RWJBarnabas HEALTH

Pharmacy Updates from the 2025 ASHP Midyear Clinical Meeting

From the PGY-1 & 2 Pharmacy Residents Class of 2025-2026

Recaps from 2025 ASHP Midyear Clinical Meeting & Exhibition in Las Vegas

"Spark Brilliance"

Where: *Mandalay Bay Convention Center*
Las Vegas, NV

When: *December 6-10, 2025*

In December 2025, ASHP's 60th Midyear Clinical Meeting & Exhibition, one of the top healthcare meetings across all professions, welcomed RWJBH pharmacy residents and more than 20,000 pharmacy professionals and students from all over the globe to exchange pharmacy expertise, ideas, and innovation in the world. This event took place in Las Vegas, Nevada.

This year's theme, Spark Brilliance, sought to build excitement in the profession for pharmacists new and experienced. The convention focused on sparking new ideas and new connections. The brilliance of the 60th annual diamond convention was on display for everyone. The 2025 Midyear featured a spotlight on connection, AI tools, and other advanced technology. By integrating technological advancements with a focus on building intergenerational connections in pharmacy, Midyear is keeping the future of the profession "bright"!

This event provided opportunities for residents to attend hundreds of educational activities presented by expert faculty for professional development, and networking events to advocate for our pharmacy enterprise at RWJBarnabas Health. In this newsletter, the residents summarized educational sessions that updated pharmacy personnel on the latest information of the profession from across the globe, for those unable to attend this year. Many of the residents presented their posters on the research conducted in the past year. Additionally, the residents played an important role recruiting future residents for the next residency year, share their experiences and made us standout with potential candidates.

What were our takeaways from the 2025 ASHP Midyear?

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"Beyond Counting Sheep: Inhaled and Procedural Sedation in the ED and ICU"

Presented by: Kyle Weant, PharmD, BCPS, BCCCP, BCEMP, FCCP and Haili Gregory, PharmD, BCPS, BCEMP
Summary Prepared by: Christina Cheng, PharmD, PGY-2 Critical Care Pharmacy Resident at RWJBarnabas Health Community Medical Center

Procedural Sedation and Analgesia (PSAA) is a technique utilized to administer sedatives or dissociative agents with or without analgesics to induce an altered state of consciousness in order for the patient to tolerate painful, unpleasant, or traumatic procedures while preserving cardiopulmonary function. The level of sedation is a significant factor for the selected agent. Major pharmacotherapy options for PSAA includes opioid analgesics and sedatives. Rarely does opioid agonists alone provide adequate levels of sedation.

Medications	Dosing	Clinical Pearls
Opioid Analgesics		
Fentanyl	Adult: 1-1.5 mcg/kg IV Maximum dose: ~50-100 mcg IV Pediatric: 0.5-1 mcg/kg IV Maximum dose: ~50 mcg IV	- Primary opioid used for analgesia - Chest wall rigidity associated with rapid administration of large doses
Morphine	Adult: 0.1 mg/kg IV Maximum dose: ~2-10 mg IV Pediatric: 0.05-0.1 mg/kg IV Maximum dose: ~2-10 mg IV	- Can lead to flushing and nausea/vomiting
Hydromorphone	Adult: 0.2-1 mg IV Maximum dose: ~2-4 mg I Pediatric: 0.01-0.015 mg/kg IV Maximum dose: ~1-2 mg IV	- Good agent to use when sustained analgesia is necessary
Remifentanil	Adult: 0.05-0.15 mcg/kg IV Pediatric: limited available data	- Not commonly available - Supporting data are lacking, particularly for dosing strategies - ~60 times more costly than fentanyl
Sedatives		
Etomidate	Adult: 0.1-0.15 mg/kg IV Maximum dose: ~15 mg IV Pediatric: 0.1-0.4 mg/kg IV Maximum dose: ~15 mg IV	- Adverse effects include myoclonus and adrenal suppression - Ideal agent to use for cardioversion
Ketamine	Adult: 1-2 mg/kg IV Maximum dose: ~50-100 mg Pediatric: 1.5-2 mg/kg IV Maximum dose: ~50-100 mg	- Peak pain reduction scores similar to IV morphine - Reducing administration rate can help with AEs (laryngospasm, hypotension) - Can result in emergence reactions (can be premedicated with benzodiazepines)
Midazolam	Adult: 0.05-0.1 mg/kg IV Maximum dose: ~2.5 mg IV Pediatric: 0.025-0.1 mg/kg IV Maximum dose: ~2.5 mg IV	- Short duration of action makes this optimal for most procedures - Rarely used as first-line agent - Midazolam as a sole agent or in combination with opioids carries the highest risk of apnea
Propofol	Adult: 0.5-1 mg/kg IV Maximum dose: ~50-100 mg IV Age ≤3 yr: 2 mg/kg IV Children and teenagers: 1.5 mg/kg Maximum dose: ~50 mg IV	- Most commonly used agent - Administer in same line as fluids to minimize injection site pain - Positive allosteric modulator of γ-aminobutyric acid type A receptors, leading to skeletal muscle relaxation
Dexmedetomidine	Adult: 1 mcg/kg IV Pediatric: 1-2 mcg/kg IV	- Bolusing is associated with hypotension and bradycardia - Although the drug possesses some analgesic effects, currently it is not recommended as a sole analgesic agent

While a majority of PSAA strategies involve IV administration, there are alternative routes that can be considered. Alternative routes consist of the following:

Route	Medication	Dosing	Considerations
Intranasal	Fentanyl	1-3 mcg/kg	- Equipment to administer intranasally may not be available - Volume to be administered may be a limiting factor - Literature for dosing is lacking
	Ketamine	3-9 mg/kg	
	Dexmedetomidine	1-5 mcg/kg	
	Midazolam	0.05-0.5 mg/kg	
Intramuscular	Ketamine	3-5 mg/kg	- Onset and duration of action may vary depending on absorption - Volume to be administered may be a limiting factor
	Midazolam	0.05-0.5 mg/kg	
	Morphine	0.03-0.1 mg/kg	
Oral and Sublingual	Dexmedetomidine	SL: 1-3 mcg/kg PO: 2-4 mcg/kg	- Relies on absorption - Timing of administration should be relative with the procedure (at least 30 minutes beforehand)
	Ketamine	PO: 5-10 mg/kg	
	Midazolam	SL: 0.2 mg/kg PO: 0.25-0.5 mg/kg	
	Sufentanil	SL: 30 mcg	
Nebulization	Fentanyl	1-2 mcg/kg	- More rapid onset of action compared with oral route - Requires nebulizer system - Medication must be sterile, isotonic, and preservative free - Medications must be the ideal 1-4 um particle size - Paucity of literature with nebulized analgesics
	Morphine	10 mg	

Additionally, medication errors often occur due to differing dosages and routes for PSAA agents. These errors can increase the risk of adverse effects and lead to inadequate or over-sedation. Studies have shown that these errors occur due to use of oral orders, storing differing concentrations closely in automated dispensing cabinets, or illegible written orders (including electronic orders). In order to minimize errors, there are several things a pharmacist should consider during PSAA.

- Clearly defined roles and responsibilities between anesthesiology, doctors, nursing, and pharmacy
- Storing different concentrations of commonly used PSAA agents in separate places in the automated dispensing cabinet
- Having a checklist before the procedure
    - Pre-sedation assessment with the American Society of Anesthesiologists Physical Classification System (I-IV)
    - Depth of sedation required
    - Past medical history/history of present illness
        - Recently administered medications
- Labeling syringes with the correct drug and concentration
- Having monitoring in place (Capnography, pulse oximetry, blood pressure cuff)
- Documentation (medications used, dosages, dosing interval, complications/adverse events)

"Emergency Medicine Pearls 2025"

Presented by: Jamie Kerestes, PharmD, BCCCP, BCEMP; Marc McDowell, PharmD, BCEMP; Laura Celmins, PharmD, BCPS, BCCCP, BCEMP; John Patka, PharmD; Jessica Neshiem, PharmD, BCEMP, FASHP; Olivia Collins, PharmD, BCEMP; Pamela McCormick, PharmD, BCPS, BCEMP; Jennifer Esch, PharmD, MBA, BCPS; Meredith Gilbert, PharmD, MBA-HM, BCPS, BCGP; Gregory Kelly, PharmD, MS, BCCP, BCEMP

Summary prepared by: Daniel Radev, PharmD, PGY-2 EM Pharmacy Resident at Rutgers University New Brunswick

Calcium Pretreatment Before Diltiazem

Clinical Question: Does pretreating with IV calcium reduce diltiazem-induced hypotension in atrial tachydysrhythmias?

Key Points:

- **Rationale:** Calcium may offset calcium channel blocker (CCB)-induced vasodilation and negative inotropy.
- Evidence remains inconsistent. Older studies showed mixed effects on blood pressure; some show transient improvement; others have no benefit.
- A recent randomized, double-blind trial found no clinically meaningful reduction in hypotension after diltiazem despite calcium pretreatment.
- Calcium chloride offers more elemental calcium than gluconate but still lacks strong supportive evidence.

Takeaway: Calcium pretreatment is not routinely recommended. Any benefit appears small, transient, and clinically uncertain.

Topical Estrogen for Recurrent UTIs

Clinical Issue: Hypoestrogenism contributes to recurrent urinary tract infections (rUTIs) through loss of lactobacilli, elevated vaginal pH, and urogenital atrophy

Key Points:

- Topical estrogen may help restore normal vaginal flora, decrease pH, and reduce UTI recurrence
- Randomized trials show >50% reduction in UTI frequency with vaginal estrogen.
- Recommended by American Urological Association for peri- and post-menopausal women without contraindications.
- All dosage forms (cream, ring, tablet) are effective.

Takeaway: Consider vaginal estrogen in appropriate patients to reduce rUTIs and antibiotic exposure. Coordinate with oncology for patients with a history of estrogen-sensitive malignancy.

Rocuronium Dosing: 3-4-5 Rule

Clinical Context: Lower rocuronium doses may reduce duration of paralysis and risk of 'awake paralysis'

Pharmacologic Considerations

Clinical Context: Lower rocuronium doses may reduce duration of paralysis and risk of 'awake paralysis'

Pharmacologic Considerations

- Standard RSI dose of rocuronium: 0.6–1.2 mg/kg.
- The 3-4-5 concept highlights:
    - 0.3 mg/kg of etomidate with rocuronium dosed at 0.45 mg/kg
    - Slower onset (≈2 minutes to intubation)
    - Shorter duration (~22 minutes)
    - Higher risk of incomplete paralysis

Takeaway: Use low-dose rocuronium selectively beneficial for minimizing prolonged paralysis, but less reliable for rapid-onset conditions.

Phenobarbital for Alcohol Withdrawal Syndrome

Rationale: Phenobarbital provides predictable kinetics, multiple administration routes, and synergistic GABAergic activity.

Evidence Highlights

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- Weight-based loading (10–15 mg/kg, up to ~30 mg/kg) achieves therapeutic levels reliably.
- Studies show reduced ICU admission, lower CIWA scores, decreased LOS, and fewer ED revisits.
- Works well as monotherapy or adjunct to benzodiazepines.

Takeaway: A structured, weight-based phenobarbital protocol is safe and effective for moderate–severe alcohol withdrawal.

Managing Early Pregnancy Loss (EPL): Mifepristone + Misoprostol

Clinical Question: Is combination therapy superior to misoprostol alone?

Evidence Summary:

- Multiple RCTs show higher complete expulsion rates and lower surgical intervention with mifepristone pretreatment.
- Large database analyses confirm reduced ED revisits and procedures.
- Mifepristone requires compliance with FDA REMS: prescriber agreement, patient consent, pharmacy certification.

Takeaway: Combination therapy is more effective and reduces healthcare utilization, but implementation must comply with legal and institutional requirements.

Xylazine Withdrawal Management

Background: Xylazine, an α-2 agonist veterinary sedative, is increasingly mixed with fentanyl and causes severe withdrawal.

Withdrawal Features:

- Hypertension, tachycardia, agitation, anxiety, sweating, N/V.
- Typically, more intense than opioid withdrawal alone.

Treatment Strategies:

- **Alpha-2 agonists**: clonidine, guanfacine, dexmedetomidine (infusion).
- **Opioid therapy** for concurrent opioid withdrawal.
- Adjuncts: benzodiazepines, phenobarbital, fluids, antiemetics.

Takeaway: Use a multimodal approach. Alpha-2 agonists remain the cornerstone of therapy.

SQuID: Subcutaneous Insulin for DKA

Concept: Subcutaneous rapid-acting insulin (lispro/aspart) as an alternative to insulin infusion for mild–moderate DKA.

Supporting Evidence

- Meta-analyses show **similar time to resolution** compared to IV insulin.
- No increase in hypoglycemia or electrolyte complications.
- ED studies show **shorter length of stay** and decreased resource utilization.
- Clinicians report strong preference for ease of use.

Takeaway: SQuID is a **safe, efficient, resource-conscious** option for selected DKA patients.

Diphenhydramine Toxicity: Seizures & Cardiotoxicity

Key Points

- First-generation antihistamines cross the blood–brain barrier and lower seizure threshold.
- Overdose can cause anticholinergic symptoms, QRS widening, prolonged QTc, seizures, coma.
- Many deaths involve co-ingested opioids; however, isolated diphenhydramine toxicity is possible.

Management

- Supportive care is primary: benzodiazepines, fluids, monitoring.
- Sodium bicarbonate for QRS widening.
- Lipid emulsion therapy for refractory cardiotoxicity.
- Physostigmine may help severe anticholinergic features but requires caution and is not widely available.

Takeaway: Diphenhydramine toxicity can mimic seizure disorders or TCA toxicity—**early recognition and supportive care are critical**.

Anticoagulation in Pulmonary Embolism

Guideline Overview

- Low-molecular weight heparin (LMWH) is preferred for most PE patients due to predictable dosing, lower HIT risk, and decreased bleeding
- UFH is recommended only when rapid reversal or procedures are anticipated

Recent Trends

- Despite evidence, UFH use in increasing nationally
- Drivers include institutional inertia, comfort level, and convenience

Pharmacist Impact

- Participation in PERT programs increases LMWH use and reduces bleeding
- Pharmacists are key in developing pathways and guiding initiation

Takeaway: Promote LMWH as first-line therapy and involved pharmacist early to optimize anticoagulation

"Pharmacologic Controversies in Rapid Sequence Intubation"

Presented by: Lydia Ware, PharmD, BCCCP, BCPS and Jessica Nagy, PharmD, BCEMP, BCPS

Summary prepared by: Kelsey Jacobson, PharmD, PGY1 Pharmacy Resident, RWJBH-Community Medical Center

Rapid Sequence Intubation (RSI) is the process of securing an airway in emergency situations by rapidly inducing unconsciousness and paralysis to place an endotracheal tube. There are the 7 P's of rapid sequence intubation which is a mnemonic that can be used to guide the steps of intubation. Pharmacists are involved in the fourth P which is paralysis with induction. This process includes administering an induction agent and neuromuscular blocking agent.

Induction Agents:

Sedative agents used to rapidly induce unconsciousness with the goal of facilitating endotracheal tube placement, preventing awareness of paralysis, and minimally impact hemodynamics. Available evidence suggests ketamine and etomidate are comparable in efficacy and safety for induction and are the preferred agents.

Agent	Mechanism of Action	Dose	Onset	Duration	Clinical Pearls
Etomidate	$GABA_A$ agonist	0.3 mg/kg	10-15 seconds	4-10 minutes	• Hemodynamically neutral • May cause adrenal suppression
Ketamine	N-methyl-D-aspartate (NMDA) receptor antagonist	1-2 mg/kg	30-60 seconds	5-15 minutes	• Stimulates release of catecholamines, which can increase heart rate and blood pressure • Direct negative inotropic effects, which can cause severe hypotension or cardiac arrest if patients are catecholamine depleted
Propofol	$GABA_A$ agonist	1-2.5 mg/kg	10-60 seconds	5-10 minutes	• Well-established cardiovascular effects (myocardial depression, decreased cardiac contractility, and reduced mean arterial pressure (MAP) and cardiac index)
Midazolam	$GABA_A$ agonist	0.1-0.3 mg/kg	30-120 seconds	1-2 hours	• Not preferred due to slower onset and risk of hypotension

Controversy: Use of etomidate in patients with sepsis

- Increased adrenal suppression with etomidate use for induction but no increase in morality

Controversy: Use of ketamine in traumatic brain injury (TBI)

- Decreases in intracranial pressure (ICP) with the use of ketamine for induction

Paralytic Agents:

Neuromuscular blocking agents (NMBA) are administered after sedative agents. It is important to ensure that patients are appropriately sedated for the duration of the paralysis.

Agent	Mechanism of Action	Dose	Onset	Duration	Clinical Pearls
Succinylcholine	Depolarizing NMBA	IV: 1.5 mg/kg IM: 3-4 mg/kg	60-90 seconds	10 minutes	• Has risk of causing hyperkalemia and malignant hyperthermia
Rocuronium	Non-depolarizing NMBA	IV: 0.6-1.2 mg/kg	1-2 minutes	40-60 minutes	• May cause transient hypertension or hypotension
Vecuronium	Non-depolarizing NMBA	IV: 0.1-0.2 mg/kg	2-4 minutes	25-40 minutes	• Not preferred due to slower onset of action

Controversy: NMBA vs. No NMBA

- NMBA administration improves orotracheal intubation success and reduces the risk of complications related to intubation

“Make It Stick: Reversing Antiplatelet Activity in Neurologic Emergencies”

Presented by: Andrew Webb, PharmD, BCCCP; Karen Berger, PharmD, BCCCP, BCPS, FASHP

Summary prepared by: Pablo J Becerra, PharmD, PGY1 Pharmacy Resident, RWJBH - Cooperman Barnabas Medical Center

Platelets

Platelets, also known as thrombocytes, are small cell fragments in the blood that play a critical role in hemostasis. Platelet activation is a complex process involving multiple receptors, several of which are key targets of antiplatelet therapy. Clinically relevant receptors include P2Y12, GPIIb/IIIa, cyclooxygenase (COX), protease-activated receptor-1 (PAR-1), and phosphodiesterase-3 (PDE-3). Assessing platelet activity is challenging, as no single test fully captures platelet function. Instead, multiple platelet function assays exist, each validated for specific clinical contexts (such as P2Y12 inhibitor responsiveness). Commonly used tests include VerifyNow PRU, thromboelastography with platelet mapping (TEG-PM), light transmission aggregometry, platelet function analyzer (PFA), Multiplate analyzer, and vasodilator-stimulated phosphoprotein (VASP) testing.

Intracranial Hemorrhage and Platelet Reversal with Desmopressin

In the setting of intracranial hemorrhage (ICH), guidance from the Neurocritical Care Society (NCS) and the American Heart Association/American Stroke Association (AHA/ASA) is largely aligned regarding antiplatelet reversal. Both recommend that platelet transfusion may be considered in patients requiring neurosurgical intervention. The guidelines also acknowledge the potential role of desmopressin as an adjunctive reversal strategy. A 2013 study demonstrated that surgically managed ICH patients who were aspirin-sensitive and did not receive platelet transfusion experienced higher rates of postoperative hemorrhage, increased hematoma volume, and greater mortality compared with those who received platelets. In contrast, the PATCH trial showed that among medically managed ICH patients on antiplatelet therapy, platelet transfusion was associated with worse outcomes, including increased mortality. Desmopressin represents a potential alternative for antiplatelet reversal in ICH; although efficacy data are mixed, it appears to be safe and may carry less risk than platelet transfusion. Dosing based on actual, adjusted, or ideal body weight is considered reasonable.

Bentracimab’s Role in Ticagrelor Reversal

Bentracimab (PB2452) is an investigational human monoclonal antibody developed to rapidly and specifically reverse the antiplatelet effects of ticagrelor. The dosing regimen consists of a 1-gram intravenous bolus over 10 minutes, followed by a 6-gram infusion over 4 hours and an additional 6-gram infusion over 12 hours. In the REVERSE-IT trial, bentracimab successfully reversed ticagrelor’s antiplatelet activity, as measured by platelet reactivity unit (PRU) testing, in 100% of patients requiring urgent surgery and in 83.1% of patients with major bleeding. Although bentracimab is not yet FDA-approved, it has demonstrated promising safety and efficacy as a targeted reversal agent. Important knowledge gaps remain, including its role in patients receiving triple antithrombotic therapy, the potential need for higher dosing in those receiving moderate CYP3A4 inhibitors, and clear criteria for extended infusion. At present, no ideal reversal agent exists for ticagrelor-associated hemorrhage.

“Electrolyte Roulette: Critical Care’s High Stakes Drama”

Presented by: Angela A. Slampak-Cindric, PharmD, BCCCP, BCPS; Michelle E. Allen, PharmD, APh, BCPS, FASHP, FCCM; Sarah M. Gaffney, PharmD, MBA, BCPS, CPEL

Summary Prepared by: Ramija Alam, PharmD, PGY-1 Pharmacy Resident, RWJBH - Cooperman Barnabas Medical Center

Step onto the casino floor of critical care, where the lights are bright, the pace is fast, and the stakes are life or death. That was the tone set during Electrolyte Roulette: Critical Care’s High-Stakes Drama at the 2025 ASHP Midyear Clinical Meeting in Las Vegas, a session that turned everyday electrolyte management into a gripping reminder of just how much these “basic labs” truly matter.

From the start, the message was clear: in critical care, you are always playing the game. Sodium opened as the ultimate high roller being powerful, dangerous, and unforgiving when misused. Through real world cases and live polling, participants were challenged to choose between different concentrations of hypertonic saline in scenarios involving elevated intracranial pressure, impending herniation, and symptomatic hyponatremia. The takeaway wasn’t just about knowing doses, but about considering risk. A bag of 23.4% sodium chloride isn’t just another IV fluid, it’s a high-alert medication that demands strict storage controls, smart pump limits, and constant monitoring to avoid catastrophic consequences like osmotic demyelination or hemodynamic instability.

But the session quickly moved beyond pharmacology into something just as critical: people. Many electrolyte errors don’t come from lack of knowledge, but from barriers in communication. Psychological safety took center stage as a hidden but essential safeguard, creating an environment where team members feel empowered to speak up, ask questions, disagree respectfully, and stop the line when something doesn’t feel right. In high-stress ICU moments, silence can be far more dangerous than uncertainty.

Magnesium followed as the smooth operator, quietly influencing everything from cardiac rhythm and neuromuscular stability to energy production. Interactive cases reinforced that ICU targets often differ from “normal” lab values and that renal function, ongoing losses, and infusion rates all matter. High-stakes uses, such as torsade de pointes and pre-eclampsia, highlighted magnesium’s role as a true lifesaving therapy, not just a routine repletion order.

Potassium, on the other hand, reminded everyone why it commands so much respect. Whether too low or too high, potassium abnormalities announce themselves through electrocardiogram changes, arrhythmias, weakness, and muscle cramps. Pulling the slots with the “C BIG K Drop” framework emphasized rapid, organized treatment when hyperkalemia is present, reinforcing that hesitation can be just as dangerous as the electrolyte imbalance itself.

Calcium entered as the heavy hitter, essential for cardiac function, muscle contraction, and coagulation, particularly during massive transfusions, post-thyroid surgery, and critical illness. Phosphorus rounded out the discussion as the energy dealer and how deficiencies can lead to the casino crash with respiratory failure, prolonged ventilation, and poor outcomes, especially in refeeding syndrome. Even chloride earned its moment, reminding clinicians that fluid choice can quietly tip the balance toward acid-base disturbances as the silent partner.

By the end, the lesson was unmistakable: electrolytes save lives when managed deliberately, safety systems exist for a reason, and teamwork is the strongest defense against error. In critical care, there is no luck, but only preparation, vigilance, and communication. Know your hand, trust your team, and never leave patient outcomes up to chance.

"Betting on Better Outcomes: Are the Interventions Targeted in Intracerebral Hemorrhage High Stakes or a Busted Parlay?"

Presentation by Brian W. Gilbert, PharmD, MBA, BCCCP, FCCM, FKCHP, FNCS; Caitlin Brown, PharmD, MPH, FCCM, BCCCP; Andrew Webb, PharmD, BCCCP

Summary Prepared by: Russell C. Scarpa, PharmD, PGY-2 EM Resident, Rutgers University

Introduction

Intracranial hemorrhage (ICH) accounts for 10-15% of stroke and carries a 30-day mortality of 40%. Hematoma expansion (HE), defined as increase in ICH volume size > 33% at 24 hours, is the main therapeutic target to improve outcomes.

The Role of Bundled Care in Improving Intracranial Hemorrhage (ICH) Outcomes

The INTERACT-3 trial (2023) found reduced poor functional outcomes (OR 0.86, 95% CI 0.76 – 0.97, p = 0.015) and no difference in death at 6 months when patients received the following bundled care treatment:

1. Systolic blood pressure (SBP) < 140 mmHg within 1 hour
2. Glucose goal 110-140 mg/dL if not diabetic, 140-180 mg/dL if diabetic
3. Goal temperature < 37.5 C
4. Anticoagulant reversal within 1 hour to goal INR ≤ 1.5 for patients on warfarin

Blood Pressure Management Goals in ICH

The ATACH2 study (2016) compared 110-139 mmHg to 140-179 mmHg, and did find more renal adverse events (9% vs 4%, p = 0.002) with the intensive BP group, with no difference in the primary outcome of patients with modified Rankin Scale (mRS) 4-6. Therefore reducing systolic blood pressure much lower than 140 mmHg may not be beneficial.

The INTERACT4 trial (2024) found that rapid SBP control to 130-140 mmHg is associated with improved mRS at 90 days, and a pooled analysis of INTERACT2-4 found a linear association between more rapid BP control and the odds ratio of achieving mRS < 0-3. Importantly, patients with ischemic stroke had worse outcomes with this BP goal.

Antihypertensive Agent Selection

- Avoid hydralazine, as it may increase intracranial pressure without modifying cerebral blood flow with variable onset and duration of action
- If using monotherapy, nicardipine is associated with higher frequency of patients reaching goal BP within 30 minutes labetalol (91.7% vs 82.5%, p = 0.039)
- Nicardipine and clevidipine have similar outcomes despite clevidipine's more rapid titratability, and costs approximately 3.5x less

Several studies have found that SBP variability is associated with worse outcomes, so maintaining BP goal is vital.

Anticoagulation Reversal Strategies

Each 1 mL expansion of ICH volume is associated with 6% increased odds of functional dependence. When door-to-reversal time for anticoagulants is < 60 minutes, the aOR for in-hospital mortality or hospice is 0.82 (95% CI 0.69 – 0.99).

ANNEXA-I evaluated Andexanet alfa vs institutional usual care, of only 85.5% of patients received four-factor prothrombin concentrate (4F-PCC). Andexanet-alfa was more effective than "usual care" for hemostasis (13.4% increase, 95% CI 4.6 – 22.2, p = 0.003), but more patients (10% vs 6%, p = 0.048) experienced a thromboembolic event, primarily ischemic stroke. Additionally, mRS 0-3 and death at 30 days were not different between groups.

When used for DOAC reversal, 4F-PCC can be dosed at 25 or 50 units/kg without a likely difference in efficacy.

For warfarin, 4F-PCC plus IV vitamin K is standard of care. Idarucizumab remains indicated for dabigatran-associated ICH but lacks comparator studies.

An analysis of data from Get-with-the-Guidelines found no difference between in-hospital mortality or favorable mRS when reversal occurred within 60 minutes, calling into question if immediate anticoagulant reversal alone has independent benefit. However, anticoagulation is a risk factor for hematoma expansion, which has been demonstrated to impact outcomes.

Summary

The most reliable interventions to improve patient outcomes in ICH are bundled interventions as demonstrated by INTERACT-3 (SBP < 140 mmHg, glucose 110-140 mg/dL if not diabetic or 140-180 mg/dL if diabetic, body temperature < 37.5 C, and anticoagulation reversal within 1 hour). Blood pressure control or anticoagulation reversal without these other interventions does not reliably improve outcomes, but both serve to reduce hematoma expansion, which remains important.

"Aging Well With HIV: Making the Golden Years Shine"

Presented by: Jerika T. Lam, PharmD, AAHIVP, APh, FCSHP, Elizabeth Sherman, PharmD, AAHIVP, Alice Tseng, PharmD, AAHIVP, FCSHP

Summary prepared by: Jonathan Kurian, PharmD, PGY-1 Pharmacy Resident, RWJBH Monmouth Medical Center

Background:

Modern antiretroviral therapy (ART) is efficacious and well-tolerated with people living with HIV living close to normal lifespans. In older adults, diagnosis at later stage disease is more common with an increased prevalence of comorbidities and general frailty. In terms of treatment outcomes, there is no difference in rates of viral suppression according to age. However, older adults have lower CD4 and CD4:CD8 count recovery. Older adults are also more likely to experience adverse reactions and change ART due to adverse reactions. Older adults tend to have altered pharmacokinetics with decreased renal/hepatic clearance, decreased lean body mass, decreased serum albumin, and decreased gastric emptying. They tend to be more sensitive to anticholinergic effects, with greater CNS sensitivity and increased risk of comorbidities and polypharmacy. Increased projected prevalence among patients living with HIV is expected including dyslipidemia, diabetes, CKD, MI, depression and anxiety. Furthermore, 15-94% of older adults with HIV use > 5 non-ART medications pointing towards pill burden and potential for polypharmacy. There is still a higher prevalence of co-medications and drug interactions in older people with HIV despite shifts to INSTI use. Multiple factors can affect the quality of life and disease state management of older patients living with HIV.

Deprescribing Strategies:

It is important to look at potentially inappropriate medications associated with neurocognitive impairment, falls, hospital readmission and mortality in older people living with HIV. The guidance with these medications should be to avoid entirely, avoid higher doses, and/or limit durations of use. These agents include anticholinergic medications which can increase risk of cognitive decree, falls, frailty, and mortality. Drugs with sedative effects can also have negative outcomes with a unit increase of sedative increase odds of frailty by 18-24%. Different databases are available to check interactions with ART and other medications but it is vital to consider interactions which are not clinically relevant. It can be helpful to use both HIV-specific and general interaction checkers for completeness when reviewing regimens. Planned and supervised deprescribing is key to managing the care of older people with HIV. This includes assessing Beers/STOPP medications, correcting doses, or stopping duplicate medications. Tapering benzodiazepines can be done as part of this process as an example of the processing of deprescribing an older patient's medications

Management of ART:

Treatment strategies for older people with HIV involves reducing antiretroviral pill burden, shifting antiviral drugs to a 2-drug regimen, and long-acting antiviral therapy. Deprescribing in patients with 3-drug regimens and achieve sustained viral suppression for 3 months as well as no resistance to agents used and no HBV co-infection can be switched to a 2-drug single tablet regimen (dolutegravir/rilpivirine, dolutegravir/lamivudine), 2 drug multi-tablet ART (boosted darunavir + dolutegravir), or a 2-drug long acting injectable ART regimen (cabotegravir/rilpivirine). In the case of switching ART in virologic failure, it is preferable to use 2 fully active drugs and 1 drug with high barrier to resistance.

Key Takeaways: The management of an older patient living with HIV involves a comprehensive medication review including non-HIV components of their regimen. Enhancing pharmacotherapy in these patients can be done by reducing pill burden and deprescribing. It is important to address polypharmacy and any inappropriate medication use through regular medication reviews. Optimizing ART for older people living with HIV is an ongoing process involving dedicated attention to adverse reactions, drug interactions, and barriers to adherence.

"Midyear Clinical Pearl: Putting 'PEP' to the Step: Updates in Doxycycline Post-Exposure Prophylaxis"

Presented by: Wesley D. Kufel, PharmD, BCPS, BCIDP, FCCP, FIDSA & Jennifer Cocohoba, PharmD, AAHIVP
Summary prepared by: Juhee Jeong, PharmD, PGY1 Pharmacy Resident, RWJBH-Community Medical Center

Doxycycline PEP for Lyme Disease

What is Lyme Disease?

Tick-borne illness that is caused by *Borrelia burgdorferi* spirochete bacteria. Not every tick carries this bacteria. The *Ixodes* species are the common ones that carry the bacteria. Mostly rodents and deer are the reservoirs for tick transmissions. Transmission takes around 36 hours. The bacteria live in the midgut of the tick, then downregulation of OspA facilitates midgut detachment to salivary glands, then upregulation and expression of OspC facilitates invasion of bacteria into the skin.
With longer summers, there has been an increase in rate of Lyme disease found in humans.

Non-Pharmacologic Prevention Measures

- Self-inspection, DEET-containing repellent, Minimal exposure of skin, Wear light-colored clothing, Tick prevention for pets
- Remove tick with tweezers by pulling upward with steady, even pressure close to the tick's salivary glands.

Doxycycline PEP: 200 mg (two 100 mg capsules) by mouth for one dose

Indicated only when the following criteria are met:

- Attached tick can be identified as *Ixodes* species, estimated time of tick attachment is greater than 36 hours, doxycycline prophylaxis can be started within 72 hours of tick removal, Lyme disease is common in that area, and the patient has no contraindications to doxycycline.

Pharmacist Involvement

- Community pharmacists in Idaho and Rhode Island can prescribe and dispense Doxy-PEP.
- Pharmacists can counsel patients on doxycycline such as taking a full glass of water, avoiding lying down for 30-60 minutes after taking, wearing sunscreen, spacing doxycycline with certain supplements, etc.

Doxycycline PEP for STI Disease

Sexually Transmitted Infections (STIs) in the United States

There are 2.2 million STIs reported in 2024.

- 445.7 per 100,000 population with chlamydia diagnoses
- 159.8 per 100,000 population with gonorrhea diagnoses
- 186,301 syphilis diagnoses

The current strategies for STI per CDC (2021) is ceftriaxone 500 mg IM given once for gonorrhea, doxycycline 100 mg PO BID for duration of 7 days for chlamydia, and benzathine penicillin G 2.4 million units IM given once for syphilis (early).

Doxycycline PEP: 100 mg by mouth for one dose

DoxyPEP is an emerging bacterial STI prevention strategy. Compared to DoxyPrEP which is the pre-emptive daily doxycycline 100 mg daily, DoxyPEP is a single dose to prevent bacterial STIs. There is currently more robust evidence for DoxyPEP with certain countries having already developed treatment recommendations.

Pharmacy Involvement

- Discuss with people who may benefit: Gay, bisexual, MWM, TGW with bacterial STI within last year
- Harm/risk reduction counseling, baseline testing for STI, offer other services like HIV testing, HIV PreP
- Review medication list for drug interactions, re-assess need every 3-6 months

“Bacteriophages for the Assist: Adjuncts to Antibiotics for Multidrug-Resistant Infections”

Presented by: Bryan P. White, PharmD, BCIDP, FIDSA; Amer El Ghali, PharmD; Ashlan J. Kunz Coyne, PharmD, MPH

Summary Prepared by: Pooja Patel, PharmD; PGY-1 Resident at Newark Beth Israel Medical Center

Antibiotic resistance continues to increase and remains a major challenge in clinical practice. Both gram-negative and gram-positive organisms contribute to difficult to treat infections, particularly in hospital-onset, device-associated, and biofilm-mediated disease. In these settings, patients often experience persistent infection, treatment failure, and resistance development despite appropriate antibiotic therapy.

Bacteriophages are viruses that infect and kill bacteria, and therapeutic use focuses on phages that actively lyse bacterial cells. Phages offer several potential advantages, including activity that does not rely on traditional antibiotic resistance mechanisms, high specificity for bacterial targets, preservation of normal flora, and the ability to replicate at the site of infection. Phages may be used alone, but much of the interest has focused on combining phages with antibiotics, often referred to as phage-antibiotic combinations (PAC).

In gram-negative infections, phage therapy has been explored across multiple infection sites and routes of administration, including inhaled therapy for pulmonary infections, intravenous therapy for bloodstream infections, and local or topical administration for device-associated and biofilm-related infections. Available data suggest phage therapy is generally well tolerated. Reductions in bacterial burden are the most consistent finding, particularly when phages are used alongside antibiotics. In preclinical models, PAC strategies resulted in faster bacterial clearance and reduced emergence of antibiotic resistance compared with antibiotic monotherapy.

In addition to gram-negative pathogens, gram-positive organisms, especially methicillin-resistant *Staphylococcus aureus* (MRSA) have been an area of investigation. Persistent MRSA bacteremia remains difficult to treat and is associated with treatment-emergent daptomycin resistance and ongoing mortality. Preclinical data show that adding β-lactam antibiotics can restore susceptibility through antibiotic resensitization. When phages were added to daptomycin and β-lactam therapy, combination regimens demonstrated improved bacterial killing, prevention of antibiotic MIC increases, and suppression of phage resistance. In experimental models, regimens that included multiple phages outperformed high-dose monotherapy and simpler combinations.

Biofilm-mediated infections, such as prosthetic joint infections, cardiac device infections, ventricular assist device infections, and infective endocarditis, present additional challenges. Biofilms limit antibiotic penetration and allow bacteria to persist in a metabolically altered state. Phages help disrupt biofilms by breaking down the extracellular matrix and lysing bacteria, allowing antibiotics to reach deeper layers. In biofilm and simulated endocardial vegetation models, phage-containing regimens achieved greater reductions in bacterial burden than antibiotics alone.

Phage therapy has also been explored in vancomycin-resistant *Enterococcus faecium* (VRE). In a patient with recurrent bloodstream infections after prolonged antibiotic failure, combination therapy with phages and antibiotics led to rapid clearance of bacteremia and reduced gastrointestinal bacterial burden without development of antibiotic or phage resistance during treatment.

Despite these promising findings, most evidence remains preclinical or limited to small clinical experiences. Ongoing challenges include narrow phage host range, treatment-emergent resistance, optimal timing of administration, manufacturing complexity, and limited pharmacokinetic data. At this time, access to phage therapy in the United States is limited to clinical trials or compassionate use through FDA emergency investigational new drug pathways.

Overall, bacteriophages, particularly when used in combination with antibiotics, represent a promising adjunctive strategy for managing multidrug-resistant infections. Wider clinical use will depend on continued optimization of phage selection, improved combination strategies, and expansion of clinical access pathways.

“What Happens in Vegas… Stays MSSA-Free? Ceftriaxone vs. Cefazolin for MSSA Management”

Presented by: Kevin Nguyen, PharmD, BCDIDP; Hunter O. Rondeau, PharmD, BCIDP

Summary Prepared by: Taylor Bordamonte, PharmD, PGY1 Pharmacy Resident, RWJBH - Cooperman Barnabas Medical Center

MSSA is a common infection globally. It remains the leading cause of bacteremia, endocarditis, osteomyelitis, and device-related infections. The optimal agent, particularly in outpatient and step-down settings, remains debated. This discussion presented the rationale supporting both ceftriaxone and cefazolin for MSSA management, highlighting where each agent may be favored or avoided based on available evidence and clinical context.

Team Ceftriaxone

Argument for Ceftriaxone

Strongest appeal – pharmacologic convenience. Once daily dosing makes it convenient for outpatient parenteral antimicrobial therapy (OPAT). Given its once daily dosing, there is reduced line manipulation, infusion burden and logistical barriers. This becomes a more viable treatment option particularly for patients with limited social support, transportation challenges, or access to infusion services. Observational studies of OPAT utilizing ceftriaxone in in clinically stable patients without endocarditis or persistent bacteremia have demonstrated similar rates of mortality, microbiologic failure, and readmission compared with cefazolin. Meta-analysis of retrospective data comparing ceftriaxone to antistaphylococcal antibiotics show no statistically significant differences in 90-day all-cause mortality, hospital readmission, or infection recurrence.

Ceftriaxone offers practical advantages in polymicrobial infections, where gram-negative coverage is needed, or when the infection may involve the CNS. Real-world pharmacokinetic variability and retrospective outcomes challenge the idea that ceftriaxone’s probability of target attainment is universally inadequate for MSSA, specifically once patients are no longer critically ill.

Limitations of Cefazolin

Cefazolin requires more frequent dosing (every 8 hours), which can complicate OPAT and increase vascular access complications. Renal dose adjustment is a consideration, and cefazolin has historically raised concern regarding inoculum effect and CNS penetration. Finally, the absence of randomized head-to-head controlled trials means that cefazolin’s “gold standard” status is inferred rather than proven.

Team Cefazolin

Argument for Cefazolin

Cefazolin has been long regarded as a first-line agent for MSSA infections due to its narrow antimicrobial spectrum, favorable safety profile, and evidence in serious infectious such as bacteremia, endocarditis and osteomyelitis. Cefazolin poses less risk for collateral damage. The risk of *Clostridioides difficile* infections is lower, and cefazolin possesses a lower risk of creating resistant gram-negative organisms. One would say that cefazolin is a better choice when keeping antimicrobial stewardship in mind. Microbiologic and PK/PD concerns further support cefazolin’s preferred use over ceftriaxone.

Limits of Ceftriaxone

The uncertainty in reliably interpreting ceftriaxone susceptibility was underscored by the CLSI and FDA removal of ceftriaxone MIC breakpoints for MSSA. In-vitro and simulation studies suggest standard ceftriaxone dosing may be insufficient for high-burden infections, critically ill patients, or patients with hypoalbuminemia. Clinical guidelines available for infective endocarditis prioritize antistaphylococcal penicillins or cefazolin – ceftriaxone is notably excluded as a recommended definitive agent.

Indication bias limits the retrospective studies available showing equivalence between ceftriaxone and cefazolin treatment. It is important to note that the patients included in the ceftriaxone arm are often less acutely ill, and more severe infections were treated with cefazolin or nafcillin. Observational data has suggested worse outcomes were seen with ceftriaxone when used beyond low-risk populations. The broader spectrum coverage provided by ceftriaxone raises stewardship concerns, particularly when used solely to treat MSSA without an indication for gram-negative coverage.

Bottom Line

Optimal therapy should be individualized, emphasizing infection severity, host factors, microbiology, and care setting.

"Betting on Factor 11: Roll the Dice, Double Down, or Walk Away?"

Presented by: Snehal H. Bhatt, PharmD, AACC, BCPS, FASHP; Allison E. Burnett, PharmD, PhC, CACP

Summary prepared by: Yulina Li, PharmD, PGY-1 Pharmacy Resident, RWJBH - Clara Maass Medical Center

Background: In the world of anticoagulation, there is a balance between thrombosis and bleeding. Patients who are older with or without abnormal renal function may not receive adequate anticoagulation due to the uncertainty surrounding optimal care and increased risk of bleeding, exacerbated by tolerability issues, dosing, and dual antiplatelet/anticoagulation needs. Currently, the major medication classes for anticoagulation focus on vitamin K antagonists, direct thrombin inhibitors, and factor Xa inhibitors. But, in the setting of the older and/or renally impaired patients, perhaps there is a need for a new class of anticoagulation medications.

Factor XI/Xia Agents: In the pipeline, there are multiple formulations of factor XI/XIa agents being developed. Antisense oligonucleotides (ASO) such as Ionis FXI_{RX} and fesomersen are subcutaneous injections with long durations of action that do not require renal dose adjustment, but have slow onset. Monoclonal antibodies such as abelacimab, osocimab, and xisomab are intravenous formulations that have a rapid onset of ~1 hour and long durations of action, but may be more expensive for patients. In terms of oral options, asundexian and milvexian are small molecules that are currently being studied for anticoagulation for atrial fibrillation and venous thromboembolism (VTE) prevention/treatment.

Clinical Evidence:

VTE Prevention & Treatment

- VTE Prevention in Total Knee Arthroplasty (Phase 2): Factor XI agents (Ionis, osocimab, abelacimab, and milvexian) were studied against enoxaparin 40 mg SQ once daily for 8-14 days. The confirmed VTE risk ratio was 0.59 (95% CI 0.37-0.94) and the clinically relevant bleeding risk ratio was 0.41 (95% CI 0.19-0.92).
- Cancer-associated VTE Treatment (Phase 3): Ongoing studies include ASTER (abelacimab 150 mg IV/SQ monthly vs apixaban acute VTE dosing) and MAGNOLIA (abelacimab 150 mg IV/SQ monthly vs dalteparin acute VTE dosing).

Atrial Fibrillation

- AZALEA-TIMI 71 (Phase 2): This study evaluated rivaroxaban 20 mg PO daily to abelacimab 150 mg SQ monthly and 90 mg SQ monthly in the setting of atrial fibrillation anticoagulation. The primary outcome was major or clinically relevant non-major (CRNM) bleeding. The investigators found 3.2 (abelacimab) vs 8.4 (rivaroxaban) events/100 person-years [HR 0.38 (95% CI 0.24-0.60)] and concluded that abelacimab reduced free factor XI activity by 97-99%. However, the study was not powered for efficacy; thus, extending the need to confirm results in a phase 3 study.
- OCEANIC-AF (Phase 3): This study evaluated apixaban 5 mg PO BID to asundexian 50 mg PO once daily in the setting of atrial fibrillation anticoagulation. It was prematurely stopped due to 98 patients (1.3%) experiencing a stroke or systemic embolism, possibly suggesting that asundexian is not an adequate anticoagulative agent. However, per prior kinetic studies, the potency of asundexian was not equivalent to the dose used in OCEANIC-AF, prompting a follow-up study (LIBREXIA-AF) which is evaluating apixaban 5 mg PO BID to an adequate anticoagulative dose of milvexian (100 mg PO BID).

Secondary Stroke Prevention

- Two phase 2 studies have been conducted to assess the addition of a Factor XI agent to antiplatelet therapy. PACIFIC-STROKE assessed asundexian with antiplatelet therapy to only antiplatelet therapy and found that there was no significant differences in ischemic stroke or covert infarctions, but rather that there may be an increased rick of CRNM bleeding [HR 1.57 (90% CI 0.91-2.71)]. AXIOMATIC-SSP assessed a dual antiplatelet therapy with aspirin to the same regimen with the addition of milvexian. The investigators found that there were numerically fewer symptomatic ischemic strokes with milvexian included but that the numeric gastrointestinal bleeds increased with milvexian doses of 50 mg twice daily and greater.

Conclusions: The current studies do not confidently advocate for the addition of Factor XI agents as an anticoagulation agent to current therapies, but there are many possibilities to its potential. As bleeding management in special populations becomes increasingly prevalent, the need for another class may be pertinent, so further studies in the realm of Factor XI should persist.

"A New Era of Oncologic Emergencies: BsAbs and Checkpoint Inhibitor Adverse Events"

Presented by: Jessica Davis, PharmD, BCOP, CPP & Jordan Snyder, PharmD, BCOP

Summary prepared by: Valassia Antigone Theocharides , PGY1 Pharmacy Resident , RWJUH – New Brunswick

Background:

Oncologic emergencies are symptoms related to an oncologic diagnosis, progression or recurrence of disease, or cancer therapy that are emergent or life-threatening. Chemotherapy induced complications related to immune checkpoint inhibitors induce myocarditis, adrenal insufficiency, and encephalopathy; bispecific antibodies (BsAbs) often induce cytokine release syndrome (CRS) and immune effector cell-associated neurotoxicity syndrome (ICANS).

Bispecific Antibodies

BsAbs work by binding to CD3 on T-lymphocytes and uniting them with a cancer cell target. Common targets include CD-20 on B-cells (mosunetuzumab, epcortamab, glofitamab), CD-19 on B-cells (blinatumomab), B-cell maturation antigen (BCMA) (teclistamab, elranatmab, linvoseltamab), GPRC5D on plasma cells (talquetamab), gp100 (tebentafusp), and DLL3 (tarlatamab).

Due to risk of CRS and ICANS, these BsAbs require hospitalization for monitoring (save patients with follicular lymphoma). CRS cases in BsAbs range from 14% in blinatumomab to 80% in talquetamab. ICANS rates range from 3.4% in elranatamab to 14.5% in teclistamab. These medications also all require step-up dosing, premedications, and REMS enrollment which pharmacists can play active roles in.

CRS and ICANS

CRS occurs as a result of a rapid release of inflammatory cytokines which activate T-lymphocytes, triggering further release of cytokines. Similarly, ICANS occurs secondary to cytokine release but when they penetrate the blood brain barrier, inducing neurological symptoms. CRS symptoms commonly include fever, hypotension, and hypoxia as well as rigors, tachycardia, transaminitis, myalgias and arthralgias. Symptoms are most common during step-up dosing or with first full treatment dose. Some risk factors that put patients at increased risk for CRS and ICANS include high disease burden, high dose of therapy, pre-existing inflammation, malignancy type, circulating or metastasized disease.

Prevention

Pre-medications may include corticosteroids (dexamethasone for its blood-brain-barrier penetration) and tocilizumab. Tocilizumab has demonstrated significant reduction in CRS for multiple myeloma patients receiving BCMA or GP3C5D-targeting BsAbs. With a single dose of 8 mg/kg IV, prior to the first BsAb step-up dose, CRS rates were reduced by about 60% (70% to 10%), and Grade of CRS was nearly entirely Grade 1 (83%), Grade 2 (17%).

Pharmacist Role

Pharmacists may play roles in education of providers, nursing staff, and patients, managing reimbursement, developing protocols, managing adverse reactions, aiding REMS enrollment, and ensuring supportive medications are initiated. Close monitoring for CRS and ICANS in patients receiving BsAbs is crucial and initiating proper treatment with tocilizumab with or without corticosteroids can be the responsibility of a pharmacist. When patients initiate these high-risk medications, it's important to ensure that the proper monitoring efforts are made to prevent and monitor therapy.

"High Stakes Headaches: Update on Headache Pharmacotherapy and Pharmacists' Role in Management"

Presented by: Millad J. Sobhanian, PharmD, BCPS and Olivia Morgan, PharmD, BCCCP

Summary prepared by: Louisa Wiafe, PharmD, PGY-2 Psychiatric Pharmacy Resident, RWJBH - Behavioral Health

Headaches and migraines affect approximately 16% of the US population and per the National Hospital Ambulatory Medical Care Survey (NHAMCS), was the fifth most common cause for emergency room visits across the United States between 2016-2022, after GI upset, chest pain, and infectious disease related concerns. In 2025, Both the American College of Physicians (ACP) and the American Headache Society (AHS) for the management of migraines and headache, which include changes in recommendations for stepped therapy in both the emergent and non-emergent settings. Recommendations have escalated CGRP antagonists to first line abortive and preventative treatment options option and recommended against the initiation of opiates and barbiturates for episodic headaches and migraines.

Domain	Pre 2025	2025 ACP (outpatient)	2025 AHS (ED / parenteral)
Acute first-line (non-pregnant adults)	**NSAID or triptan monotherapy commonly used**	**Combination therapy:** Triptan + NSAID for moderate to severe attacks If NSAID contraindicated, **add triptan to acetaminophen**; start treatment early for best effect.	For attacks requiring parenteral therapy in ED, prioritize **IV prochlorperazine** and **greater occipital nerve block (GONB)** as Level A "must-offer" options.
Alternatives when triptans contraindicated	Ergotamines, limited use of gepants/ditans due to cost and limited data at the time	Gepants (rimegepant/ubrogepant/zavegepant) or ditan (lasmiditan) considered after inadequate response to combination therapy.	Subcutaneous sumatriptan, IV metoclopramide, and IV ketorolac are Level B "should offer" options; avoid routine opioids.
Prevention: conflicting recommendations between groups	Heterogeneous practice; opioids frequently used	ACP recommends stepwise prevention: beta-blocker/valproate/venlafaxine/amitriptyline first **CGRP mAbs/gepants** suggested if first-line not tolerated or ineffective; consider cost and pregnancy.	AHS position elevates **CGRP therapies as first-line options** in many patients but cautions ED use of IV CGRP (eptinezumab) only for trial-matching patients.
Key cautions		**Do not use opioids or butalbital** for episodic migraine; counsel on medication-overuse headache thresholds and pregnancy risks.	Hydromorphone (IV) is Level A **must not offer**; some parenteral agents remain unsupported (Level U) in ED setting

Big takeaways from presentations and special considerations for pharmacists

1. Novel antimigraine therapies offer effective, well-tolerated alternatives to traditional therapies while traditional therapies remain useful tools for compelling indications and/or to supplement novel therapies.
2. Effective migraine management requires careful treatment selection and regular follow-up to assess therapeutic effectiveness.
3. Identifying barriers to therapy and distinguishing migraine from other headache types are essential for successful treatment.

"Managing the Highs and Lows of Co-Morbid Depression and Diabetes"

Presented by: Kathleen Vest, PharmD, BCACP, CDCES, FCCP, & Sarah E. Grady, PharmD, BCPP, BCPS

Summary prepared by: Victoria Arthus, PharmD, PGY1 Pharmacy Resident, RWJBH – New Brunswick

There is a bidirectional relationship between depression and diabetes, with one condition increasing the risk of the other. Depression diminishes one's ability to care for his or her health. Meanwhile, diabetes is a significant stressor, requiring frequent monitoring as well as medications which may increase appetite and weight; additionally, it produces significant health concerns. In individuals with diabetes, screen at least annually for distress, depression, anxiety, fear of hypoglycemia, and disordered eating behaviors. Re-screen sooner for depression if there is a decline in health status or if there is a prior history of depression. There are various screening tools available for the different psychological conditions related to diabetes. In order to screen for depression, the PHQ-2 may be initially utilized to identify a depressed mood or anhedonia, one of which must be present for a diagnosis of depression.

As mentioned, specific antidepressants have the potential to increase weight through histamine or serotonin 5HT2C antagonism. High weight gain is associated with amitriptyline, citalopram, clomipramine, fluvoxamine, mirtazapine, nortriptyline, paroxetine, and phenelzine. Moderate weight gain is associated with desipramine, duloxetine, escitalopram, sertraline, and venlafaxine. Low weight gain is associated with desvenlafaxine, gepirone, levomilnacipran, selegiline, tranylcypromine, vilazodone, and vortioxetine. Neutral change or weight loss is associated with bupropion, dextromethorphan/bupropion, esketamine, fluoxetine, and zuranolone.

Meanwhile, new research has emerged analyzing the impact of antidepressants upon diabetes pathogenesis. Detrimental effects have been demonstrated by tricyclic antidepressants (TCAs), which cause weight gain, glycogenolysis, and gluconeogenesis, and attenuate insulin release. Selective serotonin reuptake inhibitors (SSRIs) demonstrate detrimental and beneficial effects. Detrimental effects are caused by pancreatic cell dysfunction, HPA axis dysregulation, and inhibition of insulin receptor substrate-1. Beneficial effects are caused by enhanced serotonergic receptor-induced insulin sensitivity and glycogen synthase. Selective serotonin and norepinephrine reuptake inhibitors (SNRIs) have demonstrated a neutral effect on blood glucose. To describe a few characteristics of specific SNRIs, duloxetine is also indicated in diabetic peripheral neuropathic pain, fibromyalgia, and chronic musculoskeletal pain, and it may increase a patient's liver function test (LFT) values. Meanwhile, desvenlafaxine has lower hepatic risk than venlafaxine and duloxetine. Additionally, levomilnacipran has a greater effect on norepinephrine than serotonin and may reduce pain and fatigue.

When discussing GLP1 receptor agonists, research suggests these medications promote neurogenesis and increase synaptic plasticity. In particular, dulaglutide and liraglutide may decrease depression risk, and exenatide may decrease heavy drinking days and total alcohol consumption in obese individuals with alcohol use disorder. No causal association has been identified between GLP1 receptor agonist use and increased depression/suicidality, despite post-marketing reports. If concomitant conditions exist, monitor patients for worsening depression, as patients may experience bothersome side effects to GLP1 receptor agonists.

"Is It Worth a Shot? A Pro/Con Debate About GLP-1 Agonist Use in Pediatric Patients"

Presented by: Caroline M. Sierra, PharmD, BCPPS; Norman E. Fenn, III, PharmD, BCPPS, BCPS, FASHP; Kelly L. Matson, PharmD, BCPPS

Summary prepared by: Maram Ayadi, PharmD, PGY-1 Pharmacy Resident, RWJBH Monmouth Medical Center

Background

According to CDC, approximately 1 in 5 children and adolescents have obesity using the data from 2017 to 2020. Obesity affects some groups more than others, in which adolescents aged 12-19 years old and Hispanic children have the highest instance of obesity in pediatrics. When looking at the impact of income on these rates, it was seen that obesity prevalence increased as family income decreased. Unfortunately, the trend of obesity among children and adolescents consistently rises.

Pro GLP-1 Agonist Use

Intensive Health Behavior and Lifestyle Treatment (IHBLT) is the mainstay of therapy. However, it is a family-based program that requires face-to-face interaction and over 3-12 months of treatment. The use of pharmacotherapy should be used as an adjunct to health behavior and lifestyle treatment. Looking at prescription data from 2020-2023, GLP-1 agonists have had more than a 500% increase in prescriptions in the adolescent population. Currently three GLP-1 agonists are FDA approved for pediatric type 2 diabetes (dulaglutide, liraglutide, and semaglutide) and two are FDA approved (liraglutide and semaglutide) with one undergoing trials (tirzepatide) for pediatric weight loss. GLP-1 agonists should be prescribed by practitioners that can monitor and follow-up closely to patients that do not have sustained BMI reduction with dietary and physical activity measures as well as those at risk for other co-morbidities.

Con GLP-1 Agonist Use

IHBLT has proven improvements in weight management and less risk of eating disorder development. The American Academy of Pediatrics (AAP) recommends pharmacotherapy as an adjunct but no direction for which agent to be selected. The greatest body of evidence is with metformin, in which there is data supporting use in children as young as 6 years old. The use of GLP-1 agonists has cost concerns as well as concerns for unknown or unintended consequences of GLP-1 agonist initiation, such as long-term impact on growth & development. Additionally, when patients stopped GLP-1 agonist therapy, there have been significant weight gain observed regardless of lifestyle interventions.

Key Takeaways

The mainstay of weight management in pediatric patients remains nonpharmacologic first, with pharmacologic agents as adjunctive therapy. GLP-1 agonists are a pharmacotherapeutic consideration for weight management in pediatric patients, however, long-term safety data is lacking and a significant concern in its usage in pediatric patients.

"Adulterated: The Illicit Drug Supply and Its Effects on the Management of Patients Living With Opioid Use Disorder"

Presented by: Dennis Goodstein, PharmD, BCPS; David E. Zimmerman, PharmD, BCCCP, BCEMP, FASHP

Summary prepared by: Umair Kadri, PharmD, PGY-1 Pharmacy Resident, RWJBH Clara Maass Medical Center

Background: The drug supply in the United States continues to evolve with the traditional opioid prescription drugs no longer being the only agents leading to misuse, abuse, and overdoses. The adulteration of the illicit drug supply with recent trends continue to show newly emerging substances and mixtures of compounds including synthetic opioids, fentanyl, and xylazine. These agents have altered the management of substance use disorders (SUDs. Management of the current supply and its effects on patients requires a complex and multidimensional response with a systemic and nationwide push on harm reduction strategies. Taking a birds-eye view at the current landscape, overdose deaths have decreased by nearly 25% in the past year, with a four-fold increase in all drug overdose mortality from 1994 to 2024. Of note, there has also been a recent shift from injection to smoking along with increased access to the lifesaving medication naloxone which may contributing factors to this decrease in deaths.

Adulterants - What Other Agents are in the Supply: Illicitly manufactured drugs commonly contain additional pharmaceutically active components that are added during the manufacturing process to either (I) increase the bulk of the product or (II) enhance the potency of the end product. One of these particular adulterants are alpha-2 receptor adrenergic agonists such as dex(medetomidine) and xylazine. Recent trends of fentanyl samples show a decrease in samples containing xylazine and an increase in the inclusion of dex(medetomidine).

In terms of their pharmacology, they are both non-selective alpha-2 agonists with physiologic effects including hypotension, bradycardia, sedation, and euphoria. For xylazine in particular its lipophilicity affords it a fast onset and its effect on wounds due to partial alpha-1 receptor agonism leads to vasoconstriction leads to severe and painful skin ulcers and necrosis.

Medetomidine also known as the "Demon," while also being non-selective is more selective for alpha-2 as compared to xylazine leading to less wound effects. It however is 200 times more potent at alpha-2 receptors which contributes to a more severe toxidrome and withdrawal.

Other agents: Carfentanil may also be on a comeback with similar surges having been reported in recent years. It is a 100-times more potent than fentanyl and overdose deaths with carfentanil detection is increasing especially in the Northeast region. Other synthetic opioids or nitazenes vary in potency and have varying binding affinities. Tinuvin 990 (BTMPS) is an industrial grade UV light stabilizer with cardiotoxic effects due to it being a calcium channel blocker. This agent has also made its way into the illicit fentanyl supply.

Management: Patients with fentalogs or novel potent opioids will often require additional doses of naloxone than just patients on fentanyl alone. The caveat though is that less is more with naloxone to prevent precipitated withdrawal.

Buprenorphine is a partial opioid agonist with a ceiling effect. Various strategies have been proposed for induction including a standard, low-dose induction, and macroinduction, but it is unclear if any one protocol is superior. The takeaway is that buprenorphine induction depends on patient specific factors and the location of initiation whether it be the ED, a clinic, or inpatient.

Xylazine withdrawal is related to alpha-2 withdrawal and tends to be less severe than medetomidine withdrawal. Primary management consist of oral agents such as with clonidine. Medetomidine withdrawal can be managed with oral agents such as clonidine, guanfacine, tizanidine, and lofexidine. It is also vital to manage nausea and vomiting with agents such as ondansetron, prochlorperazine, metoclopramide, or haloperidol. Dexmedetomidine may also be used with an initial bolus and titrated infusion. If there is concomitant opioid withdrawal the addition of hydromorphone or fentanyl may also be added.

Conclusions: Contents of the current drug supply can vary widely with the actual contents often being unknown. It is important to keep up with the local drug supply so that the clinical management of patients with substance use disorders can be better tailored to the community. There are several buprenorphine induction modalities and the selection of a regimen should be based on individual patient presentation and scenario. The agent medetomidine may lead to severe alpha-2 withdrawal and typically requires the use of larger doses of alpha-2 agonists and a multimodal treatment approach for management.

"Debating Naloxone vs. Nalmefene for Opioid Reversal"

Presented by: Andrew Webb, PharmD, BCCCP; Karen Berger, PharmD, BCPS, FASHP

Summary prepared by: Adelina Gallo, PharmD, PGY-1 Pharmacy Resident, RWJUH-Somerset

Opioid Overdose Epidemic

Since 1999, the United States has experienced a steady rise in opioid overdose deaths, occurring in three distinct waves

1. **First Wave: Prescription Opioids**
    - **a.** Driven by over-marketing and over-prescribing of opioids for pain control → led to a significant increase in prescription opioid overdose deaths
    - **b.** Adverse effects were initially minimized or underestimated
2. **Second Wave: Heroin**
    - a. Occurred after crackdowns on opioid prescribing
    - b. As providers reduced prescribing due to safety concerns, patients turned to illicit opioids (specifically heroin)
    - c. Resulted in increased heroin-related overdose deaths
3. **Third Wave: Synthetic Opioids (Fentanyl)**
    - a. Began around 2013 with the introduction of illicitly manufactured fentanyl
    - b. Resulted in a significant increase in overdose deaths due to fentanyl's high potency and long duration
    - c. January 2024: Fentanyl surpassed heroin as the leading cause of opioid-related deaths

Populations Most Affected

- Non-fatal opioid overdoses most commonly occur among males aged 25-44

Opioid Reversal Agents: Naloxone vs Nalmefene

Mechanism of Action: **Nalmefene**

- 6-methylene analog of naltrexone
- Acts as a competitive opioid receptor antagonist
- Reverses opioid-induced respiratory depression
- When compared to naloxone:
    - Has a higher affinity for opioid receptors
    - Has a longer duration of action due to slower metabolism

Opioid Half-Lives

- **Heroin:** 3-4 minutes
- **Fentanyl**: ~8 hours

PK	Naloxone (4 mg nasal spray)	Nalmefene (2.7 mg nasal spray)
Time to effect	Within ~2 minutes	~2.5–5 minutes
Half-life	2.2 hours	11.4 hours
Duration of receptor blockade	Shorter	Prolonged

Clinical Implication

- When comparing the kinetics of nalmefene and naloxone, nalmefene may be the superior reversal agent for fentanyl overdoses due to fentanyl's long half-life.
- Nalmefene may be the superior reversal agent for all community opioid overdoses, considering that fentanyl is the most prevalent opioid in the community at this time.

Timeline of Approvals and Removals

- **1995**: Nalmefene injection approved
- **2008**: Nalmefene injection removed from market (commercial reasons)
- **2015**: Narcan® (naloxone) nasal spray approved
- **March 29, 2023**: Naloxone nasal spray approved for OTC use
- **May 22, 2023**: Opvee® (nalmefene) nasal spray approved
- **August 26, 2025**: Indivior discontinued promotion of Opvee® (not withdrawn from market, stopped funding marketing of the product)

Clinical Evidence: Nalmefene vs Naloxone

Ellison et al. (2024) Reversal of Opioid-Induced Respiratory Depression in Healthy Volunteers: Comparison of Intranasal Nalmefene and Intranasal Naloxone

Study Design

- Open label, randomized, crossover
- Compared 4mg intranasal naloxone vs 2.7 mg intranasal nalmefene
- Outcome: reversal of remifentanil-induced respiratory depression

Overall Findings

- Both agents reversed reductions in minute ventilation within 2.5–20 minutes of administration
- Nalmefene reversed respiratory depression faster than naloxone
- Nalmefene had a more rapid onset of action than naloxone, which required 20 minutes to achieve a comparable reversal of respiratory depression
- Both were well tolerated
    - Common side effects: nausea, headache, dizziness
- Nalmefene demonstrated non-inferiority to naloxone

Major Limitation

- Conducted in an experimental setting, not real-world overdose scenario

Considerations for Nalmefene Introduction

- Withdrawal Period
    - Withdrawal symptoms from naloxone usually resolve within 1–2 hours after naloxone administration
    - Nalmefene's longer half-life may prolong the withdrawal period
        - Patients may not be able to tolerate several hours of withdrawal → increased likelihood of attempts to overcome opioid blockade
        - May reduce willingness to accept reversal agents in the future
- Impact on Initiation of Other Medications
    - Medications for opioid use disorder can be started as early as 3 hours after last opioid use when naloxone is administered
        - If nalmefene is used for reversal, it may cause a delay in the onset of other medications
- Cost Considerations
    - Naloxone's OTC status (March 2023) may lead insurers to remove coverage
    - Insurance coverage of nalmefene may relieve cost burden of OTC naloxone for those with limited disposable income

Key Takeaways

- Nalmefene exhibits a longer half-life than naloxone, which may prolong withdrawal and
- discourage future use of life-saving reversal agents
- Naloxone allows for timely initiation of medications for opioid use disorder, while nalmefene may complicate induction and delay treatment
- Nalmefene may offset costs exacerbated by FDA approval of OTC naloxone

"Innovations in Drug Information Practice and Research 2025: Medication Management Gems"

Presented by: Shannon Werner, PharmD; Austin Mondloch, PharmD, MA, BCMAS; Genevieve Lynn (Ness) Engle, PharmD, BCMAS; Amanda Grady, PharmD, BCPS, DPLA; Kerry Schwartz, PharmD, MPH; Sheila Takieddine, PharmD, BCPS; Indrani Kar, PharmD, DPLA, FASHP

Summary Prepared by: Cara Christopher, PharmD, MPH, PGY2 Medication-Use Safety and Policy Resident, Rutgers University

Drug information and medication management practice continue to evolve, with new frameworks, technologies, and educational strategies shaping how pharmacists and clinicians evaluate and use medications. This session highlighted innovations in value assessment, AI in education, enterprise P&T governance, and 505(b)(2) product management.

Value Assessment Frameworks in Formulary Management

Health systems are adopting value assessment frameworks (VAFs) to standardize how medications are evaluated for formulary inclusion, balancing clinical outcomes, safety, quality/consistency of evidence, cost, and place in therapy. Froedtert ThedaCare Health evaluated existing VAFs (ASCO, NCCN Evidence Blocks, ESMO, ACC/AHA, ICER) and adapted an NCCN Evidence Blocks–based framework for internal use, scoring efficacy, safety, quality of evidence, consistency of evidence, cost, and place in therapy on a 5-point scale. When applied to formulary reviews and medication use evaluations, this VAF showed usability and moderate inter-rater reliability, but no clear association between VAF scores and final P&T decisions.

AI in Drug Information Education and Rotations

Generative AI tools are widely used by students in drug information and literature evaluation courses, from helpful augmentation (brainstorming, outlining, grammar) to problematic over-reliance (drafting full DI responses, generating citations, copying AI output). Concerns include hallucinated references, superficial critique of literature, and reduced critical verification.

Faculty and preceptors are encouraged to:

- Develop clear AI policies in syllabi that specify permitted and prohibited uses.
- Redesign assignments so students use AI as a starting point, then compare the AI output against traditional methods.
- Emphasize source verification, rationale for clinical decisions, and documentation of thought process in grading rubrics.

On rotations, an effective strategy is the "AI Journal Club": learners use an AI platform to analyze a selected article, then review the AI findings alongside traditional methods to identify differences and form their own conclusion. This teaches learners to verify AI output, challenge AI findings, and still develop strong literature evaluation skills while leveraging AI for efficiency.

Consensus-Based Best Practices for Enterprise P&T Committees

Core elements of the enterprise P&T process include an enterprise-wide implementation of formulary decisions, including standardized order sets, education, informatics, and timelines based on complexity.

Optimizing 505(b)(2) Product Management

Drugs approved via the 505(b)(2) pathway are not considered generic equivalents to a reference listed drug, and many now have unique HCPCS billing codes assigned by CMS. This creates a risk of billing mismatches, claim denials, and revenue loss if these products are not properly identified, coded, and managed.

An integrated approach for drug policy/formulary management, central purchasing, and pharmacy revenue integrity is essential:

- Formulary management should review FDA-approved indications, support substitution/interchangeability policies where appropriate, and set preferences for inpatient and fee-for-service use.
- Centralized purchasing should maintain a centralized catalog that identifies 505(b)(2) products, manages product exclusions, and supports preference lists and shortage management.
- Pharmacy revenue integrity should establish SOPs for denials management, root cause analysis, and regular follow-up, with metrics such as 505(b)(2) adjustment/write-off amounts used to track financial success.

This triad of functions (drug policy, centralized purchasing, and revenue integrity) enables health systems to optimize the financial integrity and appropriate use of 505(b)(2) products.

“Ante Up for Innovation: Insulin Pumps for Type 2 Diabetes”

Presented by: Diana Isaacs, PharmD, BCACP, BC-ADM, BCPS, CDCES, FADCES, FCCP; Taylor Thooft, PharmD, BCPS
Summary Prepared by: Christin Kim, PharmD, PGY2 Ambulatory Care Resident, RWJBarnabas Health

Many patients with type 2 diabetes (T2DM) use multiple daily injections (MDI), but are above the recommended glycemic goals set by the American Diabetes Association (ADA), which increases the risk of micro- and macrovascular complications. The 2025 ADA guidelines prefer automated insulin delivery (AID) systems over MDI due to improved glycemic outcomes and reductions in hypoglycemia for youth and adults with Type 1 Diabetes (T1DM) and other types of insulin-deficient diabetes. AID systems, preferably with continuous glucose monitors (CGM), should be *offered* to youth and adult patients on MDI with T2DM who can use the device safely either by themselves or with a caregiver, for improved glycemic outcomes.

Insulin pumps deliver insulin that more closely mimics physiologic insulin release compared to MDI. AID systems are an advanced form of insulin pumps that use a CGM and an algorithm to automatically adjust insulin; these systems can be closed-loop, communicating directly with CGM values only, or open-loop requiring manual user input for all insulin doses. AID symptoms can be hybrid, requiring users to only note when a meal is about to begin, details about the meal itself, and other activities such as exercise, in order to adjust bolus doses and glucose targets.

Ideal candidates for insulin pump therapy include patients who require mealtime insulin to reach glycemic targets, use CGM or frequently monitor blood glucose, have baseline carbohydrate awareness and self-management of diabetes, have regular follow-up with healthcare team, can correct hypo- and hyperglycemia independently or with caregiver support, and have financial access to pump supplies. Patients may also transition to pump therapy even if they only use basal insulin daily.

There are many different insulin pump options available. For patients with Medicare, many of these insulin pumps must be processed through Part B under Durable Medical Equipment (DME). Omnipod 5 is one of the few options available that may be processed at a pharmacy under Part D prescription benefits. Each pump has different CGM compatibility, volume of insulin able to be stored, how often insulin should be replaced, and programmable settings. Some examples of available insulin pump options include: iLet, Omnipod 5, MiniMed 780G, T:slim X2, Mobi, and Twiist, Cequr Simplicity (patch pump), and V-Go (patch pump).

Transitioning a patient from MDI to pump therapy is dependent on the product chosen, as some products only need a patient’s body weight (iLet) and other products require the total daily dose of insulin in addition to body weight in order to calculate basal rates and bolus dosing. Insulin pumps use **U-100 rapid-acting insulin only**. Patients must stop any long-acting insulin and not inject any additional insulin outside of what is provided through the pump.

Patients interested in insulin pumps are often referred to endocrinologists for initiation. However, the wait time between making an appointment and being seen by an endocrinologist can be months, which also makes consistent follow-up difficult and may precipitate a negative experience for the pump user. Primary care providers may be hesitant to initiate and manage insulin pump therapy, but with proper training, patients may see improved adherence and glycemic outcomes, contributing to positive patient experiences and stronger provider-patient relationships.

"An Ace in the Hole: Improving Depression Treatment with Pharmacogenomics"

Presented by: Jordan F. Baye, PharmD, MA, BCPS; Samantha Frear, PharmD; James Michael Stevenson, PharmD, MS, BCPP
Summary Prepared by: Jack Lyman, PharmD, PGY1 Resident, RWJBH - Somerset

Landmark trials for use of Pharmacogenomics (PGx) in Guiding Depression Management:

1. **Bradley et al. (2018)**
    a. Design: RCT, Double blind
    b. PGx Test Source: NeurolDgenetix
    c. Number of Participants:
        i. PGx- 352
        ii. Control- 333
    d. Outcomes: Depression remission/response rates at 8 and 12 weeks, Frequency of medication changes, adverse drug events
    e. Conclusions: Patients with severe depression were 3.5x more likely to go into remission if they received PGx
2. **Greden et al. (GUIDED) (2019)**
    a. Design: RCT, Double Blind
    b. PGx Test Source: GeneSight
    c. Number of Participants:
        i. PGx- 717
        ii. Control- 681
    d. Outcomes: Symptom improvement (% change from baseline in HAM-D17 score) at week 8
    e. Conclusions: Primary outcome not statistically significant, but higher rate of remission and response in PGx group
3. **Oslin et al. (PRIME care) (2022)**
    a. Design: Pragmatic, Single Blind
    b. PGx Test Source: GeneSight
    c. Number of Participants:
        i. PGx- 966
        ii. Control- 978
    d. Outcomes: Drug gene interaction <30 days of randomization, Remission rates (PHQ-9) at 24 weeks
    e. Conclusions: Remission and response rates were similar to those reported in GUIDED, significant improvement in outcomes attributed to PGx testing BUT uncertain clinical relevance

Overall Take-Home Messages from Pharmacogenomic Clinical Trials:

- Several clinical trials and meta-analyses are available
- Trails have predominantly represented:
    - US population
    - More female than male patients
    - Moderate to severe depression diagnoses
- Overall, outcomes have favored PGx use vs. usual care
- Limitations:
    - Difficulty assessing which gene/genes impact medications to the greatest extent
    - Use of proprietary algorithms in the trials

Recommended Dose Adjustments for Serotonin Reuptake Inhibitors (SSRIs, SNRIs, etc.):

Medication	Renal	Hepatic	PK DDI
Citalopram	—	Dose reduction	CYP2C19 inhibitors → ↓ dose
Desvenlafaxine	Dose reduction	Dose reduction	—
Duloxetine	Avoid	Avoid	CYP1A2 inhibitors → Avoid
Escitalopram	—	Dose reduction	—
Fluoxetine	—	Dose reduction	—
Fluvoxamine	—	Dose reduction	—
Levomilnacipran	Dose reduction	—	CYP3A4 inhibitors → ↓ dose
Milnacipran	Dose reduction	—	—
Paroxetine	Dose reduction	Dose reduction	—
Sertraline	—	Avoid	—
Venlafaxine	Dose reduction	Dose reduction	Ketoconazole → Caution
Vilazodone	—	—	CYP3A4 inhibitors → ↓ dose; CYP3A4 inducers → ↑ dose
Vortioxetine	—	—	CYP2D6 inhibitors → ↓ dose

Clinical Pharmacogenetics Implementation Consortium (CPIC):

- International consortium interested in facilitating use of pharmacogenetic tests for patient care
- Have published 42 guidelines covering 144 drugs
- Endorsed by ASHP
- Used as primary reference for PGx-guided treatment by many academic health systems implementing pharmacogenomics

Phenotype	Definition	Function
Ultrarapid metabolizer (UM)	Two increased function alleles	↑↑
Rapid metabolizer (RM)	One increased function allele, one normal function allele	↑
Normal metabolizer (NM)	Two normal function alleles	↔
Intermediate metabolizer (IM)	One decreased or no function allele	↓
Poor metabolizer (PM)	Two no function alleles	↓↓

Non-Guideline PGx Sources and Evidence:

- Non-guideline sources have potential for different information compared to CPIC
- New literature may not be reflected in current CPIC guidelines
- Commercial PGx panels may include gene, drugs, or both that are beyond the scope of CPIC guidelines
- Can potentially provide insight into how PGx test results can be clinically applied
- FDA Table of Pharmacogenetic Associations includes medications that the FDA has evaluated and believes there is sufficient scientific evidence to suggest that subgroups of patients with certain genetic phenotypes are likely to have altered drug metabolism that can lead to different responses in therapeutic effect and adverse events

Clinical Interpretation of Pharmacogenomic Testing:

- For medication-gene interactions without established CPIC recommendations there exists minimal or mixed evidence for adjustments
- Providers should review evidence for recommendations referenced on reports from PGx tests before implementing changes
- Overall, despite positive results from trials, PGx testing is still exploratory and may hold limited clinical utility in some cases

"340B Developments Impacting Pharmacy and Health System Practice: Critical State and Federal Policy Considerations"

Presented by: Kyle Robb PharmD, BCPS, Maureen Testoni, JD, CEO of 340B Health, and Mark Ogunsusi PharmD, JD
Summary prepared by: Sara Farag PharmD PGY1 Resident, RWJBH Jersey City Medical Center

Background

The 340B Drug Pricing Program remains a cornerstone of the health care safety net, enabling hospitals and clinics to stretch scarce resources and expand services for vulnerable populations. However, the program is undergoing rapid and significant change. Manufacturer restrictions, new federal pricing policies, aggressive payer strategies, and a growing patchwork of state legislation have created a more complex and uncertain operating environment. As a result, covered entities must navigate shifting policies that directly affect pharmacy operations, compliance responsibilities, and access to care for the communities they serve. This session provided a comprehensive overview of the most impactful developments at both the state and federal levels and highlighted what they mean for pharmacy and health system practice.

340B Rebate Pilot Program

One of the most substantial upcoming changes is HRSA's rebate pilot, scheduled to begin January 1, 2026. Instead of receiving discounts at the point of purchase, covered entities will buy selected drugs at WAC and then submit claims to receive rebates afterward. The shift raises concerns about cash flow, data accuracy, and administrative burden—especially because the pilot requires detailed claims-level reporting that many hospitals have not previously submitted. There is still uncertainty about implementation due to active litigation and logistical barriers, but health systems must begin preparing now.

Federal Pricing Policies: Maximum Fair Price and the IRA

The Inflation Reduction Act adds another layer of complexity through Medicare drug price negotiations, which will produce the Maximum Fair Price (MFP). Like the rebate pilot, MFP will operate using a rebate mechanism rather than upfront discounts. Manufacturers may respond by lowering WAC prices to mitigate inflation penalties, which in turn raises 340B ceiling prices after a two-quarter delay. These dynamics may lead to tighter margins for covered entities and require new strategies for forecasting drug spending and 340B savings.

Contract Pharmacy Restrictions and State-Level Action

Since 2020, many manufacturers have limited when and how covered entities can access 340B pricing through contract pharmacies. In response, 20 states (not including New Jersey) have passed laws designed to protect contract pharmacy operations and prevent manufacturers from withholding 340B-priced drug shipments. In some cases, manufacturers have reversed restrictions before these laws took effect, while other policies remain subject to legal challenges. Regardless, states are becoming increasingly active in shaping the future of contract pharmacy access.

Non-Discrimination Laws and Payer Issues

Payer and PBM behavior has also created challenges for health systems participating in 340B. Thirty-five states (not including New Jersey) now have laws prohibiting payers from reimbursing 340B claims at lower rates or otherwise treating 340B prescriptions unfairly. These laws are critical in protecting health systems from sudden revenue losses tied to discriminatory reimbursement practices. Effective enforcement depends on hospitals reporting violations, making awareness and vigilance essential.

Patient Definition Litigation: Genesis v. Acera

The Genesis v. Acera decision marked a significant moment in the ongoing debate over how a "340B patient" should be defined, as the court endorsed a much broader interpretation of patient eligibility than HRSA has historically applied. The ruling challenged HRSA's longstanding requirements that a patient encounter occur at a registered 340B location and that referral relationships be formally structured and documented, noting that the 340B statute itself does not explicitly impose those conditions. Although HRSA has not changed its audit approach and continues to apply its traditional patient definition, the decision highlights growing judicial skepticism toward HRSA's interpretation and suggests that future litigation could further reshape compliance expectations and program operations.

Medicaid, HR1, and Future Oversight

Proposed federal policy changes, including HR1, could reduce Medicaid enrollment, potentially affecting hospital eligibility for the 340B program and increasing uncompensated care. There is also growing discussion about the possibility of CMS taking over 340B oversight from HRSA, which may shift program administration toward Medicare cost containment rather than safety-net expansion. These uncertainties highlight the need for health systems to remain engaged in policy discussions and advocacy.

"How smart are smart infusion pumps in preventing medication errors?"

Presented by: Rita K. Jew, PharmD, MBA, BCPPS, FASHP and Jana O'Hara, MSN, RN, CPHFH, CPHQ, CPPS

Summary prepared by: Victoria Corriere, PharmD, PGY1 Resident, RWJBH Jersey City Medical Center

Background:

Smart infusion pump introduction allows for more precise management of infusion parameters and it able to actively detect potential issues before they become critical. However, there has been a growing a reliance on smart infusion pumps to be able to "catch" errors leading to lack of double checks and safety gaps.

Presentation of ISMP reported errors to identify root causes related to these errors and best practices to mitigate safety gaps during medication administration

Cases:

1) Nurse mistakenly scanned manufacture's barcode on diluent bag (D5W) rather than pharmacy generated amiodarone label. The HER associated the D5W with a previous D5W infusion order, which lead to the amiodarone to be infused at an incorrect rate. The patient died the following day, but the event was determined not to be the immediate cause of the patient's deterioration.
2) Smart pump library combined anesthesia profile with the main drug library. When the anesthesiologist and searched for lidocaine, the "lidocaine ANES" option with dose rate of mcg/kg/minute was available on the next page. The anesthesiologist selected the lidocaine option intended for ventricular tachycardia and administered a dose of 30 mg/min instead of 30 mcg/kg/min. Lidocaine for ventricular tachycardia has a hard max of 5.5 mg/min however, the hard stop feature was unavailable in anesthesia mode, a soft max was triggered, but the alert was overridden.
3) A hospital recently implemented smart infusion pump interoperability with EHR. Documentation of a patient's insulin infusion was recorded at different rates, 3 mL/hr and 60 mL/hr. The prescribed rate was 3 mL/hr and the pump was infusing at 3 mL/hr, however the same pump was associated with 2 different pump channels being used for 2 different patients.
4) CRNA was infusing a bottle od dexmedetomidine at 148 mL/hr for a dose of 0.15 mcg/kg/hr for a 66 kg patient instead of 2.5 mL/hr (60x overdose). Manual dose calculation in the smart pump took the CRNA out of the guardrails to make a unique infusion mcg/kg/hr to mcg/kg/min.
5) A NICU baby was on alprostadil infusion and experienced sever apneic episodes during the infusion. RN received a pump alert that the syringe that was meant to last for 31 hours infused over 9 hours. The pump was confirmed to be programmed correctly however the new syringe manufacturer was not compatible with the smart infusion pump.
6) A physician prescribed IV hydromorphone 20mg/100 mL (0.2 mg/mL) at a rate of 2.5 mg/hr as a custom concentration manually entered into the smart pump. The RN entered 2.5 mg/100mL as the concentration rather than 20 mg/100 mL. The low concentration of 0.025 mg/mL triggered a soft alert that was overrode. The RN believed that the "low concentration" warning was inconsequential. The drug was infused at a rate of 100 mL/hr instead of 12.5 mL/hr.
1) A hospital has 2 concentrations of dopamine in the drug library: 400 mg in 250 mL and 1600 mg in 250 mL. The dopamine 400 mg in 250mL (1600 mcg/mL) has "1600" in large print on the top of the label and the mcg/mL in a much smaller print. The nurse in the ED selected 1600 mg in 250 mL concentration for the smart pump, which lead to the infusion not resulting in the desired effect despite multiple titrations. The programming error was only detected when the nurse calculation infusion rate by hand.

Best practices for smart infusion pumps:

1) Commercially available remixed bags: scan manufacturer barcode
2) Pharmacy compounded infusion: scan patient specific barcode on label
3) Failure mode and effect analysis (FMEA) prior to implementing interoperability
    a. Identify safety gaps and action plans
    b. Educate practitioners about proper use, ensure users understand steps required and risk of harm if alerts are bypassed (alert fatigue is a major concern)
    c. Monitor compliance data
4) Establish escalation pathway for safety concerns
5) Create a culture of safety so staff is comfortable to speak up when there are technological concerns
6) Set hard stops for minimum concentration limits

Patient Care Considerations

1) Startup delays
    a. Prime the pump
    b. Proper alignment of syringe plunger and start up delays
    c. Smaller syringe size
2) Flow variability
    a. Standardize concentrations
    b. Optimize syringe size
    c. Syringe change over practice
3) Familiarize staff with smart pump and interoperability functions
4) Alignment throughout the medication use process to minimize errors
5) Awareness of hidden safety traps and independent second checks

Factors impacting rate of infusion for syringe pumps

1) Head height of the infusion bag/syringe
2) Syringe size
3) IV tubing
4) Infusion rate
5) Startup delays- in order to break the friction of the syringe need a break out force
    - Larger syringe means larger surface area which would require more friction to move the plunger and start infusion
    - Use the smallest syringe size possible
    - Different manufacturers have different compliance of the rubber plunger
        - Increased slack will have a hard time pushing dose
    - Best practice for a syringe pump: when starting a new syringe in a new pump and allow it to run to make sure you overcome the friction associated with startup delays
6) Flow variability- often heavily impacted by gravity
    - Gravity can lead to over infusion if the pump is too high and under infusion if too low
        - Consideration for primary and secondary infusion

Best Practices of Interoperability

- Project oversight
- Communication and change management
- Education
- Go-live strategies
    - Establish a dashboard
    - Nurse/pharmacists teams for investigation and troubleshooting
    - Gather feedback
    - Establish a learning culture
    - Understand barriers to use
    - Escalate whenever necessary

"Optimizing Automated Dispensing Cabinet (ADC) Inventory: A Data-Driven Approach Using Linear Programming"

Presented by: Craig Michael, PharmD; Chih Hsu, PharmD
Summary Prepared by: Vincent Muscarella, PharmD, PGY2 Medication-Use Safety and Policy Resident, Rutgers/RWJBarnabas Health

Automated dispensing cabinets (ADC) come with several advantages and disadvantages. Advantages to ADCs include security and accountability of medication storage, immediate medication access, and reduced nurse waiting time. On the contrary, ADCs come at a high cost to institutions, medications need to be refilled often, require maintenance, and present complex inventory management. This session highlighted the use of linear programming, a potential strategy to efficiently assign and load each medication to a pocket type in an ADC.

ADC Utilization at University California, San Francisco (UCSF) Health

UCSF Health is a 6-hospital system located in San Francisco, California that utilizes a decentralized pharmacy model in their inpatient units. The inpatient decentralized pharmacy contains ADCs and barcode medication administration (BMCA). The central pharmacy is the primary source of all ADC fills, medication automation, and sterile compounding. Without the use of ADC, there would be around 3000 missing medication requests per month at UCSF Health. The given ratio of ADC dispensing is the total amount of drug given to patient divided by amount of medication dispensed. In 2021, the given ratio of UCSF health was 50%; thus, requiring a need for ADC optimization.

How Do We Optimize ADC Inventory?

There are several different outcomes to measure when optimizing ADC dispensing: stockout, expired, vend:fill ratio, refill frequency, refill trips, and overhead cost. Two methods commonly used to efficiently utilize ADCs include removal of low and zero usage medications and adjustment of min and max par levels. When removing medications, focus should be on medications with no dispenses in 90 to 180 days and infrequently ordered mediations. Adjusting par levels will depend on pocket refill frequency, refill trip frequency, expired medications, stockout frequency, time spent by staff refilling, and inventory cost. Medications that are low filling and have low minimum par but have large cubie spaces may be swapped for a smaller cubie.

UCSF and Project TIMBUK2

- Comparing pocket sizes and medication utilization one by one is time consuming and a continual struggle.
- Project TIMBUK2 prioritizes reducing refill frequency applied at a scale of all ADC machines in the system.
- What does TIMBUK2 do → Feeds medications, dispense rate, and all storage possibilities in linear programming
- Linear programming is a linear function maximized or minimized when subjected to various constraints. Linear functioning can be used on a scale level and considers all possible cubie sizes, all locations, and dispense rates.
- The output of TIMBUK2 linear programming is a list of each meds optimal pocket size and assignment.

Why Use Refill Frequency as the Primary Outcome Measure?

- Expired medications do not include max and dispense rate
- Stockout only focused on minimal par level which is too strict
- Vend: Fill Ratio doesn't incorporate dispense rate, too vague
- Inventory cost doesn't incorporate dispense rate, too vague

Refill frequency combines max and dispense rate which creates a clear objective. The information needed to feed TIMBUK2 includes dispense rates from each medication, ADC storage data for each medication, pocket combinations, and ADS specification data. Linear programming is needed to pool large data sets; for example, a $2x10^{200}$ possible combination is too large for excel to process. Linear programming will take large sets of data with several different measures and streamline possibilities.

Future Plans for TIMBUK2

Include matrix draws, investigate cost savings, measure effects on staff, long-term time savings, and future ADC pocket combinations.