



What's TAPANing

The Official Newsletter of West Texas and Panhandle Region of TAPAN



President's Message

By Jeanette Frantz MSN, RN

Hello wesTpan,

I can't believe it is that time of year again. I hope you all enjoyed your Thanksgiving. Our house was filled with family both young and old as we gave thanks for a very blessed year.

I have to say that each leadership conference I attend gets better and better. The State Conference was unexpectedly fun! Sugar Land was a great location and I have to give a big "Thank You" to the PeriAnesthesia nurses that planned and worked the conference.

Being able to go forward and accept the awards for Outstanding Region and Best Regional Newsletter was really an unexpected pleasure. Thank you all for all your hard work and dedication to Perianesthesia nursing. It is obvious that you all work diligently all the time to make this happen. A special "thank you" goes to Edna Pabruada for her guidance to Trina and myself throughout the conference. A big thank you to the team (not sure who all to thank) that put together the notebook and to Kat for her excellent work on the newsletter.

I enjoyed all the presentations. They were timely and addressed needs that most of us struggle with daily. Armi Holcomb's presentation about children with sensory needs really provoked much thought on my part. It left me wondering if we truly do a good job screening for these children and if we meet their needs when we do have them as patients. We will be looking at our practice to examine this area of need for our pediatric patients.

Well, friends, time to roll our sleeves up and work toward the next year of achievement. If any of our regional members present at a conference, get published or are involved in any research or EBP projects, please let Kat Tollett know. Send her your achievements so we can get them printed in the newsletter. We need to encourage each other to participate in opportunities to update our practice, and adoption of the latest evidence for our practices.

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Thank you for reading the wesTpan newsletter!
We are happy to share our excitement with you! Please let us know if there is anything you would like to add!

wesTpan Region
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On an educational note, please mark your calendars for the spring seminar that we are planning to host here at Midland Memorial Hospital on June 18th, 2016. "TAPAN on the Road" will be presenting to our regional nurses during that seminar. More details to come in the very near future.

So with that I will leave you with this hope: that Ole Saint Nick comes to visit you and yours this year. From our house to yours "Merry Christmas and a very Happy and Prosperous New Year".

Jeanette Frantz, MSN, RN

President, wesTpan

State Conference 2015



Edna Pabruada, Jeanette Frantz, Trina Mora, and Sylva McClurkin at the State Conference 2015 in Sugarland, TX

wesTpan is the proud winner of the Outstanding Region Award and the newsletter award for 2015!!

A LOT of work goes into these awards! Not only is there ongoing effort throughout the year, but documentation and presentation is evaluated and judged for Outstanding Region Award (ORA). Many hours are spent all year around in many categories of service to community, TAPAN, and each other.

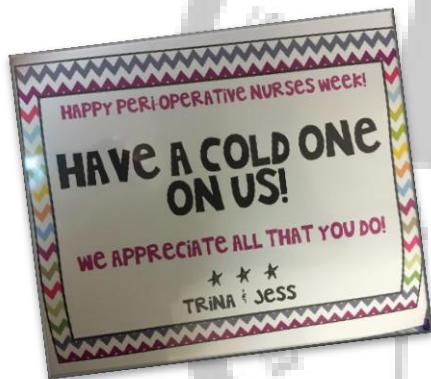
The newsletter award is amazing due to the fact that the fall issue was the first of the resurrection of a newsletter for our region. The previous issue was Summer 2013.

Many thanks go out to all of the contributors who make these efforts possible. And, thank you to the Awards Committee of TAPAN! Inspiration comes from fantastic leaders who encourage and challenge for excellence!

Thank you all!

Meet the wesTpan President

A Celebration of PeriOperative Nurses Week



Some of the POCU/PACU staff are pictured for their celebration. Midland Memorial nurses were treated to root beer and coke floats in honor of Peri-Operative Nurses Week November 9-13

I have been a nurse for 18 years and currently serve as Perioperative Education Coordinator for our Outpatient Services. The units I serve include Preadmissions, Same Day Surgery, holding, post anesthesia unit and endoscopy.

I have been employed by Midland Memorial Health for 2 years. I worked for MMH the first five years following my graduation from Midland College in 1997.

Nursing is my second career, with my first being in Quality Management for Texas Instruments from 1976 to 1990. Since becoming a nurse, I have worked in oncology, orthopedics, med-surg, critical care, hyperbaric oxygen therapy, the recovery room, and hospice and as an assistant professor for Midland College and Odessa College and briefly as a nurse recruiter.

I hold an Associate of Nursing Degree from Midland College. I attained my BSN degree from Angelo State University in 2010 and my Masters' of Nursing Education, also from Angelo State in 2013. I graduated Cum Laude with my BSN holding a grade point average of 3.79 and a grade point average of 3.33 with my Masters.

I currently hold the following certifications: ACLS, PALS, BLS and BLS instructor. I am scheduled in the fall to sit for a certification in staff development. In the spring of 2016, I will be eligible to sit for the CAPA and have plans on also obtaining that certification.

I currently hold memberships to the following professional organizations. American Nursing Association, Texas Nursing Association, American Society of PeriAnesthesia Nurses, TAPAN component, the Nursing, Society of Gastrointestinal Nursing Association and the Association for Nursing Professional Development.

Jeanette Frantz MSN, RN



Editor's Note:

What's TAPANing is the official Newsletter of West Texas-Panhandle Region.

Contributions to *What's TAPANing* are encouraged. All articles and comments relevant to Perianesthesia care must be double spaced and typed. The author is responsible for providing appropriate references for accuracy and reliability of information.

Submission Deadlines:

Feb 15- Spring newsletter
May 15- Summer newsletter
August 15- Fall Newsletter
November 15- Winter newsletter

Send comments, suggestions, and/or submissions (including individual achievements!) to: tollettk473@gmail.com

A correction to the Fall 2015 edition: A misspelling in one of the names of those who had attended the ASPAN National Conference should be corrected to read Dale O'Connell. Sincere apologies from the editor for the mistake.



• • •
Meet the westPan Vice-President
• • •

My name is Trina Mora. I am the Clinical Nurse Manager of the POCU and PACU at Midland Memorial Hospital and I am the new Vice President of the West Texas Panhandle Region of TAPAN. I graduated with my ADN Degree from Midland College in 2002. I worked approximately 3 ½ years in the Med Surg units. I then went to the Operating Room and worked for almost a year as a circulator. After that, I went to an outpatient surgical center and worked for 6 ½ years in the OR, PACU, POCU, Same Day Surgery area, and preadmissions. I became the charge nurse after 2 years of being there, and then the Clinical Manager for the last 2 ½ years. While there, I received my BSN degree from Texas Tech and became CAPA certified. In December 2012, I transferred to the Main Campus POCU and PACU as the Clinical Nurse Manager, and that is where I am still today. I am the Electroconvulsive Therapy main nurse and Coordinator for Midland Memorial Hospital. I have also received my CPAN certification. I participate in several committees and councils for Midland Memorial Hospital and also love to do community service when I can. I am a member of ASPAN, TAPAN, AONE and TONE. I help teach Tools for Success to new graduate nurses, and am a preceptor for students in their management rotation. I have applied to Texas Tech to get into the Masters Program for the Spring 2016 admission. I look forward to learning and having a lot of fun with the Vice President position of TAPAN.

Thank you very much!

Trina Mora BSN, RN, CAPA, CPAN

The officers had officially changed as of October 17th, 2015. Biographies of president and vice-president were not included in the last edition of this newsletter. We are happy to officially welcome Jeanette and Trina to the leadership positions in our region. Excited to see their new ideas flourish into action for westPan!!!

Welcome New Members !!!



Adriana Aleman, RN
Same Day Surgery Midland



Laura Newbbrough RN, CPAN
PACU Midland



Brenda Burnett, BSN
Same Day Surgery Midland



Natalie Kingston, RN, CPAN
PACU Midland



Kim Woodard RN, CPAN
PACU Midland



Curtis Sutera, BSN
PACU Midland




Cindy Brock, MS, RN
Pre-admissions Midland

Not Pictured:
Linda McDonald RN
LeeAnn Morwood BSN, RN
Allison Wyly BSN, RN
Charles Neely BSN, RN

VOLUNTEER VIEW


My name is Taylor Scheffers. I am a freshman at Abilene Christian University and I'm a Biology major with a premed concentration. Living in Chicago, I'm a long way from home, but I really am loving the weather! I volunteered at Central DuPage Hospital back home in the ER, and I really wanted to get involved in another hospital when I got down to Texas. I reached out to Hendrick Medical Center and got plugged in. I work in the post-anesthesia part of the hospital, and I love it! I didn't get as much responsibility when I was in Chicago, because I wasn't 18 yet. At



Hendrick, I get to do things for the nurses and interact with the patients (even if they are still asleep). One of the most exciting parts for me was being able to put scrubs on. I took a picture in the mirror and sent it to all of my family. When I walk to get my scrubs, I walk past the OR section and I get to see the sinks where the doctors and nurses wash before going into surgery. It's awesome being in the hospital instead of just seeing it on TV. Everyone is so nice to me too, and it just makes me even more excited to become a doctor. Overall, I truly enjoy being at Hendrick Medical Center, and I can't wait to see what God has in store for me in the next few years of my life.

Taylor is a quiet and very hard worker. Her assistance in PACU is very much appreciated. Best wishes for the holidays and a well-deserved break!

My name is Jeffrey Wooliscroft. I am a 20 year-old sophomore Biology major at Abilene Christian University and have been volunteering in PACU I since the second semester of my freshman year. My time volunteering in PACU I has been a fantastic experience. The kindness and care I was shown on my first day truly demonstrated the outstanding character of the techs and nurses in the unit. Each Wednesday, I have arrived to assist these individuals and every day I gain new experiences that have allowed me to gain a deeper understanding of the medical field. As I see patients struggle out of anesthesia and post-surgery pain on a daily basis, I watch in anticipation as I see the nurses work their magic. The amount of care and attentiveness they show for each and every patient is incredible. Regardless of the number of patients that need attending to or the often busy environment of PACU I, the nurses never fail to give each patient the amount of attention they need. I have been blessed with the wonderful opportunity to assist these individuals doing whatever I possibly can to lighten the workload. As I have worked in the unit, I have been able to observe firsthand how to care for a wide variety of patients varying from children to elderly individuals. These experiences have offered me a perspective on the medical field that I have found invaluable. Prior to volunteering in PACU I, I mistakenly failed to acknowledge the care and recovery process that is involved when individuals undergo surgery. I overlooked how much care an individual coming out of anesthesia requires. Now



that I have been able to see exactly what occurs in PACU I, I have undoubtedly gained a valuable perspective that has allowed me to appreciate the amount of effort these techs and nurses put into the care for patients. Not only has this perspective lead to a deeper appreciation for the care these

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individuals provide, it has encouraged me to continue to pursue my career goal as a medical doctor. Observing the physicians as they come to see each patient right out of surgery has been fascinating. I have been able to observe the skillful surgeons and anesthesiologists of Hendrick as they interact with their patients. Watching them ensure each of their patients is in good condition has continued to confirm the integrity and character of the healthcare professionals of Hendrick. In addition to all of these wonderful experiences, I have gained knowledge that will help me in my future endeavors. As I prepare for a medical mission trip to Guatemala this spring break, I do so with the knowledge that I have been in a healthcare environment before and am equipped to handle the challenges associated with said environment due to my experiences at Hendrick. I am so thankful for all of the incredible people and incomparable experiences I have had at Hendrick. I look forward to each new Wednesday as I continue to learn and grow in my volunteering position at Hendrick.

Curious and enthusiastic, Jeffrey's energy is infectious. Keep those questions coming and safe travels to Guatemala!

Food collection for donation to the Food Bank of West Central Texas is a year round effort for the wesTpan region!



Ellen Abaquin is pictured with several pounds of food. She is ready to deliver this batch just in time for Thanksgiving.

Save the date...

February 1-7th 2016: PANAW week
Start planning now to help promote our profession! And don't forget to take pictures of the activities!

June 18th 2016: TAPAN on the Road

A seminar is in the works! This will be a great weekend to meet some of the folks in the wesTpan region and learn about topics relevant to our practice. Further details will be available in the next newsletter and on our website: www.tapan-westtexas-panhandle.com

April 4th - May 28th 2016

CAPA CPAN testing

Registration window is open

January 11th - March 7th

Early bird registration ends

February 22, 2016

****Announcement****

Some changes are being made to the member communication practice. You will be receiving email reminders from our official email address: admin@tapan-westtexas-panhandle.com

Please be sure to add it to your contacts so you won't miss out on any happenings in our region. Also, don't forget to update your contact info through the ASPAN website.

Mission Thanksgiving 2015



Coats, blankets, and clothes were taken to Arrow Ford in Abilene to be given to those who need some warmth this winter season.

*Happy
Holidays to all*



Congratulations go to:

Kristen Abaquin Smith
passed the NCLEX exam!
Great job Kristen!
So proud of your achievement!

Kat Tollett for passing the
CPAN exam. What's the next challenge?

Volunteering: A life-Changing Experience

Submitted by Kristen Abaquin Smith GN, MM

This past August, I had the opportunity to travel to Jinotega, Nicaragua with the Texas Tech Health Sciences Center Office of Global Health. Second to Haiti, Nicaragua is the poorest nation in the Western hemisphere. The majority of the population is under or unemployed. As a result, approximately 50% of the population lives below the poverty line. Furthermore, much of the populous has little to no interaction with health care professionals. In conjunction with Misión Para Cristo, our small team of Texas Tech University Health Sciences Center (TTUHSC) students and faculty provided free healthcare and health education to the rural communities of Jinotega. Working under supervising faculty, we practiced our clinical skills including: triage, collection of patient health history, manually taking and recording vital signs, and performing head-to-toe assessment. Health-related topics such as first aid, maternal health, and prevention of sexually transmitted diseases were also presented to community health promotoras and other unlicensed health volunteers.

I wanted to participate in this health care initiative with the intention to change lives and help people; now that this trip is over, I think that it was my life that was changed.

As one can imagine, the experience was life-changing. The people of rural Jinotega live very simple lives. Of those who are employed, many of them work in agriculture, tending to vast fields of coffee and rice. Unfortunately, they have very limited means of travel, and thus, are unable to seek healthcare on their own. By traveling to these rural communities, we were able to provide the patients with necessary medicine and supplemental vitamins, as well as sound medical advice.

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In the short eight days we spent in Jinotega, our small team was able to provide healthcare to over 1,080 patients and healthcare education to approximately 40 promotoras who represented various neighborhoods.

While in the field, we had little to no access to modern technology. We were challenged to obtain our patient assessments with the few tools we brought (i.e., otoscopes, pen lights, stethoscope, sphygmomanometers, temple thermometers, urinalysis strips, and glucometers). When equipment failed or if there were not enough tools to share amongst the nurses and doctors, we had to trust our senses, gathering as much information as possible about the patient's current health state via sight, smell, auscultation, and touch. We saw patients whose diagnoses spanned the range of a urinary tract infection, to chicken pox, to torticollis, and breast cancer. Fortunately, we were each assigned local translators to assist with patient history and patient education.

less-than-ideal circumstances of language barriers, unpredictable environments, and limited supplies, we were able to function as a unit in pursuit of common goals. In fact, one of our doctors was very complimentary in stating that he was able to easily diagnose several patients based solely on the data and assessments the nurses collected.

I wanted to participate in this health care initiative with the intention to change lives and help people; now that this trip is over, I think that it was my life that was changed. As I will soon transition from the role of student nurse to that of a professional nurse, I strongly feel that my time in Nicaragua has provided me with unique clinical experiences that have influenced and will continue to shape my nursing practice, particularly in regards to teamwork, nursing assessment, patient education, health promotion, and disease prevention.

Kristen Abaquin Smith is recent senior Nursing student at TTUHSC who graduated in December, 2015. She has served as webmaster for TAPAN-wesTpan region for the past 5 years.



During my short stay in Nicaragua, I was able to witness first-hand how far health care has progressed in our own country. I was also able to experience the importance of interdisciplinary teamwork, and thus, teamwork at its best. In a setting where we were not able to depend on computers or other forms of advanced medical technology, we had to trust each other and the skills that each of us brought to the table. Despite the



\$\$ wesTpan Financial Report \$\$	
Quarterly report as of 12/1/15 totals	
INCOME (including dues, registration fees, fundraising, sponsorship):	\$409.61
EXPENSES (seminar expenses, scholarship):	\$306.77
BALANCE as of 12/1/15:	\$2,436.31

Malignant Hyperthermia

Submitted by Jon Ponder DNAP, CRNA

Malignant hyperthermia (MH) can be defined as a severe metabolic reaction that is triggered by the use of volatile anesthetics and/or depolarizing muscle relaxants (Hopkins, 2011). MH susceptible (MHS) patients have a genetic predisposition to the development MH and it is estimated to be present in 1 out of every 2000 people. However, the actual prevalence of MH episodes varies from 1 in 10,000 to 1 in 220,000 depending on the region of the world. With the recent advances in anesthesia practice, severe MH reactions have decreased in numbers and the prognosis is better for those affected (Schuster, Johannsen, Schneiderbanger, & Roewer, 2013).

Pathophysiology

Normally, during excitation-contraction coupling, depolarization of the muscle cell causes a conformational change in the dihydropyridine receptor (DHPR). This causes activation of the ryanodine receptor type 1 protein (RyR1) and the release of Ca^{2+} from the sarcoplasmic reticulum. These interactions between the DHPR and RyR1 are vital for life since they play a role in essentially all voluntary movements, including breathing (Longnecker, Brown, Newman, & Zapol, 2012).

MHS is an inherited autosomal dominant trait with accompanying incomplete penetrance and variable expressivity. At the cellular level, the defects in excitation-contraction coupling and the lack of control of myoplasmic calcium (Ca^{2+}) levels are signature features of MH. In MHS patients, triggers cause a release of Ca^{2+} from an abnormal RyR1 which leads to an exaggerated increase in intramyoplasmic Ca^{2+} concentrations. These abnormalities lead to a lethal combination of hypercontracture and hypermetabolism when exposed to volatile anesthetics and/or succinylcholine, a depolarizing muscle relaxant (Dirkson et al., 2011).

Over thirty years ago, the inhibitory role of the magnesium ion (Mg^{2+}) was first suggested to play an intricate part of the development of MH. Since that time, it has been determined to be a

substantial amount of evidence confirming that the central defect in MH is volatile agents overcoming this inhibitory effect of Mg^{2+} on the RyR1. Muscle contraction is achieved due to the interaction between the DHPR and RyR1, along with the ability of the RyR1 to overcome the Mg^{2+} inhibition. This reduced inhibitory effect of Mg^{2+} has been confirmed in humans in response to halothane and sevoflurane. However, it seems doubtful that increasing intracellular Mg^{2+} concentrations will inhibit this effect from volatile agents and possibly prevent MH (Hopkins, 2011).

Diagnostic Testing

...the actual prevalence of MH episodes varies from 1 in 10,000 to 1 in 220,000...

The caffeine-halothane contracture test (CHCT) has been the gold standard diagnostic test to confirm MH susceptibility in North America for over forty years. After a muscle biopsy is taken, the fresh muscle is then exposed to halothane and caffeine at different concentrations to elicit a response. Acquiring a diagnosis of MHS by DNA analysis of the RyR1 and DHPR genes is challenging and time-consuming. In humans, no single predominant mutation associated with MH exists making diagnosis difficult (Dirkson et al., 2011).

Trigger Agents

Both volatile agents and succinylcholine have been identified as trigger agents for MH. While the action of halothane and other agents appears to be a direct response to the RyR1, the exact physiology of the trigger role succinylcholine plays remains unclear. In studies, succinylcholine potentiated the halothane induced muscle contractions in MHS patients, but the application of succinylcholine alone could not elicit the same response. According to the North American MH registry, succinylcholine triggered MH without the

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addition of volatile agents 0.7% of the time (Schuster et al., 2013).

Overall, the probability of succinylcholine-induced MH remains low. Succinylcholine's mechanism of action may explain its role as being classified as a trigger agent. Depolarization of the

Despite hyperthermia being a part of the MH name, it is often a very late sign that signifies the ongoing metabolic breakdown.

cell membrane occurs after succinylcholine activates nicotinic acetylcholine receptors. The transient depolarization of voltage-gated receptors in conjunction with the influx of Ca^{2+} may lead to an extreme influx of Ca^{2+} and exceed the threshold for MH to ensue (Schuster et al., 2013).

On the other hand, the definite role volatile agents play in triggering MH is indisputable. However, there is a wide variation between the volatile agent used and the time until onset of an MH crisis. Halothane, which is no longer routinely used in western countries, has been proven to create MH symptoms significantly faster in MHS individuals. Fulminant MH episodes triggered by desflurane, isoflurane and sevoflurane appear to occur with a delay when compared to halothane. Also, the degree of muscle contraction and hypermetabolic state is more distinct after halothane administration compared to modern volatile agents at similar therapeutic doses. A possible explanation for this is may be due to the differing degrees of sarcoplasmic Ca^{2+} release caused by the volatile gases (Schuster et al., 2013).

Clinical Manifestations

It is not uncommon for patients to have previously undergone a general anesthetic without an MH crisis, but have a reaction after the second or third anesthetic. The earliest sign of MH onset is a sudden increase in end-tidal carbon dioxide. Metabolic acidosis quickly follows along with elevated creatine kinase (CK) levels. Masseter muscle spasm and cardiac arrhythmias such as tachycardia or tachyarrhythmias are also common.

Despite hyperthermia being a part of the MH name, it is often a very late sign that signifies the ongoing metabolic breakdown. In patients that survive the MH crisis, severe complications such as renal failure from rhabdomyolysis, congestive heart failure (CHF), disseminated intravascular coagulation (DIC) or intestinal ischemia from the uncontrolled metabolic event and myocyte death can occur (Schuster et al., 2013).

Management of MH

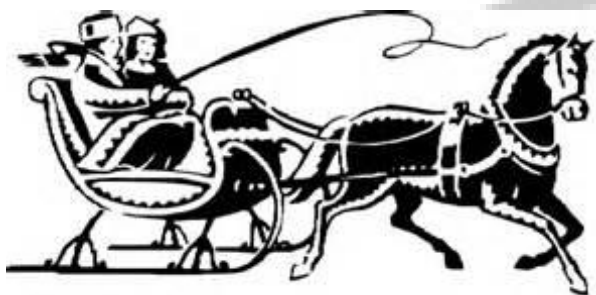
The sole treatment for MH is the administration of dantrolene, which is a direct acting muscle relaxant. By binding to the RyR1, dantrolene inhibits the sarcoplasmic reticulum Ca^{2+} release without increasing the uptake of Ca^{2+} into the sarcoplasmic reticulum (Schuster et al., 2013). There continues to be some debate on the exact mechanism by which dantrolene exerts its pharmacological effects. Some evidence proves that dantrolene may inhibit a RyR1-dependent variant of a process known as Store-Operated Calcium entry (SOCE) where Ca^{2+} is brought across the plasma membrane from extracellular stores. Also, dantrolene appears to modify other Ca^{2+} entry pathways leading to spontaneous Ca^{2+} release from the sarcoplasmic reticulum into the cytoplasm. These discoveries suggest that dantrolene works at multiple sites within the skeletal muscle to regulate calcium homeostasis. Future research determining the exact mechanism of dantrolene may also provide important understanding about the pathophysiology behind MH and other disorders of the skeletal muscle (Dirkson et al., 2011).

Practice Implications

I have yet to the opportunity to treat an MH crisis in my practice. I have participated in many drills and in-services for the staff, but I have never been involved in a true episode. I know eventually my time is coming and I believe I am prepared in the event I am faced with an MH crisis. In the seven years I have been at my facility, I can only recall 3 episodes of MH but we have about one or two patients a month with a family history of MH.

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I think we tend to take for granted the severity and frequency of MH. It is important to be reminded that MH can occur after multiple uneventful anesthetics and can even occur after the patient reaches the recovery room. These articles provided many new insights to the pathophysiology of MH and the mechanism of action of dantrolene. It will be interesting to see how this evolves in the future.



References

- Dirkson, S., Larach, M., Rosenberg, H., Brandom, B., Parness, J., Lang, R., ... Pezalski, T. (2011). Future directions in malignant hyperthermia research and patient care. *Anesthesia and Analgesia*, 113(5), 1108-1117. <http://dx.doi.org/10.1213/ANE.0b013e318222af2e>
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- Schuster, F., Johannsen, S., Schneiderbanger, D., & Roewer, N. (2013,). Evaluation of suspected malignant hyperthermia events during anesthesia. *BMC Anesthesiology*, 13(24), 1-7. <http://dx.doi.org/10.1186/1471-2253-13-24>

Jon is a full time CRNA at Hendrick Hospital. He is always willing to share his knowledge, in depth, with others. Thank you Jon!

Malignant Hyperthermia

Submitted by Amy PerryRPh, OR Pharmacy Coordinator Hendrick Medical Center

Malignant hyperthermia (MH) is a potentially fatal, inherited disorder usually associated with the administration of certain general anesthetics and/or the drug succinylcholine. The signs of MH include muscle rigidity, rapid heart rate, high body temperature, muscle breakdown and increased acid content. Immediate treatment with the drug dantrolene usually reverses the signs of MH.

Although this condition is rare, without proper and prompt treatment with dantrolene sodium, mortality is extremely high. The best way to protect yourself, your family, your patients and facility, is to be prepared before it's too late.

Emergency Treatment for An Acute MH Event

The following **four** things should be done as soon as possible:

- 1) Notify surgeon to halt the procedure ASAP: Discontinue volatile agents and succinylcholine. If surgery must be continued, maintain general anesthesia with IV non-triggering anesthetics (e.g., IV sedatives, narcotics, amnestics and non-depolarizing neuromuscular blockers as needed)
- 2) Get dantrolene/MH cart. (Call 911 if surgicenter) *****Dantrolene cart at HMC is located in the hallway by the windows between CORE A and CORE B***
- 3) Hyperventilate with 100% oxygen at flows of 10L/min to flush volatile anesthetics and lower ETCO₂.
- 4) Give IV dantrolene 2.5 mg/kg rapidly through large-bore IV, if possible. Repeat as frequently as needed until the patient responds with a decrease in ETCO₂, decreased muscle rigidity, and/or lowered heart rate. Large doses (>10mg/kg) may be required for patients with persistent contractures or rigidity.

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– DANTRIUM®(dantrolene) – Each 20 mg vial should be reconstituted by adding 60 ml of sterile water for injection and the vial shaken until the solution is clear.

- If giving large doses (> 10 mg/kg) without symptom resolution, consider alternative diagnoses.
- Obtain blood gas (venous or arterial) to determine degree of metabolic acidosis. Consider administration of sodium bicarbonate, 1-2 mEq/kg dose, for base excess greater than -8 (maximum dose 50 mEq).

Cool the patient if core temperature is >39°C or less if rapidly rising. Stop cooling when the temperature has decreased to <38°C.

If hyperkalemia (K > 5.9 or less with ECG changes) is present, treat with:

- Calcium chloride 10 mg/kg (maximum dose 2,000 mg) or calcium gluconate 30 mg/kg (maximum dose 3,000 mg) for life-threatening hyperkalemia
- Sodium bicarbonate
 - 1-2 mEq/kg IV (maximum dose 50 mEq)
- Glucose/insulin
 - For pediatric patients: 0.1 units regular insulin/kg IV and 0.5 grams/kg dextrose (% in formulation not important)
 - For adult patients: 10 units regular insulin IV and 50 ml 50% glucose
 - Check glucose levels hourly
- Furosemide 0.5-1 mg/kg once (maximum dose 20 mg)

For refractory hyperkalemia, consider albuterol (or other beta-agonist), kayexelate, dialysis, or ECMO if patient is in cardiac arrest.

Treat dysrhythmias with standard medication but avoid calcium channel blockers. Treat acidosis and hyperkalemia if present. (See above)

- Diurese to >1ml/kg/hr urine output. If CK or K+ rise, assume myoglobinuria and give bicarbonate infusion of 1 mEq/kg/hr, to alkalinize urine. Institute appropriate monitoring including: core temperature, urine output with bladder catheter, and

consider arterial and/or central venous monitoring if warranted by the clinical severity of the patient.

Follow: HR, core temperature, ETCO₂, minute ventilation, blood gases, K+, CK, urine myoglobin and coagulation studies as warranted by the clinical severity of the patient.

When stable, transfer to post anesthesia care unit or intensive care unit for at least 24 hours.

Key indicators of stability include:

- ETCO₂ is declining or normal
- Heart rate is stable or decreasing with no signs of ominous dysrhythmias
- Hyperthermia is resolving
- If present, generalized muscular rigidity has resolved

References:

Lexicomp online, 2015 updated version, Hendrick Medical Center campus.

Malignant Hyperthermia Association of the United States website, 2015 version.



And last but

not least.....

THANK YOU

to all of the contributors and helpers for this issue of What's TAPANing!!! If you didn't get to add to this issue, what are you waiting for? Send in your contribution today!

Happy Holidays to all of our members, friends, and families! Be safe this season and always!