rosenberg, et al.).

According to Gronert, et al., (2005), if the MH syndrome is not recognized and treated quickly with dantrolene sodium (Ryanodex), skeletal muscle damage, hyperthermia, and death can occur. The Malignant Hyperthermia Association of the United States (MHAUS), (2018), recommends training health care providers and having dantrolene sodium available in every anesthetizing location where MH triggering agents are used. According to Mansur, (2018), The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) addresses the need for MH protocols in L&D. Traynor, (2005), suggests that an unprepared L&D unit can forestall JCAHO accreditation.

Does an online training module in conjunction with a simulation drill provide L&D nurses with more effective strategies to handle a MH crisis than an online training module alone?

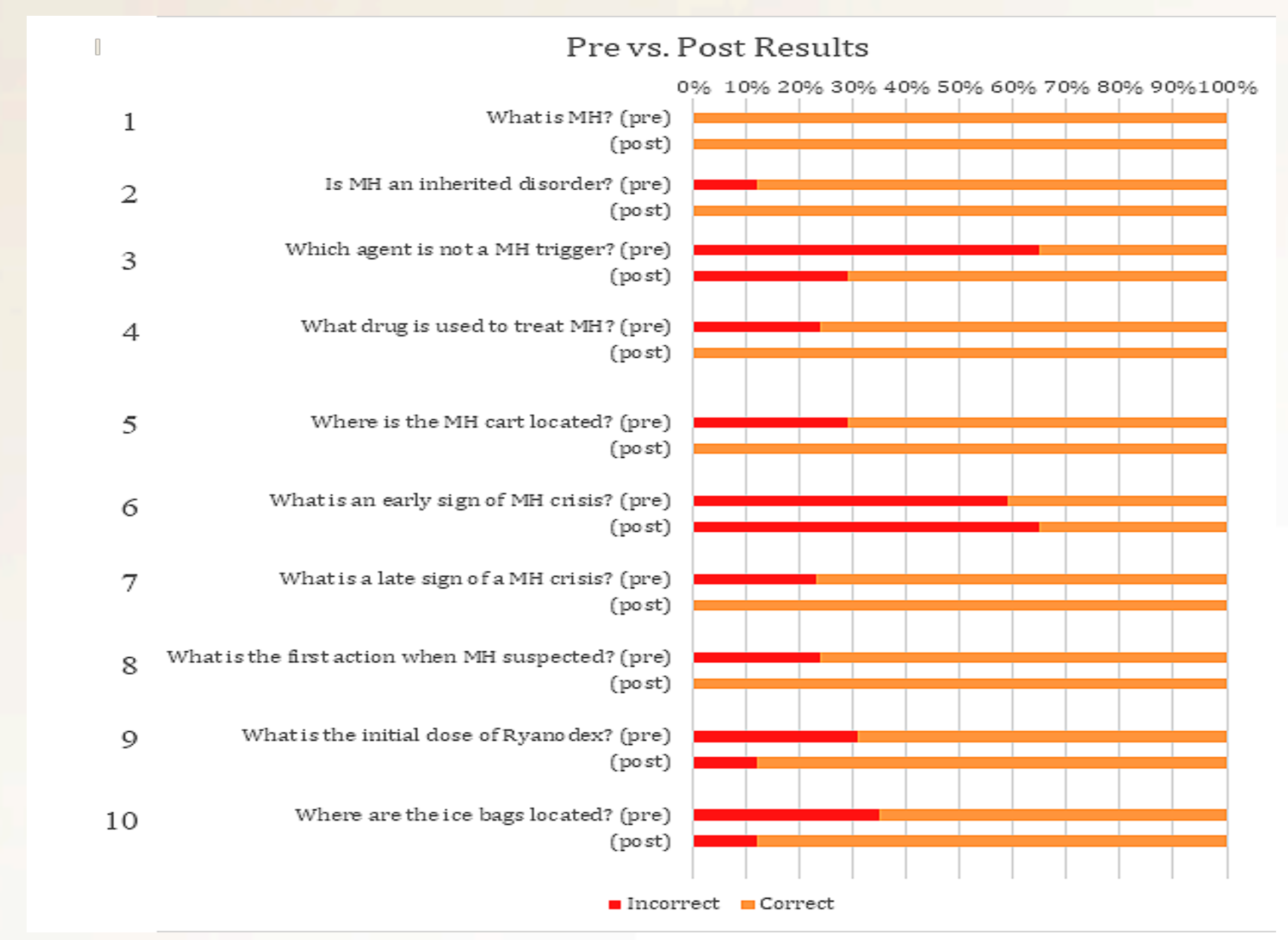
Significance

Preparation for a MH crisis and the necessity of in-house drills is supported by literature. According to Hirshey Dirksen, et al., “To give the best possible chance for a successful outcome, a swift, coordinated, multidisciplinary team response is necessary. MH occurs infrequently and... treatment, and management must be reviewed and reinforced during periodic education sessions.”

The literature is lacking in specific MH protocols for L&D. According to Cain, Reiss, Gettrust, and Novalija, (2014), many clinicians are unprepared to manage MH as “it requires the use of low-frequency, high-risk skills and procedures.” This is especially true of L&D nurses due to the infrequent use of (GA) in the L&D environment. Cain et al., (2014), developed a MH simulation drill for OR personnel. Gaba, (2004), and Waxman, (2010), support using drills to facilitate learning in high-risk industries. Crossman, (1919), reported successfully training pilots with flight simulators in World War I. Sleeper and Thompson, (2008), report that anesthesia education has included the use of simulation since 1994. For L&D nurses, MH practice drills should optimize skills, improve critical thinking, and increase problem solving.

Project Description and Design

The goal of this quality improvement (QI) project was to develop and implement a training program that teaches L&D nurses appropriate MH crisis management. The program included education on signs and symptoms of a MH crisis, location of the MH emergency cart, and appropriate medical personnel response to this lethal, rare complication of general anesthesia. In addition, a simulation drill of a MH crisis that the L&D nurses can participate in was included. The success of the education was assessed by comparing scores of pre and posttests.



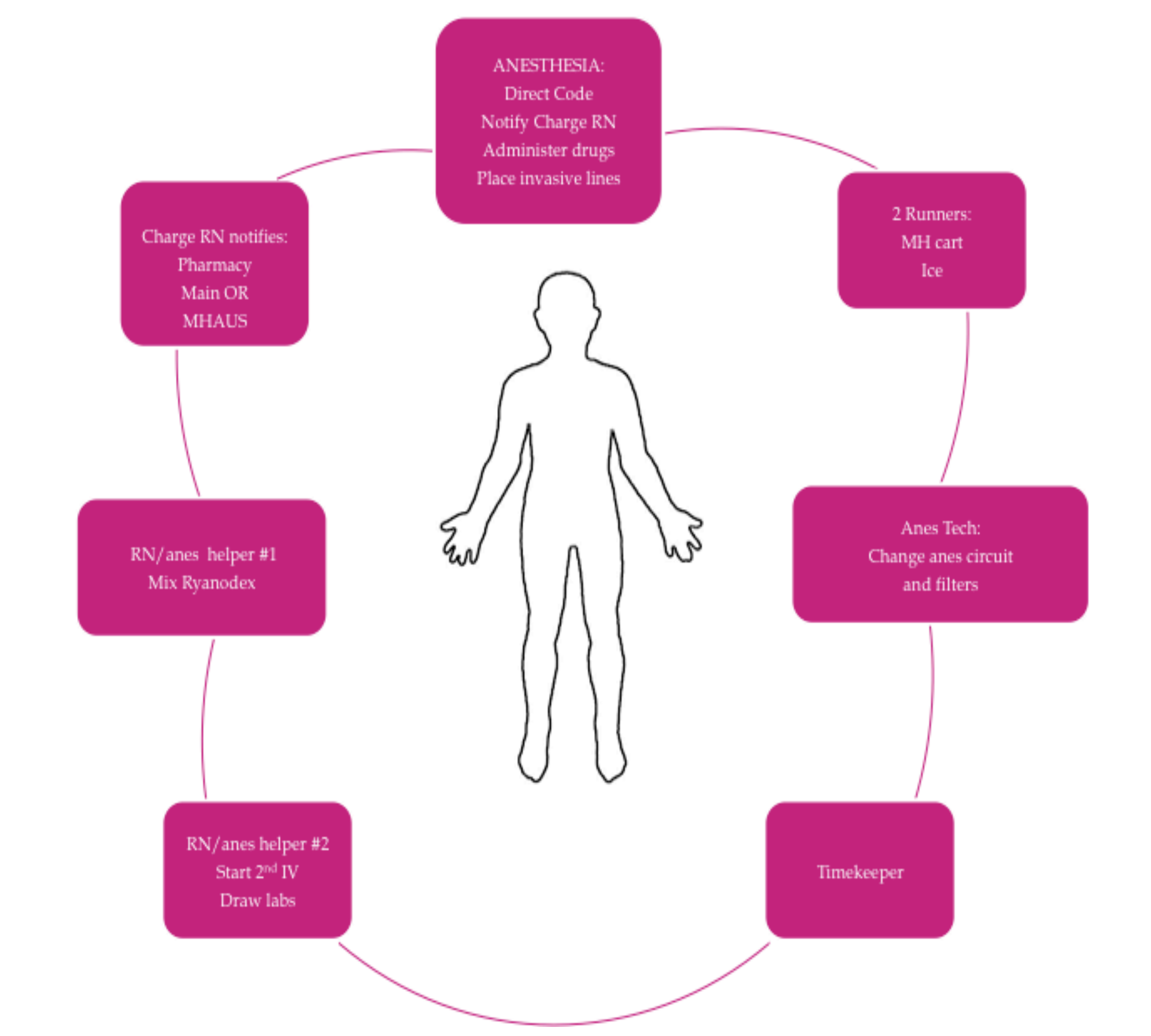
Outcomes and Evaluation

Grant Medical Center OhioHealth Research and Innovation Center used McNemar’s test for paired proportions to compare pre and posttest training responses. McNemar’s test is a non-parametric (distribution-free) test used to determine if a statistically significant change in proportions has occurred on a dichotomous trait at two time points on the same population. It “is sometimes referred to as McNemar’s Chi-Square test because the test statistic has a chi-square distribution” (Statistics How To, 2019). Response rates are recorded at time 1 and time 2 in a 2x2 contingency table. Comparing pre and posttest scores in this way assessed the success of the educational program. Results from the pre and post training rates showed statistically significant data (P- value<0.05) for two out of ten questions, question 3, “Which agent is not a MH trigger?” and question 9, “What is the initial dose of Ryanodex?” p=<0.05.

The current MH training utilized at a medium size central Ohio trauma center could be improved. Data obtained after participation in a MH educational training session and simulation drill illustrate that L&D nurses who participated in the session increased their knowledge regarding MH crisis management and are now better prepared for a MH crisis. In addition, data obtained from the post training assessment confirmed that participants in the program felt better informed about MH and their ability to manage a MH crisis.

Recommendations

Based on the data obtained, this author recommends a change in practice and training of L&D nursing staff. Including L&D nurses in MH training and drill simulations will benefit patients and improve response to a MH crisis event. This author advocates for MH training and simulation drills to be utilized in all locations where MH triggering agents are administered, including L&D units. By conducting a well-organized simulation drill for the management of a MH crisis event, patient care and safety is improved.



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