OUR LADY OF THE LAKE RMC

InPharmation

The official publication of the Pharmacy Department

Volume 2, Issue 11

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Staff Spotlight

Michael Ezebuenyi, PharmD

Favorite Scripture: "So in everything, do to others what you would have them do to you, for this sums up the Law and the Prophets." Matthew 7:12

Michael is the newest member of the Medicine group. His favorite aspect about being a pharmacist is ensuring the safe use of medications in restoring the health of patients. He is originally from the Imo State in the eastern region of Nigeria, in West Africa. He has 4 sisters and his wife will be moving to the States by the end of this year.

When Michael isn't at work, you can find him playing FIFA on his PlayStation, hanging out with friends, reading about new trends in pharmacy, attending church, or playing soccer with his team at Burbank Park. His love of soccer is evident as his dream vacation encompasses seeing his favorite soccer team, Arsenal, play. If he won the lottery, he would be traveling the world.

If he could change one thing in the world, it would be the level of tolerance people have for one another. Peace is the most important thing to him in the world.

Resident Seminars

Fluid Resuscitation in the ICU

By Kristin Howell, PharmD

Fluid resuscitation is a crucial component in the management of hypovolemic and septic patients. There are two types of fluids including crystalloids and colloids. Colloids are suspensions with large molecules that are not freely permeable, albumin being an example. Crystalloids are electrolyte solutions that are freely permeable, containing sodium and chloride which determine tonicity. There has been much debate on whether crystalloids or colloids are the superior agent (i.e., SAFE trial), yet crystalloids remain first-line in fluid resuscitation. The discussion is now shifting towards which crystalloid is best in the critically ill patient population.

Crystalloids can be divided into two categories – buffered and non-buffered solutions. Non-buffered includes Normal Saline, while buffered includes fluids such as Lactated Ringer's and Plasma-Lyte. Normal Saline has been around since the 1800s when Hartog Hamburger recognized erythrocytes did not lyse when placed in this solution. Hamburger concluded that "the blood of man was isotonic with a sodium chloride solution of 0.9%". It is believed that this is what began the moniker of "normal" to described 0.9% saline, while human plasma is actually closer to 0.6% sodium chloride. Thus, the correct terms for Normal Saline are 0.9% saline or isotonic saline.

Nonetheless, while 0.9% saline is the most commonly used fluid for fluid resuscitation; there has been noted adverse outcomes during large volume resuscitation, as it is used in a majority of critically ill patients. These adverse outcomes are based on the chloride content, which exceeds that of human plasma (see chart below). While 0.9% saline is known to cause hyperchloremic acidosis, the impact of this is a hot topic in ICUs across the country. Hyperchloremic acidosis can lead to negative outcomes such as acute kidney injury and possibly increased morbidity and mortality while in the ICU. There have been multiple studies discussing these outcomes, however most of them are either retrospective or have patients that do not meet the criteria for large volume resuscitation. Many postulate the use of buffered solutions reduces and eliminates the incidence of hyperchloremic acidosis, yet those on the non-buffered side do not feel they have enough proof to show inferiority of 0.9% saline. Therefore, until further trials can conclude otherwise, most physicians are still at odds on whether the lack of "normal" in 0.9% saline even matters all that much.

	Na^+ (mEq/L)	Cl^- (mEq/L)	Acetate (mEq/L)	Lactate (mEq/L)	K^+ (mEq/L)	Mg^{2+} (mEq/L)	Ca^{2+} (mEq/L)	pH	Osmolality (mOsm/L)
Plasma	140	103	-	-	4	2	4	7.4	290
Isotonic Saline	154	154	-	-	-	-	-	5.6	308
Lactated Ringers	130	109	-	28	4	-	3	6.6	274
Plasma-Lyte A	140	98	27	-	5	3	-	7.4	294

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Resident Seminars (continued)

Use of Direct Oral Anticoagulants in Patients with Bioprosthetic Heart Valves and Atrial Fibrillation

By Laura Carrell, PharmD

Both patients with atrial fibrillation and those with prosthetic heart valves require treatment with anticoagulants to prevent clot formation and possible stroke. All of the anticoagulant agents, including apixaban, dabigatran, and rivaroxaban (direct acting oral anticoagulants or DOACs) are indicated for patients with atrial fibrillation, but only warfarin is indicated for patients with mechanical prosthetic valves. This is because the RE-ALIGN trial in 2013 demonstrated harm in patients with mechanical valves who received dabigatran compared to warfarin. However, very little data exists regarding the use of DOACs in patients with tissue (not mechanical) prosthetic valves.

Since patients with tissue valves are at a lower thrombotic risk, guidelines recommend that they receive either aspirin alone or a 3 month course of warfarin depending on the valve's location, but they do not address the patient population who also have atrial fibrillation and will require lifelong anticoagulation. A few small studies have addressed that issue. The first is a sub-analysis of the pivotal trial comparing warfarin to apixaban in patients with atrial fibrillation, ARISTOTLE. In this sub-analysis, the researchers found no difference in the results between patients with and without valvular heart disease, but were unable to determine what percentage of patients in the "valvular heart disease" category had a bioprosthetic heart valve. Another study was a case series of 127 patients with tissue valves undergoing ablation for atrial fibrillation and were anticoagulated with apixaban or rivaroxaban. When these patients were compared to a matched cohort on warfarin, no difference was seen in the number of thrombotic or bleeding events indicating that DOACs are likely safe and effective in this population. Finally, a retrospective single center cohort study was conducted this year examining patients on a DOAC for atrial fibrillation who underwent tissue valve implantation. Only one possible thrombotic event was found in the sample of 73 patients further suggesting that these agents are effective in this population.

Ultimately, larger and more rigorous studies are needed to confirm that DOACs are safe and effective in patients with both atrial fibrillation and tissue prosthetic heart valves, but the available evidence demonstrates promising results for their use. However, there is more rigorous literature available demonstrating harm with these agents in patients with mechanical heart valves. Because of this, it appears to be safest to suggest warfarin therapy in patients with atrial fibrillation and any prosthetic heart valve.

Topical Tranexamic Acid

By Danielle Thomas, PharmD

Total joint replacement is one of the most commonly performed elective surgeries in the U.S. These surgeries provide significant pain relief and improvement in quality of life for our patients. However, they are not performed without risks. Total joint replacement is associated with large amounts of perioperative blood loss and high rates of blood transfusions. For example, patients receiving a total hip replacement are transfused at rates of 16-37%. Intravenous antifibrinolytic agents have long been used in orthopedic surgery to decrease transfusion rates. Currently, there are two available options: aminocaproic acid and tranexamic acid (TXA). TXA, specifically, works by inhibiting the conversion of plasminogen to plasmin; therefore, preventing fibrin break up and maintaining clot stability. Unfortunately, there have been case reports of thrombus formation and thromboembolic events associated with their use. The use of topical TXA as opposed to IV TXA may offer a safer alternative for reducing blood loss and transfusion rates in patients undergoing total joint replacement surgery.

The literature surrounding the use of topical TXA is not consistent, however, it does suggest that topical TXA is safe and effective in patients undergoing total joint replacement. Topical TXA offers a safer alternate route of administration, especially in high risk patients. Examples of high risk patients include those with a prior history of DVT, PE, MI or ischemic stroke, bleeding disorders, hypercoagulable states or concurrent use of clotting factor concentrates. The advantages of using topical TXA include: ease of administration, directly targeting the source of bleeding, minimizing side effects, and presumed less systemic absorption all while decreasing blood loss and transfusion rates.

At present, further studies are required to determine the optimal dosing strategy for the use of topical TXA. However, this should not stop healthcare professionals from using topical TXA. The only exception is in patients undergoing revision or bilateral total joint replacement because these patients were excluded from all trials. The use of topical TXA is now customary at institutions such as Mayo Clinic and The Cleveland Clinic. The Veterans Health Association has also published guidelines to help assist practitioners in their clinical decision making. Their recommendation for the use of topical TXA is as follows:

- 1500-3000mg mixed in 50-100mL of 0.9% saline to be applied topically to the cementer joint
- TXA should be left in place for at least 5 minutes and the remaining fluid should be suctioned prior to wound closure.

Further studies are in process to determine how TXA compares to its counterpart, aminocaproic acid. For now, research has demonstrated the safety and efficacy of topical TXA and its use should be considered in patients undergoing total joint replacement surgery.

Regulatory

Recent FDA Approvals

- Zinplava (bazlotoxumab) has been approved for the treatment of recurrent Clostridium difficile infection in patients receiving antibacterial treatment.

First-time Generic Approvals

- Oseltamivir phosphate capsules, which is generic for Tamiflu
- Olmesartan medoxomil tablets, which is generic for Benicar
- Memantine hydrochloride ER capsules, which is generic for Namenda XR

FDA Med Safety Alert

FDA warns about the risk of Hepatitis B reactivating in some patients treated with direct-acting antivirals for Hepatitis C

- The FDA is requiring a *Black Boxed Warning* be added to the drug labels of direct-acting antiviral treatments (DAA). The BBW is a result of serious liver problems and death occurring in patients who have a current or previous hepatitis B viral infection (HBV) and are being treated with DAA medications for hepatitis C virus. These patients are at a higher risk for reactivation of HBV. Healthcare professionals should screen all patients for evidence of current or prior HBV infection prior to starting treatment with DAAs. Examples of DAAs include: Harvoni, Solvaldi, Olysio, Viekira, and Zepatier.

Reminders

- **Open Enrollment Nov 1st-30th:** Please renew your benefit elections before the end of the month
- **Annual Education:** Please complete Annual Education in Healthstream by Dec 5th
- **Nov 24th:** Happy Thanksgiving!
- **Dec 1st:** World AIDS Day

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Patient Safety Corner

ISMP Safety Practice Guidelines

InPharmation will be bringing you a new series from the ISMP IV PUSH Safety Summit in 2015

ISMP Safety Practice Guideline 4: Labeling

4.1 Appropriately label all clinician-prepared syringes of IV push medications or solutions, unless the medication or solution is prepared at the patient's bedside and is immediately administered to the patient without any break in the process.

a. If the clinician needs to prepare and administer more than one syringe of medication or solution to a single patient **at the bedside**:
   - Prepare each medication or solution separately, and immediately administer it before preparing the next syringe
   - If preparing several IV push medications at a time for sequential IV push administration, label each syringe as it is being prepared, prior to the preparation of any subsequent syringes.

b. Alternatively, if a practitioner prepares one or more medications or solutions **away from the patient's bedside**, immediately label each syringe, one at a time, before preparing the next medication or solution.

c. Bring only one patient's labeled syringe(s) to the bedside for administration.

4.2 Provide clinical units with blank or pre-printed labels, including sterilized labels where needed, to support safe labeling practices.
   - One of the top reasons that syringes are not labeled is clinician concern for covering the measurement gradation on the syringe barrel. Having pre-printed, standardized labels can improve practice by providing appropriately sized labels.

4.3 Immediately discard any unattended, unlabeled syringes containing any type of solution.
   - The only situation in which it is acceptable to administer medication from an unlabeled syringe is if it is prepared at the bedside and administered immediately.

4.4 Never pre-label empty syringes in anticipation of use

Safety Opportunities

Due to a glitch in Cerner, some medications are being discontinued by the system when a patient transfers between units in the hospital. This is a normal process for certain medications (such as PACU orders), but has been mistakenly occurring for some maintenance medications (most recently, Tikosyn). Please pay attention when verifying any medication discontinued by the system to ensure that patient therapy is not unnecessarily interrupted.