The Transition

4th Year Pharmacy Students Entering the Real World of Pharmacy

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Preceptor Highlight

Dr. Nancy Nix is a 2005 graduate of the University of Georgia College of Pharmacy. Dr. Nix currently serves as the Clinical Coordinator of Oncology Pharmacy at St. Joseph's/Candler Health System (SJCHS) outpatient ambulatory infusion suite in Hilton Head, South Carolina.

Her holistic role in patient care makes her job unique. She monitors the appropriateness of chemotherapy regimens, verifies and assembles chemotherapy compounding orders, and provides continuous patient education. Her interest in oncology began when her mother was diagnosed with stage 4 breast cancer around the same time she was on her inpatient oncology rotation at SJCHS. She thanks Dr. Richard Shields and Dr. Rie Avino, her preceptors and mentors, for guidance.

However, after graduating from pharmacy school, she took a Wal-Mart Pharmacy manager position and later returned to SJCHS as a clinical pharmacist in 2009. In 2010, five years after graduation, she pursued her initial interest in oncology by completing a PGY1 pharmacy practice residency at Phoebe Putney Memorial Hospital in Albany, Georgia, and a PGY2 specialty residency in oncology at Cones Health Cancer Center in Greensboro, North Carolina. Additionally, Dr. Nix is board certified in both Pharmacotherapy (BCPS) and Oncology (BCOP), an achievement few pharmacists can claim. She is a member of several oncology organizations, such as American Society of Clinical Oncology and Hematology/ Oncology Pharmacy Association, and she is a founding member of the Advanced Practitioner Society of Hematology and Oncology. When Dr. Nix is not taking care of patients, she enjoys the great outdoors, traveling, and spending time with her 9-year-old daughter.

Nancy Nix, Pharm.D.

Written by: Rakia Nasir (Savannah, GA)

PCSK9 Inhibitors: Breakthrough in Lowering LDL

Despite the availability of statins and other lipid-modifying therapies, many individuals are unable to achieve the recommended goal of ≥ 50% reduction in LDL-cholesterol (LDL-C), and thus remain at high risk for cardiovascular disease.[1] Familial hypercholesterolemia, an autosomal dominant disorder associated with impaired function of LDL receptors (LDLR), is one of the most common types of primary dyslipidemia. Patients with familial hypercholesterolemia have high LDL-C levels from birth, and they are at great risk for premature cardiovascular disease.[2]

Proprotein convertase subtilistinkexin type 9 (PCSK9) was discovered to play a vital role in degrading LDLR. PCSK9 binds to LDLR on the surface of hepatocytes and then transports LDLR to hepatic lysosomes for destruction.[3] The presence of functional LDLR is important in lowering LDL-C because circulating LDL-C is primarily cleared by endocytosis via binding with LDLR. PCSK9 inhibitors lower LDL-C by binding to PCSK9 and preventing the degradation of LDLR.

Alirocumab (Praluent®) and evolocumab (Repatha™) are the first two PCSK9 inhibitors approved in July and August 2015, respectively. Patients were able to achieve the recommended LDL-C goals when using these agents as adjunct therapy to diet and statins with or without other lipid-modifying therapies. A 52% LDL-C reduction was seen at week 52 with evolocumab (OLSER-1 and OLSER-2), and a 62% LDL-C reduction was seen at week 24 with alirocumab (ODYSSEY LONG TERM).[4,5,6] These results could possibly lead to PCSK9 inhibitors becoming the next breakthrough in dyslipidemia management. The effect of PCSK9 inhibitors on cardiovascular morbidity and mortality is currently being studied in phase III outcome trials, and results are expected to be released in 2018.[3]

Written by: Huong Pham (Columbus, GA)

Calculating and Interpreting Anion Gaps

Clinical Case:
A 30-year-old woman presents to the ED with complaints of weakness, nausea, tingling sensation in her feet and hands, and unsteadiness. She works at the local elementary school where students have been passing around a viral stomach bug for the past three weeks. She has been nauseated and vomiting for four days and unable to keep any food down. She denies taking any medications due to continuous vomiting and diarrhea.

1. Calculate the patient's anion gap.
2. Which type of acid-base disorder does the patient have?
3. How is her body compensating?

Labs:

pH	7.55	**Na^+**	132 mEq/L
pCO_2	50 mmHg	**K^+**	3.5 mEq/L
pO_2	90 mmHg	**Cl^-**	90 mEq/L
BUN	20 mg/dL	**HCO_3^-**	45 mEq/L

Review of Acid-Base Disorders:

ACIDOSIS	*pH*	*Primary Disorder*	*Compensation*
- Respiratory	↓	↑ pCO_2	↑ HCO_3^-
- Metabolic	↓	↓ HCO_3^-	↓ pCO_2
ALKALOSIS			
- Respiratory	↑	↓ pCO_2	↓ HCO_3^-
- Metabolic	↑	↑ HCO_3^-	↑ pCO_2

Written by: Zuri Hawkins
(Columbus, GA)

(see page 4 for answers)

Nuclear Pharmacy

Prior to pharmacy school, I never knew that nuclear pharmacy existed as a potential career option for pharmacists. When ranking rotations, I decided to take the plunge and sign up for nuclear pharmacy at Cardinal Health as one of my elective rotations. I had no previous experience or knowledge of this field of pharmacy, so I was extremely apprehensive before beginning the rotation. However, after everything was completed, I can easily say that it has been one of my favorite rotations!

On the first day, I had no clue what to expect. We learned so much about drugs and mechanisms of actions in the first three years of pharmacy school, but nuclear pharmacy is completely different. I had to switch gears and think about all the inorganic chemistry I had learned during my undergraduate career. In the beginning of the rotation, we learned about different imaging devices, such as MRI and CT, that are used in hospital settings and how radioactive medications are used during these tests to show locations of tumors and cancers.

Next, we entered the back room and learned how to operate the generator to make radioactive Technetium-99m. Each kit has to have a specific radioactivity level, which is measured in millicuries. We injected the radioactive kit into certain medications to make them radioactive. Once again, these products have a target radioactivity level that must be achieved before they can be sent to hospitals. For example, Lexiscan®(regadenoson) is a drug used to induce results of a stress test if the patient is physically unable to perform the test. The radioactive product is injected into the blood, and an imaging test is performed to see if there is adequate myocardial perfusion by creating contrast in the presence of any stenotic coronary arteries.

The hardest part of nuclear pharmacy is accuracy. One must constantly measure your hood, hands, shields, and needles to make sure nothing becomes "hot", or in other words, radioactive. The syringe, vials, and entire hood are shielded by lead glass to protect one from any radioactivity. Any spill or even a single drop can cause an entire hood workstation to be closed down for 24-48 hours due to the half-life of Technetium-99.

Nuclear medications are processed early in the morning due to shipping time of products and when tests are ordered in hospitals. Therefore, products are made mostly from 2:00 a.m. to 9:00 a.m. This rotation definitely made me consider a career in nuclear pharmacy, and I thoroughly encourage everyone to sign up for this rotation to experience a unique area of pharmacy.

Written by: Janushi Pandya
(Augusta, GA)

http://www.ipharmd.net/symbol/medical-radioactive-symbol.html
http://www.hasselfreeclipart.com/clipart_school/atom2.html

Making the Most of Your Community Pharmacy Rotation

During school, most pharmacy students work part-time as interns in community pharmacies. Due to pharmacy intern hour requirements, students have had ample experience in the community setting by the time they enter their fourth year. Many pharmacy schools require students to complete at least one community pharmacy rotation as part of their Advanced Pharmacy Practice Experiences (APPE). Here is a guide to making the most of your community rotation experience:

1. **Ask questions!** As fourth-year interns, it is crucial to learn all aspects of the filling process. If there is an issue with a medication, instead of *telling* the pharmacist about it, *ask* how you can resolve the issue. Ask your preceptor to teach you how to work through any insurance rejections or drug utilization review (DUR) rejections. Now is the time to practice being a pharmacist while still being under the supervision of your preceptor!
2. **Offer to counsel!** In the state of Georgia, pharmacists or pharmacy interns are required to offer to counsel patients on all new medications. While on rotations, always be aware of all tasks occurring in the pharmacy. If you see that a patient will be picking up a new medication, use a drug information resource to determine major counseling points. When the patient comes to pick up the prescription, educate him or her on administration and potential side effects. This will not only help you practice communication skills, but it will also help you retain the information while benefiting the patient.
3. **Check out the OTC aisle!** A key component of being a well-rounded community pharmacist is to know about both prescription and over-the-counter medications. During the first couple days of your rotation, ask your preceptor if you can spend some time in the OTC section to familiarize yourself with the various medications. Make yourself a chart with symptoms and disease states, and fill it in with the appropriate recommended agents for various age groups. Strive to gain enough confidence to make your own recommendations if a patient approaches the consultation window.

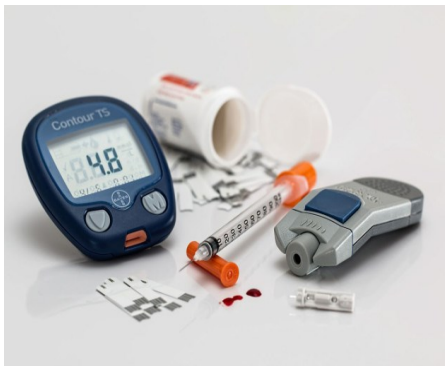
There are many other projects and assignments that can be effective learning tools during a community pharmacy rotation. Use this time wisely, and continue to think of ways to make yourself a stronger practitioner in the future!

Written by: Grace E. Lee
(Augusta, GA)

Disease State Update: New Diabetes Therapeutics

Approximately 347 million people in the world are diagnosed with diabetes. Type I is autoimmune in origin and diagnosed in childhood, and Type 2 is associated often with obesity and diagnosed in adulthood. The management of the disease is a daily burden that can become very devastating if it is not managed well. Complications of diabetes include retinopathy, which is the leading cause of blindness in the United States, as well as neuropathy, kidney failure, and amputations.

In December 2010, the U.S. Department of Health and Human Services unveiled a national 10-year set of goals and objectives for health promotion and disease prevention known as Healthy People 2020. Diabetes is one of the top disease states assessed by Healthy People 2020, which has led to an increased interest and production of new medications for diabetes. In the past two years, the FDA has approved nine new drugs for the treatment of diabetes.



http://diabetesbetter.com/

Jan 2014	Farxiga™ (dapagliflozin)	SGLT-2 Inhibitor	DM2
Apr 2014	Tanzeum® (albiglutide)	GLP-1 Receptor Agonist	DM2
Jun 2014	Afrezza® Inhalation Powder (insulin human)	Super-Rapid Acting Inhalable Insulin	DM1 or 2
Aug 2014	Jardiance® (empagliflozin)	SGLT-2 Inhibitor	DM2
Sept 2014	Trulicity® (dulaglutide)	GLP-1 Receptor Agonist	DM2
Oct 2014	Xigduo XR® (dapagliflozin + metformin XR)	Biguanide/SGLT-2 Inhibitor	DM2
Feb 2015	Toujeo® (insulin glargine)	Ultra-long Acting Insulin	DM1 or 2
Aug 2015	Synjardy® (empagliflozin + metformin)	Biguanide/SGLT-2 Inhibitor	DM2
Sept 2015	Tresiba® (insulin degludec injection)	Ultra-long Acting Insulin	DM1 or 2

SGLT=sodium-glucose co-transporter
GLP=glucagon-like peptide

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Upcoming Events

- February 15, 2016: First Day of Rotation 8
- February 29, 2016: Professionalism Portfolio Due
- March 21, 2016: First Day of Rotation 9

References for "PCSK9 Inhibitors: Breakthrough in Lowering LDL"

1. Stone NJ, Robinson JG, Lichtenstein AH, et al. 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol. 2014 Jul 1;63(25 Pt B):2889-934.
2. Robert S Rosenson RS, Ferranti SD, Durrington M. Inherited disorders of LDL-cholesterol metabolism. In: UpToDate, Freeman MW (Ed), UpToDate, Waltham, MA. (Accessed on August 31, 2015.)
3. Giugliano RP, Sabatine MS. Are PCSK9 Inhibitors the Next Breakthrough in the Cardiovascular Field? J Am Coll Cardiol. 2015 Jun 23;65(24):2638-51.
4. Sabatine MS, Giugliano RP, Wiviott SD, et al., for the Open-Label Study of Long-Term Evaluation against LDL Cholesterol (OSLER) Investigators. Efficacy and safety of evolocumab in reducing lipids and cardiovas-cularevents.N Engl J Med 2015;372:1500–9.
5. Koren MJ, Giugliano RP, Raal FJ, et al., for the OSLER Investigators. Efficacy and safety of longer-term administration of evolocumab (AMG145) in patients with hypercholesterolemia: 52-week results from the Open-Label Study of Long-Term Evaluation Against LDL-C (OSLER) randomized trial. Circulation 2014;129:234–43.
6. Robinson JG, Farnier M, Krempf M, et al., for the ODYSSEYLONGTERM Investigators. Efficacy and safety of alirocumab in reducing lipids and cardiovascular events.N Engl J Med 2015;372:1489–99.

References for "Disease State Update: New Diabetes Therapeutics"

1. Definition, diagnosis and classification of diabetes mellitus and its complications. Part 1: Diagnosis and classification of diabetes mellitus. Geneva, World Health Organization, 1999 (WHO/NCD/NCS/99.2).
2. CDC Features - Diabetes Latest. Cdcgov. 2015. Available at: http://www.cdc.gov/features/diabetesfactsheet/. Accessed November 5, 2015.
3. Healthypeople.gov. Healthy People 2020. 2015. Available at: http://www.healthypeople.gov/. Accessed November 1, 2015.
4. Centerwatch.com. New FDA Approved Drugs for 2015 | CenterWatch. 2015. Available at:
5. https://www.centerwatch.com/drug-information/fda-approvals/. Accessed November 1, 2015.

Answers to "Calculating and Interpreting Anion Gaps"

Anion Gap = $Na^+ – (Cl^- + HCO_3^-)$
AG = 132 – (90 + 45) = -3

Metabolic alkalosis due to the increase in pH and HCO_3^-, which the body is compensating for due to an increase in pCO_2.

Normal Values

pH	7.35-7.45
pO_2	80 -100 mmHg
pCO_2	35 - 45 mmHg
HCO_3^-	22 - 26 mEq/L

Reference: DiPiro JT et al, eds. Pharmacotherapy: A Pathophysiologic Approach, 9th ed. New York: McGraw-Hill, 2014.