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RHO Rx CHI post

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Sang, Guang, Bianca, Rafi, Karen, and Ajla (from left to right), pictured with Dr. Zito

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RHO CHI POST: TEAM MEMBERS

@ Davidta Brown

5th Year, STJ; Editor-in-Chief

My two great loves are innovative science and quality writing; the Rho Chi Post is an insightful combination of both. As an editor, I look forward to bringing relevant information and fresh perspectives to the student and faculty of St. John's University, as well as to making the Rho Chi Post a newsletter that offers something new to every reader.

@ Katharine Cimmino, PharmD

Graduate Copy Editor [Content-Focused]

I have always been an avid reader and writer. As a member of the Rho Chi Post I am able to merge my passions with the professionalism that comes with aspiring to be a healthcare provider. I am eager to be a part of a publication that promotes my interests and vocation.

@ Bharat Kirthivasan, PhD

Graduate Copy Editor [Content-Focused]

I received my doctorate in Industrial Pharmacy researching nanoparticles for delivery to the brain. The only thing I enjoy more than reading a well-written piece of work is writing it. I am glad to work for the Rho Chi Post, and I encourage others to do the same.

@ Tasnima Nabi

6th Year, STJ; Copy Editor [Content-Focused]

Writing has always been my greatest outlet for experience and knowledge, through which I hope to keep you engaged and informed. It is imperative to keep up with our changing profession and community. I look forward to bringing pertinent information to the newsletter.

@ Tamara Yunusova

5th Year, STJ; Copy Editor [Content-Focused]

I enjoy articulating information in a captivating and insightful way. I hope to make this publication more informative, student-friendly, and innovative.

@ Fatema Elias

6th Year, STJ; Copy Editor [Content-Focused]

I am honored to be a part of the Rho Chi Post team. In this age of technology and the continuously changing healthcare profession, I hope to engage like-minded students and professionals. Writing is something that I hold dear to my heart and I hope with this newsletter we can all stay well informed, interested, and educated.

@ Sang Hyo Kim

4th Year, STJ; Section Editor: Puzzles

Advancing technology and medicine, as well as prolonging the lifespan and improving quality of life, have increased the geriatric population. Pharmaceutical industries and healthcare systems persistently work to find solutions to changing demands and new problems of the society. I wish to learn, educate, and prepare myself and others for the future.

@ Svetlana Akbasheva

6th Year, STJ; Section Editor: Clinical

I am very excited and honored to be part of the Rho Chi Post! In a profession that is constantly evolving with new developments, it is so important to remain informed and current. The Rho Chi Post helps do just that, and I look forward to contributing to this unique publication.

@ Nicollette Pacheco

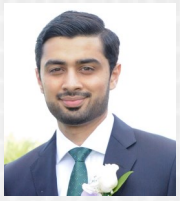
5th Year, STJ; Staff Editor [Graphics-Focused]

As a new member of the Rho Chi Post team, I have a vast appreciation of what it means to be a future pharmacist in the rapidly evolving world of healthcare. I am looking forward to being on the team as a graphics-focused staff editor, and I hope to bring my passion for science and creativity to the Rho Chi Post.

@ Andrew Leong

6th Year, STJ; Staff Writer

Students have to do more than what is required of us in classes to truly learn about our profession. That's why I joined the Rho Chi Post. This publication represents a channel by which our team members, faculty, and readership can share information - something I believe is important in this ever-changing pharmacy world.



@ Fawad Piracha

6th Year, STJ; Finance and Outreach Manager

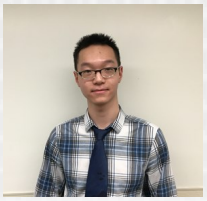
I am delighted to join the editorial team. I have the firm intention of broadening readership and facilitating growth of the Rho Chi Post.

@ Joshua Bliss

6th Year, STJ; Social Media Manager

By providing student-organized, reliable healthcare information, the Rho Chi Post helps us all in fulfilling our education both in and out of the classroom. Education is the tool we use to set paths for our futures, and every chance to expand our education is a chance at building a better future. I am honored to be a part of the Rho Chi Post & look forward to the future!

RHO CHI POST: TEAM MEMBERS



@ Alex Chu

3rd Year, STJ; Staff Writer

With a constantly evolving healthcare field, it is imperative that we keep ourselves up to date with the latest news. This is what led me to join the Rho Chi Post, which constantly comes out with interesting and informative topics. It is an honor to write for the Rho Chi Post, and I wish to contribute innovative and intriguing articles to this newsletter.

@ Jack (Hongkai) Bao

4th Year, STJ; Staff Editor

In my 3rd year of pharmacy school, I was introduced to the Rho Chi Post, an award-winning newsletter run by students. My involvement began by simply reading monthly articles, but as time passed, my passion for writing grew. Coupled with my interest in pharmacy, I made the initiative to apply for a position. Now, as a team member, I believe that the Post is a great way for students and faculty to stay up to date concerning pharmacy news.

We are always looking for creative and motivated students to join our team!

If you are interested in becoming a Rho Chi Post editorial team member, visit:

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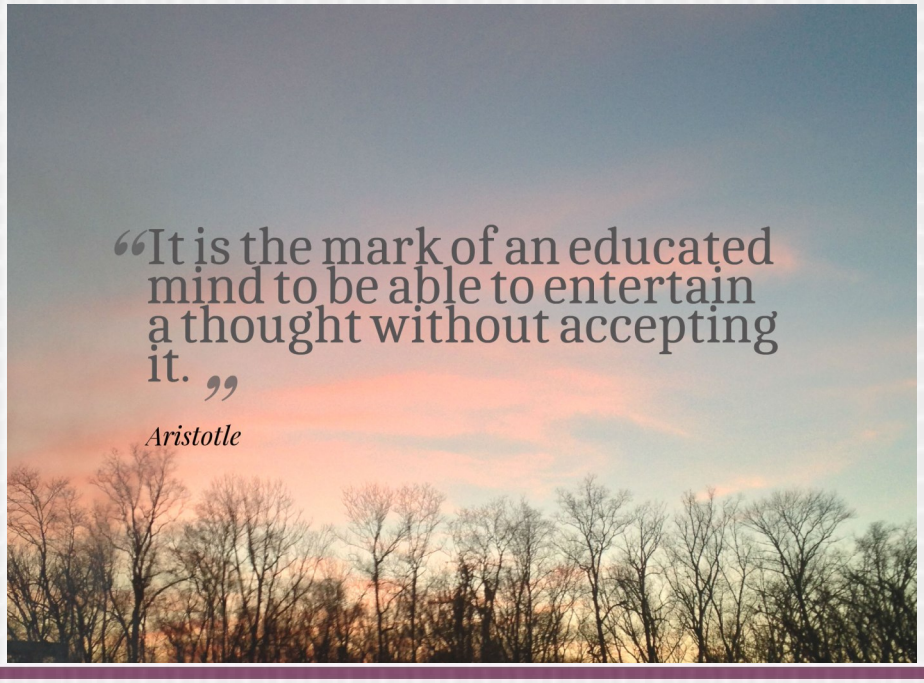
TABLE OF CONTENTS

QUOTE OF THE MONTH

By: Nicollette Pacheco, Staff Editor [Graphics-focused]



Review of Thalidomide in Memory of Dr. Frances Oldham Kelsey

By: Kevin J. Choi, PharmD Candidate c/o 2016

"Morning Sickness" – we have all heard of this term being associated with thalidomide, a drug particularly recognized for its antiemetic effect, but also for its notorious teratogenicity. However, it is worth re-familiarizing ourselves with the nature of the drug itself (and the clinical threats that it presented to the pharmaceutical world), as we mourn the loss of former Food and Drug Administration (FDA) medical officer Dr. Frances Oldham Kelsey (who passed away on August 7, 2015).[1] In short, Dr. Kelsey became a 20th-century heroine for sparing the United States from widespread birth deformities by questioning thalidomide's safety data after its release in Europe.[1]

Thalidomide contains a chiral carbon in its structure, yielding two enantiomers, R(+) and S(-), and the former enantiomer was responsible for the drug's sedative effects, whereas the latter and its derivatives were teratogenic.[2] Pharmacologically, thalidomide possesses immunomodulatory, anti-inflammatory, and anti-angiogenic properties.[3] The first property (immunomodulation) is due to a suppression of excessive tumor necrosis factor-alpha (TNF-a) production and a down-regulation of certain cell surface adhesion molecules involved in white blood cell (WBC) migration.[4] The second property (anti-inflammation) is due to a suppression of macrophage involvement in prostaglandin synthesis, along with modulation of interleukin (IL)-10 and IL-12 production by monocytes and lymphocytes. The last property (anti-angiogenesis) involves an inhibition of vascular endothelial growth factor (VEGF) and basic fibroblast growth factor.[4] Despite these properties, the discovery of thalidomide's teratogenicity shed doubt on the benefits of the drug, and led it to be closely monitored and under major scrutiny.

The doubts about thalidomide trace back to the 1950s, when Chemie-Grunenthal (a German pharmaceutical company) produced the drug as a non-addictive, non-barbiturate sedative. Thalidomide was an effective anti-emetic agent in pregnant women -- hence its additional use for "morning sickness."[5] Until it was banned in 1961, thalidomide was one of the world's highest selling drugs and it was advertised as safe for use.[6] However, reports of patients developing peripheral neuropathy became inevitable upon the drug's release, and there were multiple reports of severe birth defects that affected various systems of the human body. In 1961, these detrimental effects were linked to thalidomide use, and FDA officer Dr. Kelsey expressed great concerns over the drug's safety profile.[1,7,8]

Yet exactly how severe were the consequences of thalidomide that this chapter in the pharmaceutical world warrants the label, "worldwide disaster"? Based on the wide range of birth defects caused by drug exposure, the thalidomide disaster is sometimes referred to as the "thalidomide embryopathy." The drug affects limbs or extremities (upper and especially lower), but it can also affect the eyes, ears, and internal organs (heart and kidneys).[5] Infant mortality due to thalidomide embryopathy has been reported to be as high as 40%. Moreover, it is very probable that babies with malformations may die in utero and be either miscarried or stillborn.[9]

Thalidomide causes damage to the developing embryo during a short time ("critical period") that occurs during day 20 to day 36 after fertilization. Exposure to the drug within this timeframe causes the teratogenic effects, as evidenced by reports that involved significant birth defects in up to 50% of pregnancies from a single dose of 50 mg during the critical period.[5]

The time-sensitive window of exposure to thalidomide was an essential discovery in understanding the severity of its teratogenicity. Interviews were conducted worldwide with parents of thalidomide-affected children and their physicians.[10-12] Dates of maternal drug intake and exposure were collected as data for establishing at least an association (and eventually a direct relationship) between the magnitude of the damage seen in the infants and the timing relative to embryonic development.

Through careful analysis, it was concluded that the time-sensitive window coincided with the period during which there is rapid embryonic development of cell growth, movement, and organogenesis. This process begins at week 4 and progresses until week 10 or 11, when the embryo is fully developed. Since morning sickness also occurs during this timeframe, many women inadvertently used thalidomide during the critical period and thereby had major birth defects in their children.[5] All of the information obtained from interviews and other relevant findings was the bulk of the content in Dr. Kelsey's articles.[5] Furthermore, Dr. Kelsey persistently requested for more information from the manufacturer (William S. Merrell Company of Cincinnati) to better support her concerns.[1] It was through her determination that she prevented the marketing of the drug in the United States and subsequently disapproved its use for morning sickness during this time. Had she not played such a role, this disaster would have taken quite a toll on the lives of children in America.

Thalidomide is still in use today, but not for morning sickness. Back in 1964, Israeli scientists made the discovery that this drug could control leprosy by reducing the inflammation caused by the disease. Then, in 1998, the FDA approved it for

multiple myeloma (MM), a cancer of plasma cells in the blood.[13] The first clinical trial that was done to test thalidomide for MM included 169 patients who received an initial dose of 200 mg/day with dose increases of 200 mg every two weeks, up to 800 mg/day. In long-term follow-up studies (median follow-up of 9.2 years), 17 patients were still alive as of that article's publication (10 of whom were event-free, meaning that they had no recurrence of any complications since the initiation of the trial).[14] In patients with cytogenetic abnormalities (seen in 47% of the patients within three months of study enrollment) and a lambda (l) light chain isotype, 48% (n=58) of patients who lacked both features survived at least 6 years, as opposed to fewer than 5% who had either or both of the features ($P < 0.001$).[14]

Although patients who received a cumulative thalidomide dose greater than 42 grams in the first three months experienced superior overall and event-free survival, thalidomide was under extensive investigation.[14] In fact, a recently published study from 2010 claimed that the treatment of newly diagnosed MM was more effective with lenalidomide (Revlimid®, Celgene), a molecular derivative of thalidomide introduced in 2004.[15] In a study of 411 MM patients, participants were given either lenalidomide with dexamethasone (RD) or thalidomide with dexamethasone (TD). The former group (RD) yielded higher response rates with higher partial responses, as well as longer time-to-progression and progression-free survival (PFS).[15] Dr. Rajkumar, an investigator of the study, stated that lenalidomide was "the superior immunomodulatory drug compared with thalidomide for treatment of multiple myeloma," but he also admitted that the results needed to be confirmed through randomized controlled trials that the drugs to other treatment regimens (in order to establish the optimal initial therapy).[15]

Thalidomide is currently a subject of research testing in trials for Crohn's disease as well, a condition affecting 219 per 100,000 adults; for children younger than 20 years of age, the estimated prevalence is 43 per 100,000.16 The numbers seem less daunting for children, but more concerns are directed towards them because pediatric Crohn's disease is more aggressive than the adult-onset disease, with higher rates of drug resistance.[17] A multicenter, double-blind, placebo-controlled, randomized clinical trial was conducted between 2008 and 2012, involving children with active Crohn's disease. There were 28 randomized to receive thalidomide and the remaining 26 were in the placebo group. The objective was to evaluate the therapeutic efficacy of thalidomide for remission in refractory pediatric Crohn's disease.[17] The primary efficacy endpoints were clinical remission at week 8, determined with the Pediatric Crohn's Disease Activity Index (PCDAI) and defined by a score of 10 or less, as well as a reduction in the score of at least 25% (at week 4) or at least 75% (at week 8).[17,18] Non-responders to placebo were permitted to cross over and receive thalidomide.[17] Overall, approximately 63.3% (n=49) of children treated with thalidomide achieved clinical remission, and 65.3% (n=49) achieved a 75% response.[17] Essentially, the conclusion from the study was that thalidomide improved both clinical remission at 8 weeks of treatment and longer-term maintenance of remission; however, further investigation is needed in order to additionally validate the findings.[17]

Thalidomide may serve as a therapeutically useful agent, but it has an unspeakable adverse drug reaction that has haunted the pharmaceutical world for the past several decades. However, a major asset gained from the thalidomide disaster was the development of modern day drug testing, which could not have been possible without the late Dr. Kelsey.[5] Healthcare providers should commemorate Dr. Kelsey's crucial efforts of ensuring that our world could be a safer place.

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The Reality behind a "Stone Heart"

By: Dimitrios Savva, PharmD c/o 2016

Digoxin is a cardiac glycoside used in the treatment of atrial fibrillation (Afib) and heart failure. Digoxin inhibits sodium-potassium ATPase, leading to an increase in intracellular sodium which in turn inhibits sodium-dependent calcium transport out of the cytoplasm and ultimately results in an increase in intracellular calcium.[1] The direct effects of digoxin on cardiac muscle are mediated by its effects on the autonomic nervous system. In Afib, the therapeutic effect of digoxin is related to its vagomimetic action, which helps slow down the heart, working on rate control in patients with a rapid heartbeat due to their Afib. In heart failure, digoxin's effects are mediated by its positive inotropic and neurohormonal deactivating effects, which manage symptoms associated with heart failure by augmenting the heart's pumping ability.[2]

In the setting of digoxin toxicity, due to the inhibition of the sodium-potassium ATPase, patients usually present with hyperkalemia. One therapy that is used in patients with hyperkalemia is the administration of calcium to directly antagonize the cardiac effects of potassium.[3] However, intravenous calcium is actually contraindicated in patients experiencing digoxin toxicity due to the risk of serious arrhythmias. There is also a belief that intravenous calcium will cause "stone heart." In other words, because calcium will increase myocardial contraction, there is some belief that this increase can result in an irreversible contraction or some form of involuntary spasm of the cardiac muscles. The idea of "stone heart" first started in the 1930s when Bower and Mengle reported two cases of death due to the intravenous administration of calcium to patients with digoxin toxicity.[4] Two more cases were also reported by Herrmann and colleagues about the risk associated with the relationship between calcium and digoxin toxicity.[5]

The question of the "stone heart" effect was investigated by Levine and colleagues when they reviewed patients with digoxin toxicity from 1989 through 2005. Out of 2220 patients who had elevated digoxin levels, 161 patients were documented to have digoxin toxicity, with 23 patients receiving intravenous calcium. The results showed that there was no association between calcium administration and death in the population. In addition, there was no case of any potentially life-threatening dysrhythmias within four hours after calcium administration. Levine and colleagues found that there was no evidence that associated digoxin toxicity and calcium with the myths of "stone heart".[6] In addition to these results, even animal studies that tried to mimic acute digoxin toxicity scenarios failed to demonstrate any adverse outcomes with calcium administration.[7]

The constant back and forth of the truth behind "stone heart" with regards to digoxin toxicity and calcium is still a controversial topic. Despite some data showing no risk, treatment of hyperkalemia with intravenous calcium in patients with digoxin toxicity should still be initiated with caution due to the potential risk of increased myocardial contraction and overall risk of arrhythmias. The solution for patients with hyperkalemia due to digoxin toxicity is the administration of digoxin immune fab, or DigiFab, which are antibodies that specifically bind with molecules of digoxin and eventually get excreted and removed from the body.

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Optimizing Drug Safety in the Operating Room

By: Maryam Ahmed, PharmD Candidate c/o 2016

While hospitals are a place where people can get their ailments cured, there is still room for improvement. According to the Institute of Medicine, over 1.5 million Americans are injured in hospitals each year.[1] Hospital protocols are implemented to keep these errors to a minimum in order to optimize drug safety, specifically in the fast-paced operating room setting.

According to a 2004 United States Pharmacopeia study, medication errors do not necessarily result in harm.[1] Despite this, attention to detail and practitioner experience are required for safe and effective use of certain medications, especially in the perioperative setting. Increased awareness is es-

sential when dealing with common high-alert medications, such as anticoagulants, anesthetics, cardiovascular drugs, anxiolytics, neuromuscular blocking agents, and opioids. To aid in minimizing adverse events, single dose containers should be supplied, as these agents can cause severe consequences if improperly administered. Hospital staff, especially nurses, should also be responsible for ensuring proper monitoring and support for all high risk medications.[2]

Verbal orders are another common cause of medication errors. The use of technology through the practice of computerized physician order entry, which potentially recognizes dosing errors and reduces transcription errors, is a strategy to help minimize errors previously caused by verbal orders, and to optimize safety.[1] Computerized medication orders, barcode technology, and color coded labels are a few advancements that can be utilized to prevent errors. Implementing technology like this allows the healthcare team to focus their attention towards verifying the appropriateness of an order, rather than the actual delivery, which will ultimately aid in error reduction.

To determine the overall impact of a computerized system, a retrospective analysis of two hospitals in Melbourne, Florida was conducted using 359 incidence reports. The first hospital utilized a pen and paper system, while the other had just recently implemented a new medication management system. The results illustrated that at each site, there was a different cause of errors. At site A, omission (33%, possibly from verbal orders) was the main cause of errors, whereas incorrect documentation (24.4%) was the main concern at site B. It is possible that a portion of the errors at the computerized site may have been due to lack of experience with the new system, indicating a limitation of this study.

Since there were no uniform errors at both sites, it is difficult to draw a conclusion in regards to which system is superior, but this study did allow us to draw the conclusion that "the incidence of other, less frequent errors was similar across the two hospital sites."[3] Although the type of errors and where they occurred varied, the incidence was relatively the same, and did not provide any clinical significance.

Regardless of the system that a hospital uses, basic safety protocols should be followed. Careful labeling of drugs with the drug name, concentration, and beyond use date are minimum safety requirements. In addition, any un-readable drug or unlabeled drug should be properly disposed.[1]

If proper safety protocol is applied, in addition to the above recommendations, adverse events and medical errors can be drastically minimized.

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Better Understanding the Link between Myasthenia Gravis and Diabetes

By: Jacqueline Chirico, PharmD Candidate c/o 2016

Myasthenia gravis is an autoimmune disorder in which an antibody-mediated attack is directed against the nicotinic acetylcholine (ACh) receptors at neuromuscular junctions.[1] About 85% of people with myasthenia gravis have antibodies to the ACh receptor, while the remaining 15% are seronegative. Although one is more common than the other, both can have serious implications.[2] The most recognizable sign of myasthenia gravis is skeletal muscle weakness that worsens during periods of activity and resolves after periods of rest. The muscles that control facial expressions, eye movements, talking, and swallowing may also be involved, as well as muscles that control breathing and neck movements.[3]

Myasthenia gravis may affect anywhere from 14 to 20 per 100,000 people. That is about 36,000- 60,000 cases in the United States; however, the disease is underdiagnosed and true prevalence is probably higher.[4] It is not a hereditary disease, but it may have genetic susceptibility.[2]

Myasthenia gravis has a positive prognosis overall. Therapy can improve muscle weakness and result in relatively normal functioning. Some patients even go into remission after successful treatment.[5] Treatment options include cholinesterase inhibitors, corticosteroids, and immunosupressants. Cholinesterase inhibitors improve muscle symptoms, while corticosteroids and immunosupressants reduce immune response by limiting antibody production.[6] Prednisone is often used and is initiated at doses of 60-100 mg per day. A dose of 1 to 1.5 mg/kg may be used, however 100 mg/day is often recommended in adults. The dose can be modified to 100 mg every other day, after two to four weeks. This helps minimize side effects associated with prolonged corticosteroid use, but does not guaran-

tee patients will be free from side effects or complications of therapy.[7]

Although often used, corticosteroids are associated with an increased risk of diabetes.[8] Long-term corticosteroid use may alter glucose production and regulation, leading to hyperglycemia.[9] Corticosteroids interfere with insulin signaling in skeletal muscle cells. This means that at high doses, patients, especially those with impaired glucose tolerance, are at an increased risk for steroid-induced diabetes.[10]

Despite the possibility of corticosteroid-induced hyperglycemia, there are not many studies done to investigate whether or not this interaction is clinically significant or whether corticosteroids should be avoided; however, it is clear which other drugs should be avoided in patients with myasthenia gravis.[11]

Every patient should be looked at individually, and there is always a risk versus benefit assessment that needs to be done before deciding whether or not to initiate a particular therapy.[11] Drugs that have been proven to be associated with worsening myasthenia gravis that should be avoided are D-Penicillamine and Botulinum toxin.[9,11]

Some drugs with black box warnings associated with myasthenia gravis are the fluoroquinolone antibiotics and telithromycin.[9,11] Some other antibiotics that should be used with caution in myasthenia gravis patients include azithromycin and the aminoglycosides.[9,11] Additional drugs that should be used with caution are quinine, procainamide, magnesium, and even corticosteroids.[9,11] While corticosteroids are used to treat myasthenia gravis, patients should be monitored for worsening of symptoms. The administration of vaccinations should be closely monitored in patients with myasthenia gravis, especially since a lot of treatments options are immunosuppressants.[11]

A systematic review from 2011 evaluated the frequency of multiple autoimmune diseases in myasthenia gravis. The review focused on 25 incidence studies and case series of all myasthenia gravis subtypes with information on other comorbid autoimmune diseases, such as diabetes and thyroid disorders.

After analysis of the reported frequencies of autoimmune diseases in myasthenia gravis, the pooled estimate showed a frequency of 13% (95% CI, 12-14%) in patients with myasthenia gravis.[12] In other words, 13% of the 25 cases showed evidence of presence of another autoimmune disease. While the treatments that the patients were receiving were not recorded in this analysis, we know that treatments for autoimmune disorders commonly includes corticosteroids. Although diabetes was not the most common autoimmune disorder seen in these patients, there is a chance that it can develop as a secondary disorder in response to corticosteroid treatment of myasthenia gravis.

The strengths of this review include the fact that it is the first review that points to a correlation between myasthenia gravis and other autoimmune disorders. The methods used to pool the data across the different studies helped weaken the influence of variations that may have existed between the various study designs.[12]

While this review shows a possible correlation between autoimmune disorders and myasthenia gravis, there are some limitations. The basis for the review was evaluating published studies, so there was the chance of potential under-reporting or under-recognition of autoimmune diseases. As autoimmune disorders were not very well understood in the past, there may have been under-diagnosis of some of the disorders contained in this review. In addition, another limitation is the review's inability to rule out any study where a patient could have developed a secondary autoimmune disorder due to being treated with an immunosuppressive agent.[12]

In conclusion, there is insufficient evidence to confirm or deny a definite relationship between the treatments for myasthenia gravis and diabetes. However, there is evidence that supports the avoidance or cautious use of certain medications in myasthenia gravis patients.[12] In addition, it is unsafe to assume that myasthenia gravis led to the development of these autoimmune disorders. Of the many autoimmune disorders that were observed in the systematic review, diabetes wasn't a common one. While there is a possibility that the connection between myasthenia gravis and diabetes can be linked to the fact that both are autoimmune diseases, there is a greater correlation between using immunosuppressants and corticosteroids to treat myasthenia gravis and the development of diabetes. This is because the effects of these classes of medications are better studied, and more information is readily available, than for the link between diabetes and myasthenia gravis, which isn't well established in the literature.

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Pharmacists' Standpoint on Possible Changes to Profession

By: Victoria Chirico, PharmD Candidate c/o 2018

From I-STOP surveillance to vaccine administration, many changes have been made in the world of pharmacy, with more to come. Whether these changes are for the better or worse, they define the roles of a pharmacist in our world today. As the role of a pharmacist is shifting toward a more patient-interactive one, laws such as the Omnibus Budget Reconciliation Act of 1993 and the Medicare Modernization Act of 2003_have enabled to make these changes possible and contribute in preventing medication errors.

Jeneane Chirico, RPh, owner of Annadale Family Pharmacy in Staten Island and Gerard Chirico, RPh, a pharmacist at Rite Aid in Brooklyn were interviewed about the recent changes made to the pharmacy profession. Prior to establishing her own pharmacy, Jeneane Chirico graduated from St. John's University in 1988 and has owned her independent pharmacy for 15 years. Gerard Chirico, who also graduated from St. John's University in 1988, owned his own independent pharmacy, Carroll Court Pharmacy in downtown Brooklyn, for 15 years before working at Rite Aid.

Pharmacists now have the ability to administer certain vaccines. What is the significance of this change to the pharmacy profession?

Gerard: "I feel that pharmacists are often on the first line in the medication process. We are often contacted for advice and consultation before a doctor is even called. Also, we are the most trusted profession, and our patients rely on us for information. I think it's a no brainer that pharmacists can immunize. In the past, doctors were not informing patients on the benefits of immunization, and therefore the U.S. has been under-immunized. Pharmacists have changed this trend, which is why we are allowed to immunize. Patients no longer have to go to the doctor to get their annual flu shot, which makes it more convenient for the patient. Since pharmacists can administer vaccines now, we have more duties that promote patient care, which is what our profession is all about."

Jeneane: "I feel it is great that pharmacists can immunize. No more waiting 3 weeks to see a doctor for a flu shot and possibly getting sick while waiting in the packed waiting room. On the other hand, I chose the pharmacy profession because I wanted to be in healthcare and help people but not actually touch patients. As long as immunization is not a mandatory for pharmacists and it's still optional, I think on the whole it's a great idea. The significance of this change to the pharmacy profession is that pharmacists have more patient centered care jobs to perform. Our profession is patient care based, and I think it's great that we are being trusted to perform more works such as this. "

New York prescriptions are going to be electronic next year. What are the consequences of_this legislation for the pharmacy profession?

Gerard: "I think that it will cut down on medication errors and lessen prescription fraud via forgeries and prescription stealing. If the doctor has to pick the medication from a drop down menu in order to send it electronically, he will be able to pick the correct dosage for the medication that he or she prescribed. This will definitely prevent a lot of dosing errors. Without paper prescriptions, patients won't be able to steal prescriptions and prescribe themselves medications by forging the doctor's signature. Only doctors and their employees will have access to the computers where they can e-prescribe prescriptions. Patients won't have access to these computers, nor will know how to use them."

Jeneane: "I feel extremely happy that all prescriptions will be electronic next year. There are a few kinks that need to be worked out, but on the whole, I feel there will be less handwriting-guess errors made."

Pharmacists are seen as healthcare providers, but not under federal law. Should pharmacists be compensated for the time they take to counsel patients like doctors do when they see patients?

Gerard: "I think that pharmacists are increasingly seen as healthcare providers. This goes along with allowing pharmacists to immunize. Since pharmacists are allowed to immunize

and are doing other jobs that they were once not allowed to do, they should be seen as healthcare providers and should be compensated for it."

Jeneane: "Pharmacists are healthcare providers. We are the first people that patients seek for advice. We aren't paid for each individual. As pharmacists get more responsibilities, like counseling and immunizing flu shots, they should be compensated for them like healthcare providers like doctors are."

Counseling patients is a big part of the pharmacist profession. Do you believe counseling should be extended to situations such as refills?

Gerard: "It is our job to counsel patients, that is the major part of our profession. I counsel patients a lot, especially when they have questions regarding their medication. It is important to let inform the patients what they are taking, why and for how long. It makes the patient feel more comfortable and gain more trust with their healthcare professionals."

Jeneane: "Counseling patients was always part of our job. To tell us who needs it and for how long is a different story. I counsel patients when I am required to or when patients have questions for me. Some patients even ask me questions when they are getting a refill. They have taken the medication before, but want to make sure they are taking it the correct way and want me to remind them of the side effects. Counseling is a great way to communicate with the patients and form a trustful relationship with them."

If the AAFP approved the FDA's proposal to allow pharmacists to prescribe some medications, which medications do you think pharmacists should prescribe and how would this impact our profession?

Gerard: "I think some classes of medications we should be allowed to prescribe like NSAID's, first line antibiotics and some asthma inhalers. I think pharmacists should be able to do this because it would lower healthcare costs. Also, doctors are prescribing anti-inflammatory medications for 30 days, but pharmacists know that patients shouldn't be taking these medications for longer than 2 weeks. Since pharmacists know more about the safety of medicine, they should be able to prescribe at least some of the more common medications that patients take."

Jeneane: "We kind of do that now. If someone has an ache from doing a little too much gardening, I recommend them to take Advil (NSAID) if they are able to. I also tell them the prescription dose is the same medication but just a higher milligram. I let them be the judge on how much to take. I just provide them with the limits."

With the recent implementation of the I-STOP, do you think the program has been beneficial in pharmacy? Notably, in the prevention of medication errors with controlled substances?

Gerard: "I think it was a long time coming. I-STOP can and will save lives, if only we can convince doctors to actually access and use the system. I think it will prevent medication errors with controlled substances. Since we are counting how many control pills we have and are dispensing everyday, we can keep track of control medications. Also, I-STOP prevents patients from getting prescriptions written from different doctors for the same control medications. Since it is documented that a patient has received a script for a control substance, the patient is limited from getting that control substance prescribed to them from a different doctor. This helps prevent pharmacists from different stores from dispensing the same medication and causing the patient to overdose on the control substance."

Jeneane: "It is about time…that's all I have to say! I was involved with the groundwork helping make this program work. I have seen doctors and ER physicians writing for less medicine. I never see Percocet 10/325 #360 tabs anymore! Unfortunately heroin use has gone up and also there has been and increase in Adderall and Xanax scripts. I think I-STOP has been beneficial in pharmacy. We have more control over abused substances and are preventing abusers from getting their hands on these substances. Since doctors know what the patients are prescribed, there are less medication errors, such as overdosing patients."

The idea that New York prescriptions should only be allowed to be filled in New York has been brought up quite often. Do you agree or disagree with this proposal?

Gerard: "I don't agree that NY prescriptions should only be filled in NY. Patients travel and most drugs are federally controlled. However, I think control drugs given by an NY physician should only be filled in NY. I also think that out of state controlled drugs should not be allowed to be filled in NY, until all states adopt the I-STOP policy."

Jeneane: "My pharmacy is in Staten Island near New Jersey, and I do get a lot of New Jersey scripts. So I would not like that too much. What would be ideal is if New Jersey and all the states adopt the I-STOP policy. I do notice that some pain doctors on Staten Island stamp their prescriptions with *Fill in NY only*."

We thank Gerard and Jeneane Chirico for sharing their outlook on the pharmacy profession. They both hope that if changes are made, these changes will prevent medication errors, benefit patients, and prevent the abuse of controlled substances.

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The Importance of Counseling and its Impact on Medication Adherence

By: Sherin Pathickal, PharmD Candidate c/o 2016, Rahul Patel, PharmD Candidate c/o 2017, and Sierra Swaby, PharmD Candidate c/o 2020

The pharmacy profession is changing within the healthcare system by making pharmaceutical care one of its main responsibilities. Pharmaceutical care does not adhere to the way that pharmacists have traditionally practiced, but instead requires the pharmacist to work with the patient and other healthcare providers to promote health. Furthermore, pharmaceutical care requires that pharmacists take responsibility for preventing and resolving drug related problems, and for optimizing drug therapy, while involving the patient throughout the whole process.[1] For this reason, pharmaceutical care does not end when the patient leaves the pharmacy, but it involves assessment, monitoring, documenting care and progress, and follow-up care.

The responsibilities of a pharmacist vary among different areas of practice. Pharmacist responsibilities cover a broad range, including activities such as dispensing medications, monitoring patient health, educating patients, and advising physicians and other health professionals on drug related questions.[2] Furthermore, pharmacists are responsible for the patient's welfare. In order to provide the best care, a pharmacist should develop and build a relationship with each patient. In doing so, the patient will feel more confident and comfortable in providing their medical history to the pharmacist, allowing the pharmacist to gather the proper tools and information needed to develop a drug therapy plan.

To build a solid foundation for a relationship between the pharmacist and patient, effective communication must ensure that each patient is getting the best drug therapy possible. One of the major obstacles to communication in a pharmacy is time. With a community setting that has largely become a business, pharmacists should remember to make themselves available to the patients. Each patient deserves and should have time with the pharmacist before they leave the pharmacy, so that they understand why they are taking the medication and how it should be taken, which will increase medication adherence. Caretakers should also be informed on how to properly administer medications to individuals who are unable to do so themselves. Student pharmacists can play an important role in developing this relationship by taking time to counsel each patient with attentiveness and empathy.

A study published by Ohio State University observed how pharmacists and patients engaged in communication about personal health within an independent pharmacy setting. Carmin Jane Gade, a graduate of Ohio State University with a Doctorate in Philosophy, commented on the pharmacist-patient relationship by explaining that, "communication often holds the missing link to success and should not be overlooked. Pharmacy care is likely to be directly correlated to individual's health outcomes and well-being."[3] As current and future pharmacists, we should understand the influence of the care that we provide through a communicative relationship with the patient.

As pharmacists, one of the most pertinent counseling points that we can offer to all patients is the importance of medication adherence. The *Annals of Internal Medicine* published a study that looked at patient compliance and its impact on the healthcare economy. Of the medications that were filled, nearly half were taken inappropriately.[4] The consequences of not taking medications as prescribed are costly and can be dangerous, often leading to poor disease management, hospitalizations, and even deaths.[4] Emergency room visits and hospital stays increased as well, by 17% and 10% each year respectively.[5] This was mainly due to an inability to afford medication, a common problem that leads to a lapse in medication compliance. These numbers only underline how noncompliance can lead to increased costs on the healthcare system.[5] Even more shocking is that nearly a quarter million people in the USA die each year due to lack of medication adherence.[6] These costs can all be avoided if the proper counseling and patient education take place, a responsibility that mainly lies with the pharmacist.[4] The New England Healthcare Institute

(NEHI) predicts that approximately 290 billion dollars could be saved each year with proper adherence and medication education.[7]

Patient adherence is an aspect of pharmacy that has been a recurrent problem. The question remains: How can we fix it? Can we, as pharmacists, actually make a difference and improve a patient's compliance in taking his or her medications?

In a retrospective study conducted during the fall of 2010, patients who had hyperlipidemia were prescribed simvastatin and were placed into two groups, one of which received counseling from community pharmacists, and the other which simply took their medications and went home. Each patient was asked if they were available for consultation with the pharmacist, and those who refused did so due to time constraints, due to a caregiver or someone other than the patient picking up the medication, etc. Those who were part of the intervention group received two sessions, one at the initial pickup, and one following a refill pick up where they were asked about their adherence. Over 500 subjects were in each study group and compliance was monitored through the medication possession ratio (MPR), in which the total days' supply of medications during the treatment period were divided by the number of days in the treatment. Anyone who had a value over 80% was considered to be adherent to the therapy.[8]

Results indicated that those who received counseling on the benefits of being adherent to their medications were more likely to be compliant (40.9% for the group who received counseling vs. 33.7% for those who did not, and the data was found to be statistically significant with a $p<0.05$).[8] Although both groups had a downward trend in the MPR and adherence over time, the rate of decline was consistently lower for the intervention group. After 12 months of follow-up, the rate of adherence measured via MPR was 56.9% vs 61.8% in favor of the intervention group, with a $p< 0.01$. Persistence in terms of whether or not the patients filled their prescription within the allotted period of time was also higher for the intervention group with 43.9% filling on time as compared to the 38.2% in the comparative group ($p=0.05$).[8]

Although further studies need to be conducted using larger populations and various disease states, this study gives credence to the fact that pharmacists play an influential role in patient adherence and treatment management. With further education and guidance from the pharmacist, more patients may become adherent to their medications, leading to a decrease in economic costs and complications due to non-adherence.

Despite the fact that pharmacists have been a large part of our healthcare system for many years, their role is constantly being redefined. We are known as the drug experts, and as such, we are a source of valuable information as well of help for those who are concerned and have questions about their health. As pharmacists, it is important that we take an active role in counseling each patient. It not only leads to a clearer understanding about questions and concerns each patient may have, but also plays an important role in underlining the necessity of medication adherence. As interns and future pharmacists, it is vital that we understand, and appreciate, the role that we can play in managing a patient's health.

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PUZZLES

Are You Smarter than a D&D Student? [Neurology-Psychiatric Edition]

By: Sang Hyo Kim, Section Editor [Puzzles]

Headache:

- What 3 amino acids are contained within the synthetic tripeptide of ergotamine?
- How many triptans are currently available to treat migraines? Which triptans are susceptible to MAO-A enzyme because of their structural resemblance to serotonin (5-HT)?
- What receptors do the triptans work on? Of these receptors, which receptor causes vasoconstriction?

Epilepsy:

- What enzyme inactivates GABA? Do you know the structure for GABA?
- What drug acts on the NMDA receptor? What ion flows through this receptor upon activation?
- The drug felbamate is a dicarbamate analog that causes rare aplastic anemia and severe hepatotoxicity. Which portion of the SAR causes severe hepatoxicity in felbamate?
- What problem concerning phenytoin did the development of fosphenytoin solve?
- Valproic acid demonstrates various mechanisms in the management of epilepsy . What part of the chemical structure of Valproic Acid contributes to its teratogenicity?

Parkinson's Disease and Multiple Sclerosis:

- Which of the following crosses the blood brain barrier: dopamine, L-Dopa, or carbidopa?
- Which of the two MAO-B inhibitors are associated with amphetamine metabolites?
- Teriflunomide is an active metabolite of leflunomide and is an immune modulating drug that reversibly inhibits the de novo synthesis of pyrimidine by blocking which mitochondrial enzyme?

Lexicomp Online® , Lexi-Drugs® , Hudson, Ohio: Lexi-Comp, Inc.; March 2016.

PUZZLES: ANSWERS

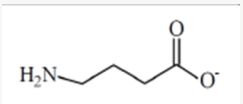
Headache:

- What 3 amino acids are contained within the synthetic tripeptide of ergotamine?
  - **Answer:** Proline, Phenylalanine, and Alanine
- How many triptans are currently available to treat migraines? Which triptans are susceptible to MAO-A enzyme because of their structural resemblance to serotonin (5-HT)?
  - **Answer:** 7 Triptans; Sumaptriptan, Zolmitriptan, Almotriptan, and Rizatriptan.
- What receptors do the triptans work on? Of these receptors, which receptor causes vasoconstriction?
  - **Answer:** 5HT1B, 5HT1D, 5HF1F; 5HT1D causes vasoconstriction.

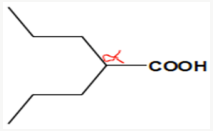
Epilepsy:

- What enzyme inactivates GABA? Do you know the structure for GABA?
  - **Answer:** GABA transaminase

    Structure of GABA:



- What drug acts on the NMDA receptor? What ion flows through this receptor upon activation?
  - **Answer:** Felbamate; The NMDA receptor regulates the flow of calcium through the channel.
- The drug felbamate is a dicarbamate analog that causes rare aplastic anemia and severe hepatotoxicity. Which portion of the SAR causes severe hepatoxicity in felbamate?
  - **Answer:** The benzyl hydrogen, which normally results in atropaldehyde formation. Chemists confirmed that benzylic hydrogen plays a pivotal role in the formation of hepatotoxicity by replacing the benzylic hydrogen with fluorine substituent. When a fluorine atom was placed instead of the benzylic hydrogen , there was no formation of atropaldehyde.
- What problem concerning phenytoin did the development of fosphenytoin solve?
  - **Answer:** Fosphenytoin was developed to solve the solubility problems of sodium phenytoin.
- Valproic acid demonstrates various mechanisms in the management of epilepsy . What part of the chemical structure of Valproic Acid contributes to its teratogenicity?
  - **Answer:** The COOH and branching at the alpha carbon.



Parkinson's Disease and Multiple Sclerosis:

- Which of the following crosses the blood brain barrier: dopamine, L-Dopa, or carbidopa?
  - **Answer:** L-Dopa
- Which of the two MAO-B inhibitors are associated with amphetamine metabolites?
  - **Answer:** Selegiline
- Teriflunomide is an active metabolite of leflunomide and is an immune modulating drug that reversibly inhibits the de novo synthesis of pyrimidine by blocking which mitochondrial enzyme?
  - **Answer:** Dihydroorotate dehydrogenase (DHODH)

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