



SLEEPY TIMES

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MESSAGE FROM THE CHAIRMAN

-SCOTT T. REEVES, MD, MBA

Thankfully, Hurricane Florence came and went without much of an effect on Charleston, but it did have a great effect on hospital and departmental operations. Florence was the most unpredictable storm we have had recently. Due to five previous events in the last three years, we received great feedback from our teams, and this was a storm for which we were well prepared. Team A, which was truly the A-Team, although activated 36-48 hours prior to the arrival of any real weather, did an amazing job. Each site took care of a multitude of patients, including cardiac, transplant and complicated OB cases. They did so in great spirits (see photos). We made sure that this year, our teams were large enough so everyone had down time away from patient care. We want to thank all of Team A for their dedication and excellent patient care.



Dr. Clark



Dr. Reeves



OPENING STATEMENT CONTINUED...

We have already received some great feedback from both Team A & B and other members of the department and will be discussing how to update our weather plan to further improve for our next event. We can't thank the departmental leadership enough for all of the help with coordinating schedules and communicating with their teams.

Main Team A

Robert Harvey
Sam Vizzini
Hal Mahafee
Matt Daylami
Andrew Klein
Cipriano Ayala
Mark Abumoussa
Chris Fatora
Ali Lataille
John Green
Katie Smith
Jamie Sayers
Treffle Beaupre

ART Team A OR
and ICU

Tim Heinke
Laura Roberts
Ryan Smith
Jared McKinnon
Kacie Bhushan
Ulrika O'Neil
Geoff Kilgore
Hannah Mather
Devin Antonovich
Ryan Mims
Jerad Beall
Emma Raidt
Hanna Purcell
Nick Gilmore
Kevin Massey

Main Team B

David Stoll
Ryan Gunselman
Kevin Draper
Brooks Duff
Marc Hassid
Lauren Moore
Joey Seymour
Lynn McInerny
Sheri Zhou
Eugenia Pugach
Keeland Bankhead

ART Team B
and ICU

Tara Kelly
Ana Castro
Ian Osburn
Matthew Graves
Carlee Clark
Chris Skorke
Alan Finley
Greg Foster
Annette Cooper
Rachel Hanna
Katie Cardwell

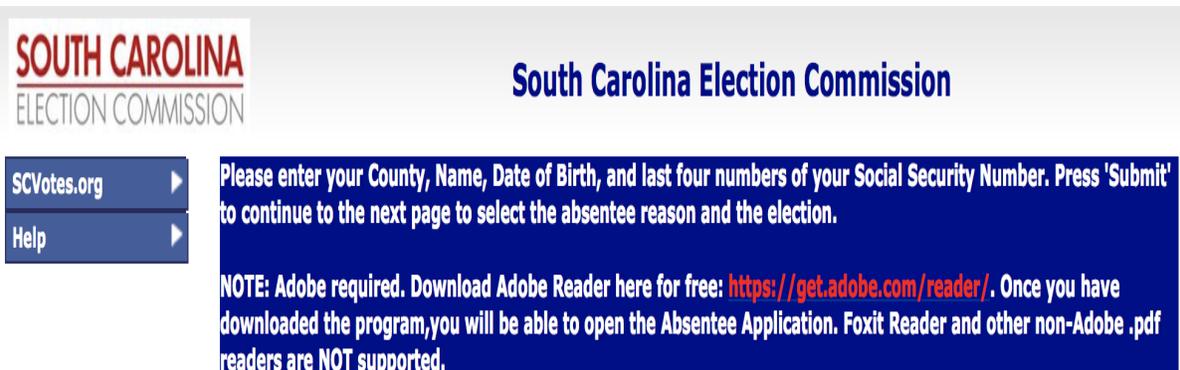
ABSENTEE VOTING

We will soon have our midterm elections in November. It is frequently difficult for us to get away in time to actually vote due to the nature of our jobs at MUSC. Fortunately, the State of South Carolina makes voting by absentee ballot easy. Follow the link below to register. Once complete, you will print a SC Application for Absentee ballot to sign and mail. **TO VOTE IN THE 2018 GENERAL ELECTION, YOU MUST BE REGISTERED BY SUNDAY, OCTOBER 7.**

There are many reasons to be qualified to vote by absentee ballot, including:

For reasons of employment will not be able to vote on Election day; going on vacation during the Election; students attending school outside their county of residence, etc. Register today...

<https://info.scvotes.sc.gov/Eng/VoterInquiry/VoterInformationRequest.aspx?PageMode=AbsenteeRequest>



SOUTH CAROLINA
ELECTION COMMISSION

South Carolina Election Commission

SCVotes.org ▶
Help ▶

Please enter your County, Name, Date of Birth, and last four numbers of your Social Security Number. Press 'Submit' to continue to the next page to select the absentee reason and the election.

NOTE: Adobe required. Download Adobe Reader here for free: <https://get.adobe.com/reader/>. Once you have downloaded the program, you will be able to open the Absentee Application. Foxit Reader and other non-Adobe .pdf readers are NOT supported.

FY2017 DEPARTMENTAL WINS BY CARLEE CLARK, MD

ICCE, ICCE, Baby

At the end of the fiscal year, Brenda Dorman and I were asked to identify our top 5 wins for Anesthesia ICCE. We discussed this with Dr. Reeves and submitted our top 5, but we actually had a lot more than 5 accomplishments and we wanted to share them with everyone. We felt like this would be a great opportunity to let the whole department know what the ICCE has been working on and will continue to be working towards this year. FY2017 was a great year for setting groundwork and we have been able to accomplish a lot with more involvement and feedback from members of the department. A big thank you to all of those who have participated, discussed, trialed, failed and succeeded. Over the next few months, we are going to highlight some of the work below in Sleepy Times to give a more in-depth view of the work we are doing.



Top 5 Wins for 2018

1. Reorganization and relocation of the Preoperative Assessment Clinic and implementation of new strategy
2. New Pain Management Clinic at MUSC East
3. Recruitment of new anesthesia providers in preparation for CAC and SJCH
4. Initiation of Critical Care Team into the CVICU
5. Collaboration with HV ICCE in getting MUSC Heart Transplant Program recertification

All of the Contenders (in no particular order)

- Development of the Equipment Task Force
- Development and recruitment for a CRNA Educator position, Dennis McKenna
- Drs. Renuka George, Lauren Moore, and Dennis McKenna joined the Hospital Value Based Committee
- All of the amazing work that the pediatric leadership is doing with operationalizing CAC and SJWC
- Naming Cory Furse as Medical Director for CAC
- QAPI: All faculty, CRNAs and residents now have an EPIC Quality dashboard with some individual metrics
- Moving Ophthalmology to RT from ART
- Navigated many medication shortages without compromising patient care

OB SAFETY BUNDLES BY LATHA HEBBAR, MD

National Partnership for Maternal Safety: Bundles of Maternal Care

Over the next three editions of Sleepy Times, I will be penning the currently existent “Safety Bundles of Maternal Care.”

Background: A patient safety bundle is a set of straightforward, evidence-based recommendations for practice and care processes known to improve outcomes. A bundle is not a new guideline but rather represents a selection of existing guidelines and recommendations in a form that aids implementation and consistency of practice. In 2014, the National Partnership for Maternal Safety Recognition was created within the Council on Patients Safety in Women’s Health Care to reduce maternal mortality and morbidity in the United States. This collaborative initiative with representation from all major women’s health care professional organizations (including SOAP) has created three priority *safety bundles* for the most common preventable causes of severe maternal morbidity and maternal death: *obstetric hemorrhage, severe hypertension in pregnancy, and peripartum venous thromboembolism.*



Obstetric hemorrhage:

Obstetric hemorrhage can be antepartum or postpartum.

Antepartum hemorrhage: The incidence of antepartum hemorrhage has been steady over the years. The most common cause of antepartum hemorrhage is placenta previa. Other causes include placental abruption, uterine rupture, genital trauma and vasa previa.

Postpartum hemorrhage: The incidence of PPH is on the increase and it is defined as EBL > 500 mL following vaginal delivery and > 1000mL after CD. At MUSC we active the OB hemorrhage page when EBL > 1000mL after vaginal delivery and > 1500 mL after CD. Causes of PPH include the 4T’s: Lack of Tone, Trauma, issues with Thrombus formation and Tissue (retained products or abnormal placentation).

The Consensus bundle for Obstetric Hemorrhage was published in 2015. (Anesth Analg 2015;121:142-8). The goal of the partnership is the adoption of the safety bundle by every birthing facility in the United States. The bundle for OB hemorrhage is organized into four action domains (4 R’s): Readiness, Recognition and Prevention, Response and Reporting and Systems Learning. There are 13 key elements within these 4 action domains.

Box 1. Obstetric Hemorrhage Safety Bundle From the National Partnership for Maternal Safety, Council on Patient Safety in Women’s Health Care

Readiness (Every Unit)

1. Hemorrhage cart with supplies, checklist, and instruction cards for intrauterine balloons and compression stitches
2. Immediate access to hemorrhage medications (kit or equivalent)
3. Establish a response team—who to call when help is needed (blood bank, advanced gynecologic surgery, other support and tertiary services)
4. Establish massive and emergency-release transfusion protocols (type-O negative or uncrossmatched)
5. Unit education on protocols, unit-based drills (with postdrill debriefs)

Recognition and Prevention (Every Patient)

6. Assessment of hemorrhage risk (prenatal, on admission, and at other appropriate times)
7. Measurement of cumulative blood loss (formal, as quantitative as possible)
8. Active management of the 3rd stage of labor (department-wide protocol)

Response (Every Hemorrhage)

9. Unit-standard, stage-based obstetric hemorrhage emergency management plan with checklists
10. Support program for patients, families, and staff for all significant hemorrhages

Reporting and Systems Learning (Every Unit)

11. Establish a culture of huddles for high-risk patients and postevent debriefs to identify successes and opportunities
12. Multidisciplinary review of serious hemorrhages for systems issues
13. Monitor outcomes and process metrics in perinatal quality improvement committee

<http://www.safehealthcareforeverywoman.org>

OB SAFETY BUNDLES CONTINUED... BY LATHA HEBBAR, MD

At MUSC, we have incorporated all key 13 elements within these four domains. I will briefly walk you through **MUSC's initiatives for decreasing morbidity and mortality due to OB hemorrhage:**

Readiness:

1. Hemorrhage cart with supplies, checklist: we have a separate OB cart with supplies for the obstetric team, in addition we have an open anesthesia hemorrhage bucket with supplies for IV access including RIC lines, pressure bags for rapid fluid/blood administration, A-line kit and IV fluids
2. Immediate access to hemorrhage medications: Our L&D nurses have access to all uterotonics and TXA (stored on L&D Acudose)
3. Establish an immediate response team - we have an OB hemorrhage stat group page which includes obstetricians and anesthesia personnel. Our response to these pages is to grab the OB hemorrhage bucket, evaluate the 4T's of OB hemorrhage (Tone, Trauma, Thrombus and Tissue), help with maternal stabilization including need to activate the OB hemorrhage protocol, transport to OR and establishing adequate IV access
4. We have an established Emergency release transfusion protocol. A scripted phone call by the nurse to the blood bank stating the patients location will result in activation of the emergency OB bleed protocol resulting in the release of 6 PRBC's, 6 FFP and a unit of platelets

L&D EMERGENCY BLEED PROTOCOL

1. Anesthesia will instruct to "Initiate the Emergency Bleed Protocol" and instruct the Primary care RN whether or not to "Keep ahead".
2. Primary care RN/Circulator is the "point person" who will call the blood bank @ 2-2671 and state:

"Labor and Delivery needs to initiate the Emergency Bleed Protocol in Labor & Delivery OR#____. The patient's name is____ and MRN is _____. **We need 6 units of Packed Red Blood Cells, 6 units of Fresh Frozen Plasma and 1 unit of Pheresed Platelets (old 6 pack of platelets).** Our tube system # is 23. The phone # you can contact us is at _____. The ordering MD is____. Please DO/DO NOT keep ahead on this order. We DO/DO NOT have a runner available."

 - Determine if a runner is available, either from our unit or from the blood bank, to obtain and transport the cooler with the requested products.
 - If no runner is available, instruct the blood bank that the products will be sent via the tube system.
 - The bloodbank will continue cross-matching products with a "keep ahead" order until you notify them to discontinue it.

References

L&D Charge RN # 6-6191
Blood bank phone # 2-2671
Main OR Charge RN # 6-6306

07/13

AFTER HOURS/WEEKENDS. CONSIDER PAGING THE HSC AT 17595 TO ASSIST WITH COORDINATING ADDITIONAL PERSONNEL

**OB SAFETY BUNDLES CONTINUED...
BY LATHA HEBBAR, MD**

MUSC's PPH Algorithm/Checklist

5. We do have unit education on protocols and unit based drills for OB hemorrhage with succinct debrief sessions following the drills

START

- Activate OB Hemorrhage page 2-3333 state location
- Open IV Fluids; supplemental oxygen; Assess for additional access
- Conduct vigorous fundal massage
- Assess VS including O2 sat q 5 minutes
- Keep patient warm
- Anesthesia instructs to activate the EMERGENCY BLEED PROTOCOL with 1 person designated primary blood bank contact
- Continue evaluation/documentation of cumulative blood loss by weight every 3-15 minutes (1gm=1cc/ml)
- Administer medication as ordered- see table
- Empty Bladder: straight cath or place Foley with urimeter
- Send Labs
- Move to OR for laceration repair or D&C

CONSIDERATIONS

- Rule out retained products of conception, lacerations, hematomas.
- Inspect for uncontrolled bleeding at all levels
- Potential etiology: Uterine atony, amniotic fluid embolism, uterine inversion, coagulopathy
- Uterine Tamponade Balloon
- Interventional Radiology
- Additional surgical techniques and/or personnel?
- Consider calling GYN Onc for surgical backup

| Drug | Dosage | Route | Frequency | Max Dose |
|----------------------------------|-------------------------|---------|--|------------------------|
| Oxytocin | 10 units/20ml/100 D5W | IV | Infuse rate sufficient to maintain uterine contractility | Per 100 units |
| Oxytocin | 10 units (1ml/10 units) | IM | Once | - |
| Methergine (Ergometrine Maleate) | 800-1000mg(100-150mcg) | IM/Oral | Once | 1000 mg |
| Terbutaline | 2.5 mg | IM | Max repeat every 15 to 30 min | Total of 8 doses (1mg) |
| Methergine | 0.2 mg | IM | Max repeat every 3-5 hours | Total of 3 doses |

this table is for reference only

Recognize:

6. Assessment of hemorrhage risk (prenatal or on admission) – patients at risk for various degrees of OB hemorrhage are incorporated into EPIC

7. Measurement of cumulative blood loss - since visual assessment of blood loss has been shown to be inferior relative to gravimetric measurement for accuracy, we perform gravimetric measurement on all our deliveries (both vaginal and cesarean). We have predetermined dry weight for all sizes of sponges, laps and pads we use. Blood loss is thus accurately measured using weighing scales 1 gm = 1 cc of blood

8. Active management of 3rd stage of labor - we have a uteronic protocol for both vaginal and CD

| OB Hemorrhage—No Denial—No Delay | |
|---|--|
| <p>Low Risk:</p> <ul style="list-style-type: none"> • No previous uterine incision • Singleton Pregnancy • ≤ 4 previous vaginal births • No known bleeding disorder • No history of PPH | <p>Hold Specimen</p> |
| <p>Medium Risk:</p> <ul style="list-style-type: none"> • Prior c/s or uterine surgery • Multiple gestation • > 4 previous vaginal births • Chorioamnionitis • History of previous PPH • Large uterine fibroids | <p>Type and Screen</p> |
| <p>High Risk:</p> <ul style="list-style-type: none"> • Placenta Previa, or low lying • Suspected accreta or percreta • HCT < 30 AND other risk factors • Platelets < 100,000 • Active bleeding on admit • Known coagulopathy | <p>Type and Cross</p>  |

**OB SAFETY BUNDLES CONTINUED...
BY LATHA HEBBAR, MD**

Response:

9. We have a stage based OB hemorrhage emergency management plan similar to CMQCC. These cards are laminated and placed in the OB hemorrhage bucket

10. We do have a support program for patients, families and staff for significant hemorrhage

| |
|--|
| Stage 0 |
| <ul style="list-style-type: none"> Active management with oxytocin infusion of 30 units/500 mL titrated |
| Action |
| <ul style="list-style-type: none"> Quantitative evaluation of cumulative blood loss: use of graduated containers, visual comparisons, and weighing blood soaked materials after delivery of placenta. 1gm = 1mL Ongoing evaluation of vital signs per hospital protocol; more if needed per patient condition. |
| <p>Proceed to STAGE 1 if:</p> <ul style="list-style-type: none"> cumulative blood loss > 500 mL for vaginal or > 1000 mL for C/S OR VS > 15% change (HR ≥ 110, BP ≤ 85/45, O₂ sat < 95%) OR |

| |
|--|
| Stage 1 |
| Continued bleeding and Blood loss: > 500 ml vaginal or > 1000 ml C/S, OR VS changes (by > 15% or HR ≥ 110, BP ≤ 85/45) sat < 95% OR increased bleeding during recovery |
| Mobilize |
| <ol style="list-style-type: none"> Notify OB Notify Charge RN Notify Anesthesia provider |
| Actions |
| <ul style="list-style-type: none"> Establish 16g IV Infuse oxytocin 500mL/hr (30 units/500 mL) Vigorous fundal massage Administer 2nd uterotonic Vital signs including O₂ sat q 5 minutes Weigh and calculate blood loss Administer O₂ to keep sats >95% Empty bladder – foley with urimeter Type and Cross for 2 units PRBCs Keep patient warm |
| <p>Consider potential etiologies: atony, trauma, laceration, retained placenta, AFE, inversion, coagulopathy, accreta</p> <p>Proceed to STAGE 2 if:</p> <ul style="list-style-type: none"> Continued bleeding or continued VS instability, & < 1500 mL cumulative blood loss |

| |
|---|
| Stage 2 |
| Continued bleeding or Vital Sign instability, and < 1500 mL cumulative blood loss |
| Mobilize |
| <ol style="list-style-type: none"> OB at bedside; 2nd OB or STAB & anesthesiologist called to assist; Activate OB hemorrhage page Charge nurse: assign recorder and runner, notify nursing supervisor, call radiology to prepare for IR if available, and call for second anesthesiologist Notify MET if indicated Assign a 2nd RN to communicate with blood bank and offer family support |
| Actions |
| <ul style="list-style-type: none"> Administer hemabate or misoprostil Move to OR Transfuse 2 U PRBC (do not wait for lab results); blood warmer; request for blood bank to draw FFP Order STAT CBC/plts, Chem 12, Coag panel, and ABG Start 2nd IV Weigh & calculate cumulative blood loss Announce vital signs Ready essential equipment. |
| <p>*THINK:</p> <p>Prepare for procedures/interventions based on etiology for balloon, selective embolization with IR (atony), repair (trauma), B-lych suture for (C/S), etc.</p> <p>Proceed to STAGE 3 if:</p> <ul style="list-style-type: none"> still bleeding, cumulative blood loss > 1500 mL, > 2 units PRBCs given, VS unstable or suspicion for DIC |

| |
|---|
| Stage 3 |
| Cumulative blood loss > 1500 mL, > 2 U PRBCs given, VS unstable or suspect DIC |
| Mobilize |
| <ol style="list-style-type: none"> Activate Massive Transfusion Protocol Notify GYN/Onc Surgeon Call in OR staff (anesthesia assist) Call in supervisor, Blood bank to stay ahead of blood products |
| Actions |
| <ul style="list-style-type: none"> Announce VS and cumulative blood loss Assist anesthesiologist with art line, PA or CVP line, or intubation. Use fluid warmer and/or rapid infuser Keep patient warm. Apply sequential compression stockings to lower extremities. Repeat labs q 30-60 minutes. |
| <p>*THINK:</p> <ul style="list-style-type: none"> Selective Embolization (IR) Interventions based on etiology from previous stage not yet completed; prevent hypothermia, acidemia, and hypocalcemia Surgeries: uterine artery ligation or hysterectomy For resuscitation: aggressively transfuse based on VS, and blood loss. After first 2 units PRBC, near equal FFP and PRBC for massive hemorrhage 4-6 PRBC:4FFP:1 apheresis platelets Once stable: modify postpartum management consider ICU |

| |
|---|
| Packed Red Blood Cells (PRBCs) |
| <ol style="list-style-type: none"> Best first line product 1 unit = 200 ml volume If antibody positive, may take 1-24 hrs for crossmatch |
| Fresh Frozen Plasma (FFP) |
| <ol style="list-style-type: none"> Approximately 35-45 min to thaw Highly desired if > 2 units PRBCs given, or for prolonged PT, PTT |
| Platelets (PLTs) |
| <ol style="list-style-type: none"> Priority for women with platelets < 50,000 Single—donor apheresis unit (= 6 units of platelet concentrates) provides 40-50 K transient increase in platelets |
| Cryoprecipitate (CRYO) |
| <ol style="list-style-type: none"> Approximately 35-45 min to thaw Priority for women with Fibrinogen levels < 80 10 unit pack raises Fibrinogen 80-100 mg/dl Best for DIC with low Fibrinogen and don't need volume replacement Caution: 10 units come from 10 different donors, so infection risk is proportionate Warm upper body with blankets or warming device Sequential compression stockings |

**OB SAFETY BUNDLES CONTINUED...
BY LATHA HEBBAR, MD**

Reporting and Systems Learning:

11. Every OB hemorrhage is required to have a debrief – we do a huddle and fill out the debrief form

OB Hemorrhage Team Debriefing

Patient Name/MRN _____ Team Members _____
 Goal: Debrief completed in 100% of all Obstetrical hemorrhages that have continued blood loss >1000cc vaginal birth, > 1500cc CS birth.
 All debriefs to have at least RN and MD who participate in debriefing session, with the goal of participants (anesthesia and other responding health care providers) to complete ASAP within 24 hours. Place in NM wall folder.

| | | |
|---|--|--|
| <p>OB Risk Assessment</p> <ul style="list-style-type: none"> <input type="checkbox"/> Documented on admission <input type="checkbox"/> Documented within last 12 hours <input type="checkbox"/> Last risk assessment documented in H&P (circle one) Low medium high <input type="checkbox"/> Current Type & Screen in lab and documented <input type="checkbox"/> PP Hemorrhage Algorithm/Checklist at bedside and followed <input type="checkbox"/> OB Hemorrhage page called 2-5555 <input type="checkbox"/> Adequate IV access—two 18 gauge IV <input type="checkbox"/> Vital signs obtained <input type="checkbox"/> Emergency Blood Protocol activated and time _____ | <p>Medications</p> <ul style="list-style-type: none"> <input type="checkbox"/> Oxytocin _____ units (circle one) IV rapid infusion IM myometrium <input type="checkbox"/> Methergine 0.2 mg IM X _____ <input type="checkbox"/> Hemabate 250mg IM or myometrium X _____ <input type="checkbox"/> Cytotec (misoprostil) _____ mg Orally Vaginal Rectally <p>Procedures</p> <ul style="list-style-type: none"> <input type="checkbox"/> Intrauterine balloon <input type="checkbox"/> D&C <input type="checkbox"/> B-lymph <input type="checkbox"/> Uterine or hypogastric artery ligation <input type="checkbox"/> Uterine artery embolism <input type="checkbox"/> Square hemostatic suture in the lower uterine segment <input type="checkbox"/> Hysterectomy <p>Post hemorrhage the patient required:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Intubation <input type="checkbox"/> Pressors <input type="checkbox"/> Central/arterial line <input type="checkbox"/> Disposition: (circle one) PACU ICU L&D PP | <p>Blood Volume/Options</p> <ul style="list-style-type: none"> <input type="checkbox"/> Pressure bag <input type="checkbox"/> Invasive hemodynamic monitoring <input type="checkbox"/> Blood warmer/rapid fluid warmer <input type="checkbox"/> Cell saver <p>Estimated Blood Loss: _____ cc</p> <ul style="list-style-type: none"> <input type="checkbox"/> Visually estimated only <input type="checkbox"/> Formal estimation by weight (1gm=1cc/ml) <input type="checkbox"/> Formal estimation by volume collection <p>Blood Products Transfused</p> <ul style="list-style-type: none"> <input type="checkbox"/> Units of PRBC _____ <input type="checkbox"/> Units of FFP _____ <input type="checkbox"/> Units of Platelet _____ <input type="checkbox"/> Units of Cryo _____ <input type="checkbox"/> Factor VIII _____ |
|---|--|--|

Thinking about how the OB hemorrhage was managed...

| | | |
|---|--|--|
| <p>Identify what went well</p> <ul style="list-style-type: none"> <input type="checkbox"/> Communication went well <input type="checkbox"/> Teamwork went well <input type="checkbox"/> Leadership went well <input type="checkbox"/> Decision making went well <input type="checkbox"/> Recognition to response went well <input type="checkbox"/> Roles of responding personnel went well <input type="checkbox"/> Other: <input type="checkbox"/> Briefly describe: | <p>Identify opportunities for improvement: Human factors</p> <ul style="list-style-type: none"> <input type="checkbox"/> Communication needed improvement <input type="checkbox"/> Teamwork needed improvement <input type="checkbox"/> Leadership needed improvement <input type="checkbox"/> Decision-making needed improvement <input type="checkbox"/> Recognition to response needed improvement <input type="checkbox"/> Other: <input type="checkbox"/> Briefly describe: | <p>Identify opportunities for improvement: Non-human factors</p> <ul style="list-style-type: none"> <input type="checkbox"/> Delay in blood product availability <input type="checkbox"/> Equipment issues <input type="checkbox"/> Medication issues <input type="checkbox"/> Inadequate support (in-unit or other areas) <input type="checkbox"/> Delay in transport of patient <input type="checkbox"/> Other: <input type="checkbox"/> Briefly describe: |
|---|--|--|

12. Monthly multidisciplinary OB safety meeting - review for systems issues

13. Outcomes are monitored in the monthly Perinatal Quality improvement committee meeting

The implementation of this multidisciplinary Safety Bundle at MUSC will effectively reduce the frequency of severe obstetric hemorrhage and improve maternal outcomes.

DEPARTMENT FACULTY FEATURED IN AUGUST 2018 ASRA NEWSLETTER

“Oh Mg!” Magnesium: A Powerful Tool in the Perioperative Setting

Although a little bag of magnesium sulfate might not look like much, the divalent cation possesses numerous attributes that have served anesthesiologists well for many decades. Magnesium is a cofactor to ATP production, aids in ion transportation, competitively antagonizes calcium release, inhibits catecholamine release, and antagonizes N-methyl-D-aspartate (NMDA) receptors. Although its analgesic properties may have been overlooked for newer and more sophisticated drugs, magnesium has resurfaced in the era of bundled payments, enhanced recovery pathways, and multimodal analgesic plans.

Over time, magnesium has been used for a variety of perioperative applications. It was first examined as a potential induction agent in the early 1900s, but its use was unsuccessful because of poor bioavailability and its limited capacity to cross the blood-brain barrier. However, increased interest in the 1980s focused on magnesium's ability to antagonize NMDA receptors. Since then, numerous studies, reviews, and meta-analyses have attempted to clarify the role of perioperative magnesium.

ANALGESIA

Both animal and clinical studies have highlighted magnesium's antinociceptive effects. Its proposed mechanism of action includes competitive and noncompetitive NMDA antagonism of hippocampal presynaptic calcium channels that regulate aspartate and glutamate. Both pathways are thought to contribute to the prevention of central sensitization. In animal models, magnesium has inhibited hyperalgesia, amplified the analgesic effects of low-dose morphine, and delayed morphine tolerance.^{1,2}

Several studies, reviews, and meta-analyses have examined intravenous (IV) magnesium in the intraoperative setting with conflicting results. In patients undergoing abdominal hysterectomy and randomized to magnesium (50 mg/kg bolus with 15 mg/kg/hr infusion for 6 hours) or saline, postoperative pain scores and analgesic demand boluses did not differ between the groups.³ However, all the patients had patient-controlled epidural anesthesia.



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“Although its analgesic properties may have been overlooked for newer and more sophisticated drugs, magnesium has resurfaced in the era of bundled payments, enhanced recovery pathways, and multimodal analgesic plans.”

In a separate study of hysterectomy patients, subjects received magnesium (200 mg bolus on induction and 200 mg/hr infusion for 5 hours) or placebo and were followed for 48 hours.⁴ The magnesium group demonstrated higher pain scores 3 hours following their surgical procedure yet decreased opioid consumption 1 hour following surgery, but no other differences were noted between groups. In children undergoing tonsillectomy and administered placebo, ketamine, magnesium (30 mg/kg

bolus intraoperatively), or ketamine plus magnesium, significant differences in pain scores were not noted between groups.⁵ With all these studies, the wide variety of doses and baseline pain medications, as well as numerous other confounding factors, may have contributed to the negative findings.

Alternatively, numerous clinical studies have demonstrated the antinociceptive effects of magnesium; however, dosing strategies were highly variable. Postoperative analgesia was improved after abdominal hysterectomy with an initial bolus of IV magnesium (30 mg/kg) followed by an infusion (0.5 g/hr).⁶ Likewise, an IV magnesium bolus (50 mg/kg) at induction improved pain and decreased opioid consumption following lumbar spine surgery.⁷ In addition to decreased opioid consumption and shorter recovery room stays, an IV magnesium bolus (30 mg/kg) within an hour of induction followed by an infusion (9 mg/kg/hr) decreased postoperative agitation following functional endoscopic sinus surgery.⁸ The authors attributed the findings to improved pain

DEPARTMENT FACULTY FEATURED IN AUGUST 2018 ASRA NEWSLETTER CONT...

Table 1: Summary of magnesium dosing strategies.¹⁰

| Surgery | Pain rating* | Bolus (mg/kg) | Time before induction (minutes) | Infusion (mg/kg/hr) | Magnesium mean fentanyl consumption (mcg) | Control mean fentanyl consumption (mcg) | Mean difference in fentanyl consumption (mcg) 95% CI |
|-----------------------------|--------------|---------------|---------------------------------|---------------------|---|---|--|
| Upper extremity | Severe | 30 | 15 | 10 | 89 | 104.8 | -15.8 |
| Laparotomy | Severe | 40 | 15 | 10 | 70.05 | 100.55 | -30.5 |
| Open cholecystectomy | Severe | 50 | 15 | 8 | 52.81 | 83.64 | -30.83 |
| Hysterectomy | Severe | 40 | 15 | 0/10/20** | 555.72 | 588.88 | -33.16 |
| Lumbar discectomy | Moderate | 50 | 10 | 20 | 100 | 147 | -47 |
| Abdominal hernioplasty | Moderate | 30 | After | 6 | 192.44 | 288.8 | -96.36 |
| Endoscopy sinus surgery | Moderate | 40 | 10 | 15 | 82.27 | 173.04 | -90.87 |
| Laparoscopy cholecystectomy | Mild | 50 | 15 | 25 | 254 | 323 | -69 |

* According to surgical procedure

** 0, 10, and 20 mg/kg/hr infusions were studied. A dose of 10 mg/kg/hr was found to reduce narcotic requirements. Increased doses did not yield further benefits and led to more hemodynamic compromise.

control, magnesium's neuroprotective capabilities, and decreases in overall anesthetic requirements.

Furthermore, magnesium can counter remifentanyl-induced hyperalgesia in patients undergoing thyroidectomy. However, it can also mask hypocalcemia, a potential complication in thyroidectomies.⁹

A meta-analysis of 13 studies with 694 patients undergoing a variety of surgical procedures found that a magnesium bolus (30–50 mg/kg) and infusion (6–25 mg/kg/hr) decreased opioid consumption without compromising hemodynamic stability.¹⁰ Based on this information and excluding studies that used alfentanil, morphine, and remifentanyl for the sake of standardization, a loading dose of magnesium (30–50 mg/kg given 10–15 minutes prior or shortly after induction) followed by an infusion (8–15 mg/kg/hr) significantly reduced fentanyl consumption overall and in surgeries associated with significant pain (see Table 1 Adapted from data in meta-analysis).¹⁰

OTHER PERIOPERATIVE ROLES AND ADVERSE EFFECTS

When using perioperative magnesium, providers must understand its other properties and possible adverse effects. Magnesium has documented central and peripheral neurologic effects. It increases microcirculation in cerebral blood flow and

may prevent vasospasm in patients suffering from aneurysmal subarachnoid hemorrhage.¹¹ In parturients with pre-eclampsia, magnesium provides systemic, cerebral, and uterine vasodilation coupled with neuroprotection and seizure prophylaxis. This offers maternal and fetal neuroprotection and may lower the risk of fetal cerebral palsy in women at risk for preterm birth.¹² Peripherally, magnesium potentiates nondepolarizing muscle relaxants at both the pre- and postsynaptic sites. Magnesium infusions (60 mg/kg over 15 minutes) administered prior to induction can reduce rocuronium onset time by 65%.¹³ Similarly, magnesium may reduce succinylcholine induced fasciculations¹⁴ and the incidence and intensity of myoclonus caused by etomidate.¹⁵

As a competitive antagonist of L-type calcium channels, magnesium also impacts the cardiac and pulmonary systems. Magnesium has both antiarrhythmic properties and is the treatment for Torsades de Pointes (pulseless: 1–2 g IV over 5–20 minutes; pulse present: 1–2 g over 5–60 minutes). Concomitantly, it promotes arterial vasodilation and prevents catecholamine secretion.¹⁶ Those cardiovascular characteristics may be desirable to assist in the perioperative management of patients with pathologically elevated hemodynamics, such as pheochromocytoma. Moreover, antagonism of calcium-induced muscle contraction by magnesium potentiates bronchodilation, and

DEPARTMENT FACULTY FEATURED IN AUGUST 2018 ASRA NEWSLETTER CONT...

Table 2: Summary of magnesium toxicity.

| Serum Level | Symptoms | Signs | ECG findings | Other concerns |
|-------------|--|--|--|--|
| 4–6 mEq/L | Nausea, vomiting, lethargy, and headache | Diminish DTRs and hypotension because of vasodilation | | Associated with increased potassium and decreased calcium levels |
| 6–10 mEq/L | Nausea, vomiting, lethargy, and headache | Absent DTRs, bradycardia, and hypotension | Increased QRS duration and prolongation of PR and QT intervals | Inhibition PTH release causing systemic decreased calcium levels |
| >10 mEq/L | | Coma, paralysis, respiratory failure, and cardiac arrest | Complete heart block | |

Abbreviations: DTRs, deep tendon reflexes; ECG, electrocardiogram; PTH, parathyroid hormone

a 2 g IV bolus of magnesium improves peak expiratory flow rates and forced expiratory volumes in acute asthma attacks.¹⁷

Although magnesium has numerous benefits and a large therapeutic window, its use is not entirely without risk: a summary of magnesium toxicity is presented in Table 2. Consequently, close monitoring is required for all patients receiving therapeutic magnesium, and administration must be stopped with the development of any signs or symptoms of hypermagnesemia. Additionally, IV calcium acts as an antagonist to magnesium and should be administered immediately if patients experience sequelae of hypermagnesemia.

Therapeutic magnesium administration should be used with caution or avoided in certain patient populations. Given magnesium's propensity to cause muscle weakness and electrocardiogram changes, it is best avoided in patients with pre-existing atrioventricular block and those with chronic neuromuscular diseases, such as myasthenia gravis. Similarly, because magnesium homeostasis is maintained through renal excretion, patients who have renal impairment are at higher risk for accumulating toxic levels. Notably, patients with end-stage renal failure may require dialysis to reduce magnesium levels. Conversely, patients with normal renal function or moderate renal impairment may receive fluids and loop diuretics to hasten reduction of magnesium levels.

CONCLUSION

The cost of the opioid epidemic in the United States is astronomically high on patients, families, and communities. Shipton et al¹⁸ reported that the economic liability of opioid misuse in the United States is projected to exceed \$78 billion a year. This, in combination with recent drug shortages in the operating room, has resulted in increased demand for anesthesiologists to seek out nonopioid analgesic strategies in the perioperative period, in which magnesium plays an important role.¹⁹

Magnesium has a long history of perioperative use for numerous indications. A definitive analgesic dose should be the product of consideration of patient comorbidities, type of surgery, and anesthetic requirements. Based on recent literature, a loading dose of magnesium of 30–50 mg/kg followed by an infusion of 8–15 mg/kg/hr can be a powerful tool in an anesthesiologist's antinociceptive arsenal. In the era of enhanced recovery after surgery and opioid abuse epidemics, the time has never been better to incorporate this potent analgesic into our daily perioperative care.

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CONGRATULATIONS TO RENUKA GEORGE, MD!



Renuka George is delighted to serve as the new Associate Program Director for the Anesthesia Residency Program. She was born and grew up on the hospital campus of the Christian Medical College in Vellore, Tamil Nadu, India. The hospital campus was started by an American missionary, Dr. Ida Scudder, who believed in the importance of the Woman Physician. Renuka is heavily influenced by Dr. Scudder's legacy as well as her parents and husband, who all practice medicine. Renuka has led a rather nomadic life in several states and countries, which has inspired her appreciation for diversity and other people's perspectives. She graduated from Trinity University in San Antonio, Texas, with a BS in Business Administration/Marketing and went on to Ross University School of Medicine, Dominica. Renuka married her husband, Dr. Burke Gallagher, during medical school and is thrilled that he will be completing his residency soon. She went on to complete her anesthesia residency in 2016 at the University of Texas Health Science Center in Houston, where she served as a chief resident. Since then, Renuka completed her fellowship in Regional Anesthesia and Acute Pain Management at MUSC and has served as faculty here since 2017. Renuka looks forward to expanding her passion for teaching and diverse perspective within this new role. Congratulations, Renuka!

ANESTHESIA DISCUSSION WITH YOUTH-PATIENT ADVISORY COUNCIL

A few members of the pediatric anesthesia team had the opportunity recently to meet with the Youth-Patient Advisory Council (Y-PAC). This is a group of teenagers with chronic medical problems who meet with our child life specialists to discuss their experiences and recommendations for the Children's Hospital. We joined the group for their most recent meeting after Tammy Lamont, Chief CRNA at Rutledge Tower, expressed interest in improving our ability to communicate effectively with this age group. The council members were an engaging, energetic group with varying thoughts and preferences. They were very open about their stories with anesthesia.



Not surprisingly, the majority of what they had to say was about the preoperative discussion and their preference for induction technique. Some want to be told everything, some want to know as little as possible. Some prefer IVs, some prefer mask induction. Some like premed, some hate the loss of control. Regardless of preference, though, they all expressed that they like being asked and given a choice.

The Y-PAC members recently presented at Grand Rounds for the Department of Pediatrics and they created a handout for the clinicians with 12 tips for communicating with patients their age. Although all of the tips don't apply directly to the perioperative arena, most of them do, and most of them can probably be applied to our adult patients as well. If anyone has any ideas on better communicating information with these patients or their families, I'm sure they would love to hear it.

1. Please come prepared when you meet me. I realize you need to ask questions, but know how old I am, if I am a boy or a girl and my diagnoses and history. It helps me trust you and shows you see me as a person, not a patient.
2. Ask me what I like to be called. Tell me what to call you. Some doctors want to be called Dr. Last Name and some let me call you Dr. First Name. Let me know.
3. Please talk to me, not just my parents. This is happening to me and my body.
4. Remember that privacy is important to me. Ask me if I want my parents present or not. Please realize I may have visitors that I don't want to hear my personal information. Ask if this is a good time or if I need a more private setting.
5. It is okay to be honest with me. Offer options, give me choices. I want to be involved in my care and the decisions that are being made about me. Make me part of the team.
6. Use medical words and then interpret that into everyday language...I like to know the medical terms but also appreciate you explaining with words that are easier to understand.
7. When you have to wake us up, do so slowly and with some thought. Turn on the light over the sink, not the big one over my bed. Use a quiet voice...talk to me before you touch me.
8. Realize everyone is different. Some kids want to know all the details, some don't. Don't assume...ask us first.
9. When you talk about me in the hallways, I can still hear you. Just consider that...
10. Even if I have been a long-term patient here, I don't know everyone or everything. Please treat each admission as a new situation for us. Remind me who you are.
11. Let me ask you questions. Tell me at the start that I get to do this, so I can be thinking about them. I may feel overwhelmed at first and not have any questions. Once I have time to think, I will.
12. Listen to what I say and take it seriously. I know my body best, even if I don't explain things in a way that makes sense to you. Respect my feelings and what I share.

LETTER FROM PATIENT

Patient Letter: I was treated like royalty

Dear MUSC Health Care Team,

The following letter was shared with me about a patient's positive experience at MUSC last month. I always enjoy reading these letters and with the patient's permission, I wanted to share with the entire MUSC Health team.

It emphasizes what our patients and families see – the dozens of care team members who contribute to the care we deliver – it takes all of us! It also repeatedly points out an important element that speaks to one of our Imagine MUSC 2020 Goals: Commitment to Patients and Families First.



Huge thank you to the care team members recognized in the letter and all of you for the great work you provide every day.

Those individuals mentioned who were on the patient's care team:

- Pre Op RN: John Johnston
- Anesthesiologist: Dr. Joel Matthew Sirianni
- Attending: Dr. Sunil Patel
- Resident: Dr. Fraser Henderson
- Post Op RN: Tara Swenson
- Additional CTMs not mentioned by name:
- Circulator RN: Katherine Avalli
- Anesthesia Resident: Dr. Ian Osburn
- Anesthesia Tech: Brian Byrne
- Scrub Person (CST): Anna Christ

Dear Dr. Cawley,

I would like to express my sincere appreciate for **every** staff member I encountered yesterday August 15, 2018 when I had lumbar decompression surgery with Dr. Sunil Patel as an out-patient.

From registration, to the lobby lady who guided me to the elevator, to the waiting room prior to surgery, to pre-op, to post-op, I was treated like royalty.

I particularly want to praise my pre-op nurse David for his professional care and easy conversation. Dr. Joel (?) the anesthesiologist who thoroughly explained the whole surgical procedure to me, since I wouldn't know what would be going on, was very considerate about my sensitivity to opioids. He prepared a special "cocktail" of drugs prior to being wheeled into surgery including anti-nausea meds, and he also selected less strong pain meds during surgery. His concern was over and above my expectation. His resident assistant was also very capable.

I haven't words enough to express how capable Dr. Sunil's resident doctor is. (Also, can't remember his name.) Prior to surgery, he gave me one of the most thorough pain exams I've ever had. He carefully plotted my pain nerves. I was so impressed! It gave me such confidence knowing that he knew exactly which nerves were causing me such pain.

My sweet post-op nurse (?) (who is relatively new to the area coming from NY, with two young girls and her husband works for the State Department) never left my side. She checked my vitals, gave me pain meds, and told me I wouldn't remember our conversation. The only thing I forgot was her name!

David was the gentleman who wheeled me to my car. What a caring individual! He thanked ME for allowing him to wheel me to my car.

Also, when phoning to make an appointment, the staff is so courteous!

I have had surgeries at three other hospitals, and my experience at MUSC far outweighs any other I've experienced. I just wanted to share my complements with you!

Thank you!

A Grateful Patient

WELCOME TO THE DEPARTMENT



Please welcome Grace Johnston, MSNA, CRNA, to the Department! Previously, Grace worked in private practice for four and a half years, specializing in adult cardiac and vascular anesthesia. She received her BSN from MUSC in 2009 and continued her graduate clinical practice at MUHA specializing in neuroscience intensive care. Grace received her MSNA from MUSC in 2013. She is an active member of the South Carolina Association of Nurse Anesthetists and the American Association of Nurse Anesthetists. Grace lives in Mt. Pleasant with her husband and 14-month-old baby boy. She enjoys boating, football, and traveling.

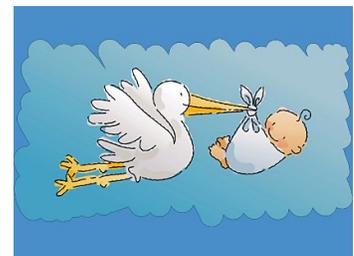
Derek Martindale, MSNA, CRNA, has recently joined the Department, coming to us from the Lone Star State. He practiced at the University of Texas Health Science Center, San Antonio and ambulatory centers in the area since 2014. Derek participated in all surgical cases, including labor and delivery. Captain Martindale is a 15-year veteran in the Air Force, serving four years of active duty and is currently in the Reserves as a flight nurse. Derek is a two-time graduate of MUSC, earning a BSN in 2009 from the College of Nursing and a MSNA from the College of Health Professions in 2014. Derek resides in Mt. Pleasant with his wife and four children.



NEW BABIES IN THE DEPARTMENT



Congratulations to Brittany and Justin Benson as they welcome Ryan William! Ryan was born on July 7, 2018, weighing 6 lbs. 10oz .



Congratulations to Edward Calhoun and family as they welcome Edward Dudley Colhoun VI, going by Ward! Ward was born on Sept. 23, 2018, weighing 8 lbs. 4oz. at 22 inches long.



THE WINNER OF THE CHILI COOK-OFF FOR THE AHA HEART WALK!

And
the
Winner
is...

Townsend Langley's
Pee Dee Pepper
Pot Chili



GRAND ROUNDS FOR THE MONTH OF OCTOBER



“What to Do After a Nerve Block Injury?”
October 2, 2018
David Hardman, MD, Professor
Department of Anesthesiology
University of North Carolina School of Medicine

“Subspecialty Team Meetings”
October 9, 2018
Division Chiefs
Dept. of Anesthesia & Perioperative Medicine
Medical University of South Carolina



“Topic TBA”
October 16, 2018
Lecture by Department Fellows
Dept. of Anesthesia & Perioperative Medicine
Medical University of South Carolina

“Morbidity & Mortality Conference”
October 23, 2018
Ryan Gunselman, MD, Associate Professor
George Guldán, MD, Associate Professor
Dept. of Anesthesia & Perioperative Medicine
Medical University of South Carolina



“Topic TBA”
October 30, 2018
Jason Taylor, MD, Assistant Professor
Dept. of Anesthesia & Perioperative Medicine
Medical University of South Carolina



DEPARTMENT OF ANESTHESIA AND
PERIOPERATIVE MEDICINE

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CHECK OUT OUR WEBSITE AT:
[HTTP://WWW.MUSC.EDU/ANESTHESIA](http://www.musc.edu/anesthesia)

Future Events/Lectures

Intern Lecture Series

October 4th—Peripheral Vascular Disease,
Dr. Heine, SEI 314

October 18th—Acute Oliguria, Dr. Sabbagh,
SEI 314

CA 1 Lecture Series

October 3rd—Spinal, Epidural, and Caudal
Blocks, Dr. Gunselman, CSB 429

October 10th—Respiratory Physiology: The
Effects of Anesthesia, Dr. Britell, CSB 429

October 24th—Anesthesia for Patients with
Respiratory Disease, Dr. Eastman, CSB 429

CA 2/3 Lecture Series

October 1st—Visiting Professor Lecture, All
Residents, Dr. Hardman (UNC), CSB 429

October 8th—Career Planning, All Residents, Dr.
Sabbagh, CSB 429

October 15th—Update on Lower Extremity
Blocks, Dr. Bolin, Moodle

October 22nd—Acute Pain Management in the
Opioid Dependent Patient, Dr. Gunselman,
Moodle

October 29th—Advanced Regional Anesthesia
Techniques, Fellows, Moodle

Grand Rounds

October 2nd—Visiting Professor Lecture,
Dr. Hardman (UNC)

October 9th—Subspecialty Team Meetings,
Division Chiefs

October 16th—TBA, Fellows

October 23rd—Morbidity & Mortality
Conference, Drs. Gunselman & Guldan

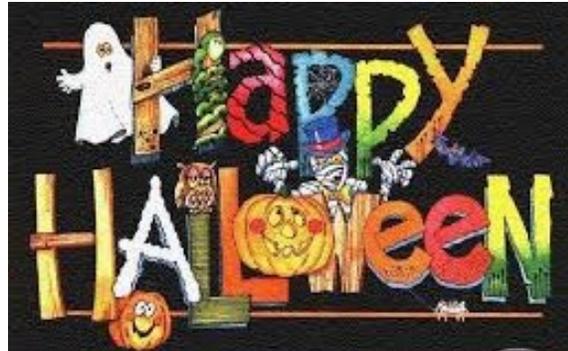
October 30th—TBA, Dr. Taylor



I HUNG THE MOON

Please don't forget to nominate your co-workers for going 'Beyond the Call of Duty.' I Hung The Moon slips are available at the 3rd floor front desk and may be turned in to Kim Pompey. Thank you!

Jodi Weber, CRNA—provided preoperative workup on my patients for the next day in ERCP. The workups were beyond compulsory. They facilitated my day.



Holiday Party 2018
Saturday, December 1, 2018
Carolina Yacht Club



MUSC Leading Health Innovation for the Lives We Touch

[Imagine 2020 Strategic Plan](#)

We Would Love to Hear From You!

If you have ideas or would like to contribute to *Sleepy Times*, the deadline for the November edition will be October 19, 2018.