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The ARISTOTLE trial looked at two primary outcomes regarding efficacy and safety of apixaban when compared to current clinical recommendations in reducing the risk of post-TAVR thromboembolic and bleeding complications. 18,201 patients were enrolled (9120 patients on apixaban; 9081 patients on warfarin). Results indicated that apixaban therapy may be superior compared to warfarin in preventing stroke in afib patients and has lower bleed risk.[6]

Seeger et. al. assessed the safety and efficacy of apixaban compared to current clinical recommendations in reducing the risk of post-TAVR thromboembolic and bleeding complications. A total of 617 patients were enrolled; among the 272 patients with AF, 141 were treated with apixaban and 131 with warfarin. This study did show that the apixaban group proved superior in lowering stroke rate at 30 days and 12 months, and apixaban had a lower rate of life-threatening bleed.[7]

In conclusion, apixaban is a treatment option for patients with TAVR requiring oral anticoagulation.

www.valleyhealth.com/pharmacy

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Pharmacy Focus

In this issue:

Formulary Update

Bupivacaine liposomal injection suspension (Exparel®)

This product is an amide local anesthetic containing bupivacaine in multivesicular liposomes. It is indicated for postsurgical analgesia and administered as a single-dose into the surgical site. Bupivacaine liposomal injection should be injected slowly into soft tissues of the surgical site where bupivacaine will be released from the mutivesicular liposomes over a period of time. Concomitant administration with other agents, including bupivacine HCl, should be used with caution as it may disrupt the liposomal particles or cause an immediate release of bupivacaine from this liposomal suspension. Bupivacaine liposomal injection suspension, previously restricted at TVH to hemorrhoidectomy, bunionectomy, breast reconstruction, and hernia repair, is also now available for use in gynecologic laparotomies and laparoscopies.

Edetate disodium (EDTA)

EDTA is a chelating agent, most commonly used in lead poisoning. At TVH, EDTA was approved by the Pharmacy & Therapeutics Committee and Medical Board for off-label use as a 1 mL 2% solution to be used topically in band-keratopathy. This molecule will chelate and bind to any divalent and trivalent heavy metals that can displace the calcium portion of the compound. Specifically for topical use, it can help form a soluble complex with calcium ions which are typically deposited from band-keratopathy. The surgeon applies the topical solution to the eye for a few minutes, followed by a light scraping of the chelated compound. It is generally well tolerated with few adverse effects, which include toxicity of the corneal stroma, such as stinging and/or swelling of the eye.

Indocyanine green (IC-Green®)

Indocyanine green is an injectable powder for solution that is indicated in determining cardiac output, hepatic function and liver blood flow, as well as for ophthalmic angiography. It has also been used off-label as a tissue dye in vitrectomy that is done in internal limiting membrane peeling for epiretinal membranes, which is common in diabetic macular edema and macular holes. Several case reports and articles have described various methods for diluting and applying this product. For this particular off-label use, it is diluted in D5W and injected into the eye in order for the dye to settle. Indocyanine green is contraindicated in patients who have an allergy to iodide, given the product contains sodium iodide, though anaphylactic and urticarial reactions have been reports in patients with or without allergies to iodide.

Blood glucose levels in the hospital setting

By Jeff Gorovits, FDU Pharm.D. Candidate 2020

Because blood glucose levels can directly impact the wellbeing of a patient, it is important to understand the goal levels that should be achieved throughout the patient's hospital stay.[1] Glucose levels will vary greatly in a person if they are fasting or had eaten recently, and they can be indicative of a patient's ability to get better during their hospital stay.[3]

Glucose levels depend on when the patient has last eaten. Fasting glucose is usually measured around 8-10 hours after eating. Glucose levels begin to rise within about 10 minutes of eating carbohydrates and peak within an hour or so. Blood glucose levels do not usually exceed 140 mg/dL and will return to pre-prandial levels within a few hours.[1] When glucose levels exceed 140 mg/dL in an outpatient setting, it is considered a hyperglycemic state and may require a hemoglobin A1C assessment.[2]

Patients who are admitted to the hospital have different requirements depending on their disease state: glucose levels greater than 140 mg/dL may not require insulin or other therapy, but blood glucose levels 180 mg/dL or greater should be addressed. Close monitoring of blood glucose in hospitalized patients, especially those receiving parenteral nutrition (PN), prevents complications, infections and mortality.[3] Insulin or other medication may be initiated in hospitalized patients to maintain target blood glucose levels in the range of 140-180 mg/dL.[2,4] Although these goals may vary by patient and institutional policy, typically, blood glucose levels should be monitored for hospitalized patients and maintained at levels that avoid hypoglycemia (<70 mg/dL) and hyperglycemia (>140 mg/dL).[2,4]

Developing hyperglycemia while on parenteral nutrition has been linked to poorer outcomes that may be preventable through appropriate insulin administration and glucose monitoring.[3] Due to normal biological processes, the glucose levels of a patient who is not on PN fluctuates between meals.[3] However, the glucose levels of a PN patient are elevated because the rate at which insulin decreases blood glucose levels is similar to the rate at which dextrose is entering the bloodstream because of constant infusion. Therefore, bedside glucose testing reflects the constant carbohydrate infusion being delivered by PN and yields a higher result than a patient under normal care. This is part of the reason that insulin is typically administered as part of the PN in an effort to reduce stress on the pancreas.[2] A diabetic PN patient may present with higher blood glucose levels and require closer monitoring than a non-diabetic patient.[1,2] Goal glucose levels are summarized in Tables 1 and 2.

Table 1: *Glucose levels at various stages of carbohydrate consumption for a non-diabetic patient*[1,2]

State	Glucose Levels (mg/dL)
Fasting (normal blood sugar)	70 – 110
Post-Prandial (1 to 2 hours after eating)	< 140
Mostly sedentary patient in hospital setting	< 140 for healthy patients 140 – 180 for previously hyperglycemic patients
Hypoglycemia	≤70

Table 2: *Glucose levels for a patient on parenteral nutrition*[4,5]

TPN Patient / Requirement	Glucose Levels (mg/dL)
Hospitalized Patient	140 – 180
Lower Limit	110
Reassess Insulin	<100
Adjust Insulin (Hypoglycemic)	≤70

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DRUG INFO CORNER

By Vivian Liu, FDU Pharm.D. Candidate 2019

Question: Is apixaban (Eliquis®) suitable for use in a patient who just underwent a TAVR even though this drug class is contraindicated in patients with mechanical valve replacement?

Answer: Transcatheter aortic valve replacement (TAVR) is a non-invasive procedure indicated for symptomatic aortic stenosis, a condition where the heart's aortic valve narrows and produces a reduced ability to pump adequate blood flow from the heart into the aorta.[1] Symptomatic patients typically present with dizziness, fatigue, dyspnea, angina, and heart murmurs. TAVRs are less invasive compared to mechanical valve replacements because open heart surgery is not required in TAVR. In TAVR, the doctor inserts a catheter through the femoral artery, guiding it to the heart, where the defected valve will be replaced with a bioprosthetic valve of porcine origins. Approximately one-third of patients who require a TAVR also have a comorbidity of atrial fibrillation, indicating their need for oral anticoagulant therapy (OAC).[2]

Apixaban is a direct oral anticoagulant (DOAC) factor Xa inhibitor (anti-Xa) indicated to reduce the risk of stroke and systemic embolism in patients with nonvalvular atrial fibrillation (afib).[3] Safety and efficacy of apixaban has not been evaluated in patients who have prosthetic heart valves.[3] AHA/ACC guidelines state that "anticoagulant therapy with oral direct thrombin inhibitors or anti-Xa agents should not be used in patients with mechanical valve prostheses" with Level III: Harm. These patients should be on warfarin therapy.[4,5]

This leads to the question that since TAVR is a bioprosthetic valve replacement rather than mechanical valve replacement, is DOAC still considered contraindicated in a biological valve replacement?

The contraindication and exclusion of mechanical valve replacement patients from subsequent DOAC trials was a result of the RE-ALIGN study, which was designed to determine the dose for dabigatran in patients when compared to patients on warfarin. While the researchers were trying to establish a new and safe regimen, the trial was terminated early due to excessive events of thromboembolic and bleeding events in patients taking dabigatran in this patient population.[7] Due to these findings, DOACs are contraindicated in patients with mechanical valve replacements.[3,5]

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Meet the new Pharmacy Residents

The Valley Hospital Pharmacy Residency Program is nationally accredited by the American Society of Health-System Pharmacists. Upon graduation from schools of pharmacy, pharmacists may choose to further their education through a one-year long post-doctoral residency. This additional training exposes new practitioners to the different aspects of the practice of pharmacy, offers the opportunity to manage special patient populations, and allows application of knowledge and skills in participating as an interprofessional team member.

Elizabeth Hay, BS, MBA, Pharm.D.
Post-Doctoral Community Pharmacy Resident

Dr. Elizabeth Hay recently joined The Valley Hospital as the PGY-1 Community Pharmacy Resident. Born and raised in Clemson, SC, home of the Clemson Tigers, she went on to Clemson University and graduated with a B.S. of Bioengineering. In May 2018, she earned an MBA from The Citadel and a Doctor of Pharmacy from the South Carolina College of Pharmacy at the Medical University of South Carolina. Her interests include transitions of care and specialty pharmacy and she is excited to get started in our outpatient pharmacy. Aside from working in the pharmacy, she loves country music and enjoys golf, hiking, and spending time with her dog, Princess.

Rachel Nottebart, Pharm.D.
Post-Doctoral Pharmacy Practice Resident

Dr. Rachel Nottebart is originally from southern New Hampshire, and earned her Doctorate of Pharmacy from Albany College of Pharmacy and Health Sciences in Albany, NY. Her clinical interests include cardiology, oncology and critical care. She is excited to explore these areas and many more throughout her residency here. Rachel has been dancing since she was 3 years old, and was able to continue throughout college as a member of the ACPHS dance team. When not dancing or working, she can be found skiing, riding her bike along the Hudson River and playing tennis.

Catherine Purtill, BS, Pharm.D.
Post-Doctoral Pharmacy Practice Resident

Dr. Catherine “Cat” Purtill grew up in the Poconos, Pennsylvania and graduated from East Stroudsburg University with a Bachelor degree in Biochemistry and Chemical Biotechnology. Upon graduation, she then earned her Doctor of Pharmacy degree from The University of Findlay College of Pharmacy. Catherine’s current clinical interests are cardiology, pediatrics and emergency medicine. Upon completion of the residency program, Catherine hopes to become board-certified in cardiology. In her free time, Catherine enjoys spending time with her eight nieces and nephews, hiking, painting and researching the best bakeries in town!

Luckow Oncology Pharmacists Earn National Certification

Jooyoung Park, Pharm.D. and David Turberville, Pharm.D., are honored in a celebration of their accomplishment in earning **Board Certified Oncology Pharmacist (BCOP) credential.** This rigorous, prestigious, national credential is for pharmacists who meet eligibility requirements, including at least four years in the practice of oncology pharmacy and pass the national Oncology Pharmacy Specialty Certification exam. Pharmacists with BCOP credential demonstrate advanced knowledge and expertise in managing pharmacotherapy, reducing medication errors, providing education, and addressing the physical and emotional issues in this patient population as a member of the healthcare team. To learn more about national credentialing and certification for pharmacists, please visit www.bpsweb.org.

Kudos to both for successfully completing the requirements to this arduous process!!! Pictured are Jooyoung and David surrounded by the Luckow team.

Pharmacy faculty publish in national pharmacy journal

Sasha Falbaum, Pharm.D., and Maria Leibfried, Pharm.D., Fairleigh Dickinson University School of Pharmacy & Health Sciences clinical faculty at The Valley Hospital, published a review article in the national, peer-reviewed pharmacy journal, *U.S. Pharmacist.* The article, entitled "Treatment of Pulmonary Embolism," describes the epidemiology, pathophysiology, presentation, and management of patients with pulmonary embolism. To read the complete publication, please visit the journal's website at: https://www.uspharmacist.com/article/treatment-of-pulmonary-embolism