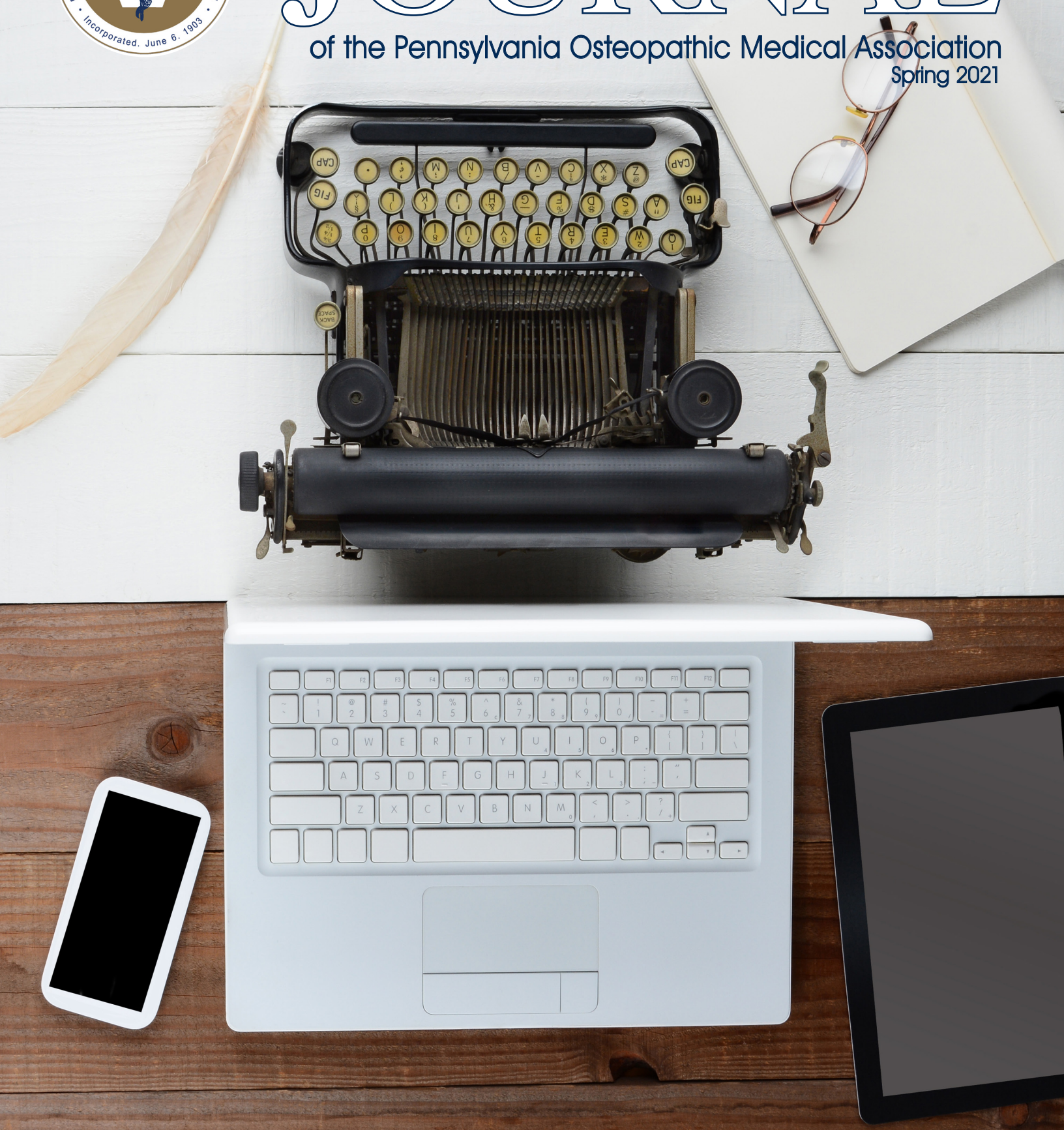




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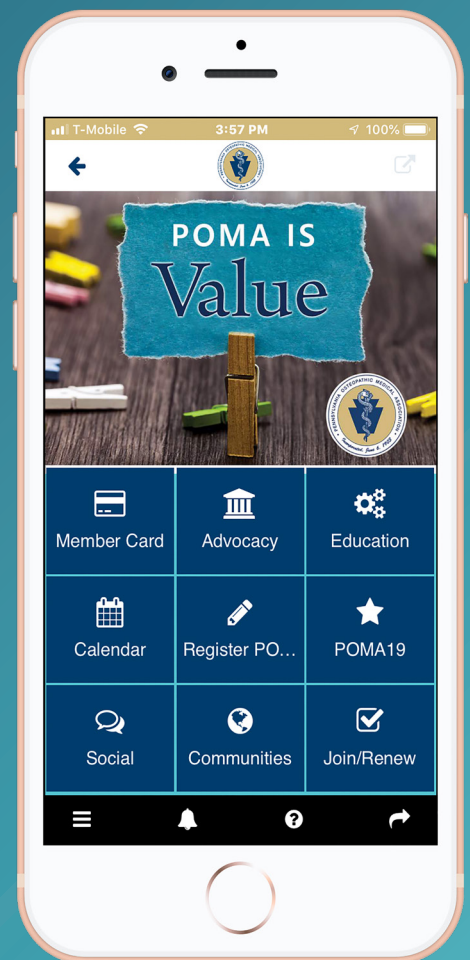
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# FROM THE EDITOR'S DESK

Mark B. Abraham, DO, JD



Mark B. Abraham, DO, JD  
Editor-in-Chief

As I write this, I think that maybe we should have gone with a picture of a groundhog. Punxy has Phil. The lottery has Gus. My backyard has a whole family. But, I'm thinking more about Phil and Bill Murray. Specifically, the movie. *Groundhog Day*. I don't know about you but for me, time seems to have stopped in March, 2020. It seems like this has just been one long day since the shutdown.

This issue is about technology and what we as a society and profession have done this year. "Necessity is the mother of invention." This year has proven to be the glaring example.

Medical education and training changed overnight. Our practices did too. The list goes on and on. You know it. You've lived it.

If I told you 18 months ago that there would be a novel virus leading to a world-wide pandemic and shutdowns in transportation, educational changes, business closures, travel restrictions, as well as multiple political fights within the United States, and yet science was able to develop multiple vaccines against the virus and start inoculating the public, you would have thought I was crazy. Eighteen months? It takes longer than that to usually go through a trial phase let alone research, development and then testing. Yet, that's exactly what happened.

There were many factors which allowed this to happen. Operation Warp Speed was a major force. So was the research conducted 17 years ago on SARS-Cov-1. It was that research which was the framework for developing the vaccines. What would have happened if one (or all) of the pharmaceutical companies purged their systems of the old research two years ago? Where would we be? As hard as that is to believe, that actually almost happened.

When friends, family or patients ask me in general about the vaccines and getting vaccinated, I tell them I received it. In many ways

it helps to validate vaccines themselves. It isn't just hard for us to believe what happened in such a short period of time, but the general public may be more shocked and hence skeptical. How long did it take to make vaccines against Small Pox, Varicella, Measles, Mumps, Rubella, Polio, Meningitis, HPV? The "talking heads" on the cable channels laughed at the possibility of a vaccine being released before the end of 2020.

Well, it happened. We have them. There are three in distribution in the United States. We also have therapeutics, something else which we didn't have less than a year ago. How many lives have they saved?

In 1980, The Talking Heads sang:

And you may ask yourself,  
"Where does that highway go to?"  
And you may ask yourself,  
"Am I right? Am I wrong?"  
And you may say to yourself,  
"My God! What have I done?"

Where did that highway go? Were we right or wrong? What have we done?

Somehow, we have done a lot. For ourselves. For our families. For our patients. For our friends.

"Same as it ever was...  
Same as it ever was...  
Same as it ever was..."

No. Not the same as it ever was (sorry David Byrne). The same as it is. The trying. The persistence. The advancing.

As you read through this issue, please keep this in mind.

And on a personal note, as pertains to advancement, I congratulate a valued member of POMA and the *Journal*, Dr. Samuel Garloff who now has the distinction of being awarded the letters WGRP. Well earned, Dr. Garloff. Well earned.

# OUT OF MY MIND

Samuel J. Garloff, DO, WGRP

## *Amytal Interview of a P.I.N.O.*

Recently I attended the inaugural meeting of the Chicago chapter of P.I.N.O. It was invitation only, quite exclusive, I stood and introduced myself: "I'm Sam and I'm a P.I.N.O." For those of you who may not be aware, P.I.N.O. stands for "Physician In Name Only". Only those who are retired may identify themselves in this fashion. Since I was the one who initiated the meeting, and was the only invited guest, I received the prestigious honorific WGRP. WGRP stands for World's Greatest Retired Psychiatrist. This is quite an honor. First, due to the fact that I am the only recipient and secondly, because it can never be taken away. This much sought-after title will be retired at the time of my demise.

The uninitiated may be surprised to learn that board certifications, fellow and distinguished fellow certificates are not your property. Of course, you may spend thousands of your dollars preparing for these honors, but you don't own them. How do I know? During my pre-P.I.N.O. days, I attended to a physician patient who unfortunately found himself in trouble with the State Board. It was evident to us both that his license would be revoked. His attorney asked that I represent his client at the Board hearing as an expert witness on his behalf. I agreed. It was an incredible learning experience.

Board hearings are open to the public. When called to the stand, I informed the hearing examiner that psychiatric records were sealed and not open to the public. The hearing room was cleared. The state's attorney then grilled me on anything he could think of no matter how obliquely it related to the case. My patient's attorney had me testify to diagnosis, prognosis and treatment. After I was excused, the state presented their expert witness. She was a doctoral level psychologist who had written and published a recent paper on the

significance of the proper selection of lipstick color in the office. The state's attorney then questioned her about medications (which she could not prescribe), treatments (that were not approved), etc. I asked my patient's attorney to address this on the stand with me during cross examination. I was then informed that there would be no cross. The rules of the hearing stipulated that the defendant's witness testify, the state's witness testify, and the hearing examiner render the verdict.

I left that hearing determined that I would one day join the State Board. Eventually, I did. My patient lost his license. At his next appointment, he reported that within 48 hours, he was contacted by his certification board and his specialty college to return his certificates or face criminal charges.

A few years later, my wife and I were in San Antonio. I was about to become a distinguished fellow. After being called to the stage and given my certificate, I returned to my seat. I received handshakes and congratulations accompanied by offers of celebratory drinks. I glanced at my wife. She was being bombarded with "you must be so proud of your husband." I saw the look in her eyes. Every husband knows the look. It was a combination of "my feet hurt," "when can we go back to the hotel," and "if one more person tells me how proud I must be, I'm going to tell them where I find his socks."

We left. I remembered what happened to my patient. I never had the certificate framed. I have no idea what happened to it. I don't care. I write WGRP after my name. That they will have to pry from my cold, dead hands.

Moral? Make up your own. To my successors on the Board; take a day off and attend a hearing. You may then learn why I always challenged disciplinary cases presented to the Board by the state's attorneys.



Samuel J. Garloff, DO

# LECOM DEAN'S CORNER

## Lake Erie College of Osteopathic Medicine

### Pandemic Technology Remains in a Post-Covid World



Silvia M. Ferretti, DO  
LECOM Provost,  
Vice President and  
Dean of Academic Affairs

"Give me six hours to chop down a tree and I will spend the first four sharpening the axe."  
— Abraham Lincoln

With the fallout of a global pandemic still fresh in our collective consciousness, and as the mission of the Lake Erie College of Osteopathic Medicine (LECOM) approaches its third decade, it seems a fitting time to recap the technological education we have in place, much of which will remain as a useful part of a changing healthcare landscape.

Through all of the assessments of the medical ramifications of the virus, we took considerable care following and implementing CDC protocols, ensuring that the institutional enterprise could respond rapidly and adapt to changes as information about the virus was made available and ensuring that the thoroughness and richness of students' education was uninterrupted.

As the first LECOM class began its studies in 1993, the College already was converting to digital technologies, implementing a fully hardwired computer system and a highly competent Information Technology (IT) Team. Our leadership was aware of the changing times, adapting its curriculum and platforms to reflect the burgeoning Information Age. Class structures were highly digitalized, with the Jenzabar Learning Platform, Polycom Communications, and online examination modalities included as part of normal educational operations. Distance education has long been incorporated into our curriculum for program disciplines, with the School of Pharmacy and the Masters Programs utilizing the systems routinely. Our preparedness addressed concerns about hurricane season affecting the Bradenton, Florida campus, resulting in extensive planning for sudden disaster situations to arise in the Sunshine State. Within its first years of operations, the Bradenton campus endured five hurricanes without interruption to education.

On March 15, 2020, LECOM Provost, Vice President, and Dean of Academic Affairs, Silvia M. Ferretti, DO, notified affected students that rotations would cease and LECOM would con-

vert to a cyber-based educational experience. We activated the plan for Covid-19 Temporary Distance Education.

The administration's foundational pre-planning and preparedness allowed the institutional response to COVID-19 and the ensuing curricular changes rapidly. Aided by a strong Information Technology Department, the College launched a seamless online curriculum to its students across the campus locations. The remote access plan was activated virtually overnight as the Pandemic began to affect the nation.

LECOM online learning delivered virtual instruction to students separated from the campus locations and supported regular and substantive interaction between the students and instructors. The Internet, augmented by transmissions through the Zoom conferencing system, the Online Learning Management System (LMS) — Jenzabar, telephone conferencing, and pre-recorded and newly recorded presentations provided solid educational support.

Didactic courses employed a combination of these technologies based upon the needs of the course directors, lecturers, speakers, and faculty.

The content depth, breadth, rate of education were maintained without interruption and student interaction was continued during the regular course schedule. Osteopathic Manipulative of Medicine (OMM) and physical diagnostics were conducted in person.

Didactic assessment (examinations) were delivered through a recognized program known as Exam Soft.

The College of Osteopathic Medicine moved all campuses and pathways to its online curriculum for the first- and second-year didactic training; and moved all third- and fourth-year students to an online clinical curriculum for core and elective rotations.

Laboratories and workshops converted to online learning sessions. Live and online question and answer sessions were offered with faculty; and faculty accessibility and availability to answer questions was actively maintained throughout online interactions.

*(continued on page 27)*

## Philadelphia College of Osteopathic Medicine

### *The Adoption of Technology in Healthcare*

*With the abrupt halt last spring to in-person learning and clinical instruction, face-to-face patient care and communal gatherings, technology — and people — had to adapt and evolve.*

*At PCOM, we transitioned to this new normal with speed and coordination, working across three campuses to move more than 300 courses from 25 programs to a virtual model of instruction. It was no small feat, but technology enabled us to do that. And though our community has shown great resilience in their embrace of such monumental change, the importance of personal connection, human interaction and the physical practice of medicine cannot be overstated.*

*The experience of the last year has no doubt changed us all. And the post-pandemic future will, of course, include the virtual technology to which we have all grown accustomed. I marvel, in fact, at what these innovative tools have allowed us to accomplish. But while technology has the power to bring us together, it cannot substitute being together.*

*Erik Langenau, DO, MS, professor, chief academic technology officer and director of professional development and online learning, has been critical to the success of our efforts over the past year and talks more about his experience below.*

*Fraternally,  
Kenneth J. Veit, DO*

### **Acceleration: The Adoption of Technology in Healthcare and Health Education**

*Erik E. Langenau, DO, MS*

Thrust into a new world of COVID-19 and social distancing, clinicians, patients and students quickly turned to technology for assistance. Many of these technologies have been available for years, but for a variety of reasons and traditions, adoption has been slow. COVID-19 forced a rapid adoption of technology. Since March of 2020, we have become comfortable with many of these technologies used in healthcare delivery, health education and continuing medical education.

**Healthcare.** Take a minute to reflect on the incredible advances over the last year.

We expanded use of telehealth visits, remote consultation with specialists, online scheduling and registration, and patient portal utilization. Medical professionals learned to work and communicate within interdisciplinary teams from remote locations; many of these teams used sophisticated remote networking industry solutions such as Microsoft Teams. Also, imagine the technologies involved in the testing and manufacturing of vaccines, the coordination of mass testing, and the logistics for distributing Personal Protective Equipment (PPE).

**Health Education.** Students in health sciences experienced a unique set of challenges over the last year. Historically, they learned in face-to-face settings with large auditorium-style lectures, anatomy labs, clinical skills labs, simulation labs and, of course, clinical environments with real patients. Many of these options, especially early in 2020, were previously unavailable to students. Instructors and school administrators quickly had to flip from face-to-face to online instruction. Administrators, faculty and students, by necessity, had to quickly embrace web conferencing, recorded lectures, online assessment with remote proctoring, online collaborative learning and engagement, online clinical decision making exercises and menu-driven simulations. Faculty and educational administrators looked to solutions provided by organizations such as Kaplan, Aquifer, DrawItToKnowIt, Access Medicine, Case Files, among many many others. Faculty and staff became adept with Learning Management Systems (LMS) such as Blackboard. An LMS serves as the foundation for learning by storing content, engaging learners, assessing knowledge and communicating with others. No longer complacent, faculty and staff all became experts in online learning and engagement. Using educational technology became everyone's responsibility—student, faculty, staff and administrator.

**Continuing Medical Education (CME).** Large national conferences (such as the American Osteopathic Association) suspended a long tradition of face-to-face, large and extrav-

*(continued on page 27)*



*Kenneth J. Veit, DO  
PCOM Provost, Senior Vice  
President for Academic  
Affairs and Dean*

# A STUDENT'S VOICE — PCOM

*Ashley Pinckney, PCOM OMS-IV*



*Ashley Pinckney,  
PCOM OMS-IV*

The COVID-19 pandemic challenged every process in our world. Anything not considered mandatory to be conducted in-person was asked to be held virtually. Things still held in-person were done so with a myriad of restrictions. One year later, many of these changes have not yet reverted to their pre-pandemic ways. This time forced us to consider the value and execution of all activities.

Medical education at the student level was headed towards virtual learning anyway, with many school curricula offering both in-person and virtual lectures. Often, more students rely on previously recorded or live stream lectures than attend in-person offerings. I think that the advancements attained with regard to virtual learning and education as a result of the COVID-19 pandemic, coupled with safe in-person offerings to complement what is taught online will provide medical students with more flexibility to personalize learning moving forward. As I prepare to start residency later this year, programs offering on-demand and virtual didactics options were a common theme this interview season. This is said to allow residents more flexibility with their learning around outpatient and night rotations. Virtual conferences offer flexibility to professional healthcare students and practicing healthcare providers to obtain the benefits of conference programming around our busy schedules, and often with far fewer costs.

However, many conferences are known to offer hands-on workshops for providers to stay abreast of new techniques and medical advancements. Much of that does not translate well through a virtual platform. The same can be said for telemedicine healthcare visits. Social or counseling based office visits lend themselves to the telemedicine style of healthcare delivery. I do not think that anything takes the place of an in-person history and physical when it comes to a sick visit or annual exam.

A disadvantage that can be said for both virtual learning and conferences is potentially

greater levels of stress and burnout due to increased expectations and demands on an already overworked population. Virtual meetings and makeup lectures can quickly seep into what previously would have been personal or free time. Many of us have felt the pressure to “just hop on to a quick meeting” on our days off or after a long shift. This challenges the very meaning of wellness that so many institutions strive towards.

I would be remiss if I did not comment on the virtual residency recruitment season that thousands of students across the country participated in this year. Virtual interviews saved senior medical students thousands of dollars in travel costs. The disadvantage of this is having to make major career and life decisions based solely on information gathered virtually. Many students had in-person rotations cancelled and were unable to evaluate a potential program as to their fit for training. It is hard to convey the culture of a program virtually. I know I am not alone in my anxiety to embark on the next phase of my training, and potentially without having ever set foot in my new training space. There may be opportunity in the future for residency programs to offer both in-person and virtual interviews to those that want them.

What is missing from these technological advancements are the means to access them. Not every patient has a wi-fi connection and capable device to conduct telemedicine visits. Not every professional has a living situation free from noise or distractions. Consideration must be given to these varying circumstances. What is also missing from the narrative is balance. We casually say, “Everything in moderation,” yet many of us spend hours each week outside of our normal workday tending to virtual demands. The COVID-19 pandemic taught us a lot of lessons in different ways, and though apprehensive, I am still excited to be at the forefront of this new frontier in medicine.



# ABOUT THE AUTHORS

**Justin P. Canakis, OMS-IV**, was awarded second place in the 2020 POMA Clinical Writing Contest for his article, *“Determining the Effects of Pre-Workout Supplementation on Endurance Testing Performance, Renal Function and Femoral Artery Endothelial Function in Resistance Trained Rats.”* A fourth-year student at the Philadelphia College of Osteopathic Medicine, he is a graduate of College of William & Mary in Williamsburg, Virginia. Founder and past president of the Autism Health Awareness Project in Philadelphia, Mr. Canakis served as vice president of the PCOM Gastroenterology Club and is past president of the Health Career Collaborative.

**Jeffrey M. Kalczynski, OMS-IV**, was awarded second place in the 2020 POMA Clinical Writing Contest for his article, *“Feasibility of a Community Paramedicine Program.”* A fourth-year student at the Philadelphia College of Osteopathic Medicine (PCOM), he is an ensign in the United States Navy. A graduate of the University of Delaware, he is a member of the Emergency Medicine Residents Association, the Pennsylvania College of Emergency Physicians, the American College of Emergency Physicians and the Student Association of Military Osteopathic Physicians and Surgeons.

**Jacob W. Matsil, DO**, was awarded an honorable mention in the 2020 POMA Clinical Writing Contest for his article, *“Determining*

*Reason for Flu Shot Refusal.”* Dr. Matsil is a third-year family medicine resident at Millcreek Community Hospital in Erie, Pennsylvania. A graduate of Michigan State University (MSU) in East Lansing, he is a 2018 graduate of MSU College of Osteopathic Medicine.

**Pamela S.N. Goldman, DO, MHSA, FACOI**, *“Big Data and the Use of Machine Learning in Medicine,”* is a medical director for a major healthcare company and a specialist in hospital medicine and utilization medicine; a clinical assistant professor at the Philadelphia College of Osteopathic Medicine, and an adjunct professor at the Lake Erie College of Osteopathic Medicine (LECOM) Health Services Administration. A graduate of Juniata College in Huntingdon, Pennsylvania, and a 2006 graduate of LECOM, she completed an internship and internal medicine residency at Frankford Health Care System in Philadelphia, Pennsylvania. She also received a Master of Health Services Administration degree from LECOM and completed a healthcare leadership and management for physicians certificate program from the American College of Osteopathic Internists (ACOI) and the University of Texas at Dallas. A fellow of ACOI, Dr. Goldman is the 2019-2020 president of POMA, past chair of the POMA Foundation Board of Directors and a member of the American Osteopathic Association.



*Justin P. Canakis,  
PCOM OMS-IV*



*Jeffrey M. Kalczynski,  
PCOM OMS-IV*



*Jacob W. Matsil, DO*



*Pamela S.N. Goldman, DO,  
MHSA, FACOI*

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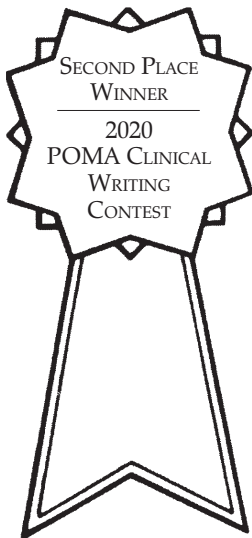
# Medical Update

## **Determining the Effects of Pre-Workout Supplementation on Endurance Training Performance, Renal Function, and Femoral Artery Endothelial Function in Resistance Trained Rats**

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by Justin P.  
Canakis, OMS-IV

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### **Abstract**

Pre-workout supplements (PWSs) contain a cocktail of ingredients that are marketed to increase energy levels, endurance, and muscle power. PWSs are not regulated by the Food and Drug Administration (FDA) and have a history of causing adverse side effects. The goal of this study is to independently analyze the efficacy and safety of Pro Supps Mr. Hyde (MH) in resistance trained rats. Data suggest that six weeks of pre-workout supplementation in rats undergoing resistance training results in modest efficacy with improvement in amount lifted but no change in muscle mass. Urinary creatine tests and vascular reactivity tests were selected as biological markers of safety. Urinary creatinine tests revealed that the MH group demonstrated elevated creatinine levels; however, urinary creatinine may not be a conclusive indicator in determining renal function. Data from vascular functions tests revealed no significant differences. More research needs to be conducted because there is a scarcity of literature that explores the effects of PWSs on resistance training and safety. Given that each formula has a unique proprietary blend, a general consensus regarding the efficacy and safety of PWSs cannot be inferred. This study is novel because it is the first of its kind that conducts an independent analysis of acute MH supplementation. Future research efforts are still necessary due to the popularity of PWSs, the lack of regulation and accountability, and the high degree of product variability.

### **Compliance with Ethical Statement**

Funding for this study was provided from The College of William and Mary's Monroe Scholar Program—there are no conflicts of interest. This current study has been approved by the Institutional Animal Care and Use Committee (IACUC) at The College of William and Mary. All procedures performed in studies involving animals were in accordance with the ethical standards of the institution or practice at which the studies were conducted. Additionally, Researchers who participated in this studied complied the Human Care and Use of Laboratory Animals and the Occupational Health and Safety modules of the CITI Program. Informed consent was obtained from all individual participants included in the study.

### **Introduction**

Consumers who are trying to gain a competitive edge and improve their workouts often look towards supplements that promise better performance. Pre-workout supplements (PWSs) are widely marketed to improve one's energy and endurance, increase strength, foster muscle growth, and burn body fat. Vitamins, Minerals, and Supplements (VMS) is one of the fastest growing industries in the world — producing about \$32 billion in revenue for just nutritional supplements alone in 2012 — and it is projected to double that by topping \$60 billion in 2021 according to the *Nutritional Business Journal*.<sup>1</sup> This lucrative industry is not regulated by the Food and Drug Administra-

tion (FDA) and these companies are allowed to sell products without the supervision of the FDA. In 2013, a pre-workout supplement that was widely sold in the United States, Craze, tested positive for the methamphetamine analog N,a-diethyl-phenylethylamine (N,a-DEPEA).<sup>2</sup> Furthermore, the researchers noted that N,a-DEPEA is not listed on Craze's ingredient label.<sup>2</sup> This lack of oversight and regulation poses a significant risk to consumers. For example, in December 2011, two soldiers died after using a pre-workout supplement known as Jack3d, which contains dimethylamylamine, or DMAA.<sup>3</sup> DMAA raises blood pressure and heart rate, and frequently raises blood pressure and heart rate, and can lead to heart attacks.<sup>3</sup> Due to the supplement industry's poor track record, it brings to question whether or not these products, especially PWSs, are safe for consumers to take before their workouts.

Given the lack of insight and scarcity of studies examining such products, we set out to explore the efficacy of a pre-workout supplement and its effect on performance, muscle hypertrophy, vascular function, and renal function in resistance trained male rats. We chose to research the pre-workout supplement, Pro Supps Mr. Hyde™, due to its immense popularity and unique proprietary blend. Mr. Hyde™ which contains “approximately 2-3 times the amount of caffeine as most other pre-workouts” and claims to be a “pre-workout amplifier” that supports skin tearing pumps, enhanced endurance, maximum performance and muscular strength.<sup>4</sup> The formula consists of three matrixes (Figure 1) — a strength, caffeine, and intensity matrix.<sup>4</sup> The strength matrix contains: 2.5g Beta Alanine, 1g Creatine Nitrate, 500mg L-Leucine, 500mg Agmatine Sulfate, 500mg L-Citrulline Aspartate.<sup>4</sup> The caffeine matrix contains: 300mg Caffeine Anhydrous, 69mg Dicafeine Malate, and 50mg of Caffeine Citrate.<sup>4</sup> The intensity matrix contains: 50mg Hordenine, 50mg Pikatropin® Picamilon, 50mg N-Methyl L-Tyramine HCl, 2mg Yohimbe Bark Extract, and 2mg Rauwolfia Vomitoria Root Extract.<sup>4</sup>

While PWSs combine a number of ingredients that appear to play some role in improving nerve function, muscle function, and metabolism, there still remains great skepticism as to whether there is any validation despite the underlying biochemical rationale. Furthermore, supplements do not fall under the usual FDA regulation of conventional foods and drug products and the manufacturer is responsible for safety and claims regarding

the product but do not need FDA approval before marketing the product. The FDA only steps in after the fact. In the case of the supplement proposed in the current project, the FDA has already stepped in once to request a change and the product has been reformulated. Nevertheless, the supplement used in our study contains: alanine, creatine, leucine, L-citrulline aspartate, caffeine (anhydrous), dicafeine malate, caffeine citrate (3 forms of caffeine), Pikatropin Picamilon, citrus aurantium, octopamine, and nobile orchid stem extract. A Pubmed search for studies using this combination of ingredients yielded 0. We propose that this combination of ingredients may improve performance but may also represent a significant stress to the cardiovascular system and kidneys.

## Materials and Methods

### Animals.

Experiments were approved by the Institutional Animal Care and Use Committee of The College of William & Mary and adhered to the ACSM standards of humane animal experimentation. Animals were housed and trained in the ISC 0114 vivarium from the time of their delivery until the end of the training protocol. Male, Fisher 344 rats, weighing 160-180g, were divided into two groups: Mr. Hyde (MH, n = 12) and Control (C, n = 12).

### Resistance Training.

A six-week resistance-training regimen was designed where animals would exercise for two days, followed by one rest day — this pattern remained consistent throughout the six weeks. Animals were trained using a protocol previously described (Lee et al. 2004). Briefly, animals climbed a 1 m ladder with 2-cm steps, inclined at 85° with two days of exercise followed by one day of rest for 5 weeks (each rat trained for 20 days). A cylinder containing weights was attached to the base of the tail and resistance was increased by adding weights to the cylinder. Rats did two climbs (two repetitions) of the ladder at each workload; 50, 75, and 100% of the maximal load from their previous exercise session. In addition, if the rat completed both climbs at 100% of the previous maximal load they attempted an additional one or two climbs with an increased weight (+30 g) resulting in a failed climb (total 6–8 climbs/day). The initial load consisted of 50%

Supplement Facts		
Serving Size: 1 Scoop (7.5g)		
Servings Per Container: 15		
	Amount Per Serving	% Daily Value
<b>Strength Matrix</b>		
Beta Alanine (CarroByn®)	2.5g	**
Creatine Nitrate (NO3-T6)	1g	**
L-Leucine	500mg	**
Agmatine Sulfate (AGMAPURE®)	500mg	**
L-Citrulline Aspartate (1:1)	500mg	**
<b>Caffeine Matrix</b>		
Caffeine Anhydrous	300mg	**
Infray™ (Dicafeine Malate)	69mg	**
Caffeine Citrate	50mg	**
<b>Intensity Matrix</b>		
Hordenine	50mg	**
Pikatropin® Picamilon	50mg	**
N-Methyl L-Tyramine HCl	50mg	**
Yohimbe Bark Extract	2mg	**
Rauwolfia Vomitoria Root Extract (std. min. 90% Alpha-Yohimbine)	2mg	**

\*\* Daily Value not Established.

Other Ingredients: Natural & Artificial Flavor, Soluble Corn Fiber, Malic Acid, Sucralose, Calcium Gluconate, Silicon Dioxide, FD&C Red #40, FD&C Red Lake #40, Soy Lecithin, Contains Soy Lecithin, Contains Citrus Juice.

Figure 1: Supplement Facts of Pro Supps Mr. Hyde™ purchased in May 2015.

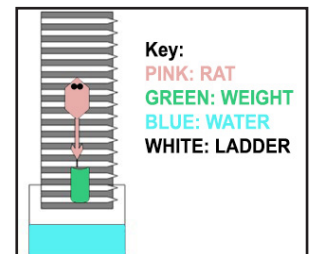


Figure 2: Schematic of training.

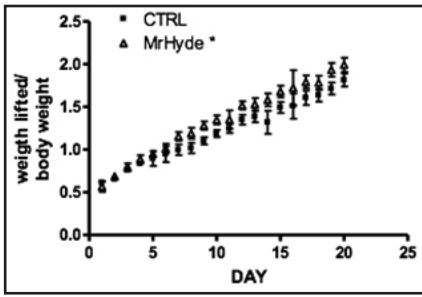


Figure 3: Weight lifted/Body Weight vs Day of Training.

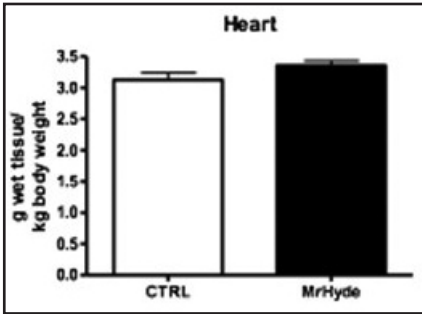


Figure 4: Grams of Wet Heart Tissue / Kg Body Weight.

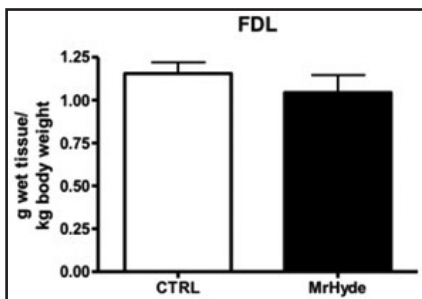


Figure 5: Grams of Wet Flexor Digitorum Longus tissue / Kg Body Weight.

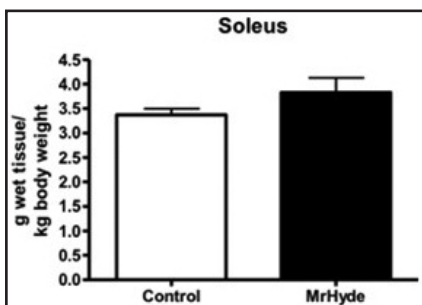


Figure 6: Grams of Wet Soleus Tissue / Kg Body Weight.

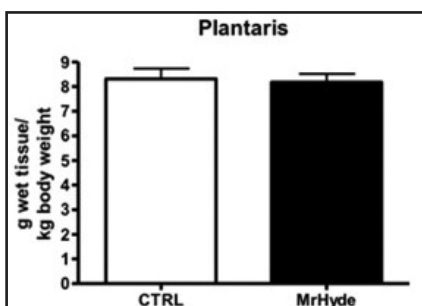


Figure 7: Grams of Wet Plantaris Tissue / Kg Body Weight.

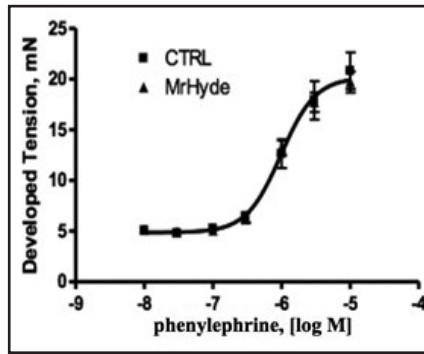


Figure 8: Phenylephrine, femoral artery dose-response curve.

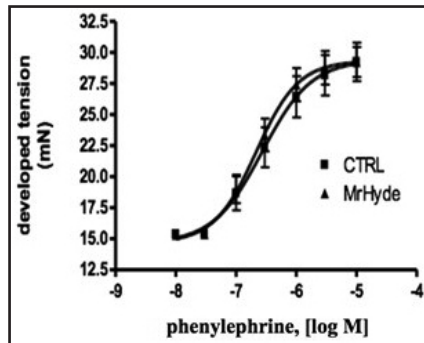


Figure 9: Phenylephrine, aortic dose-response curve.

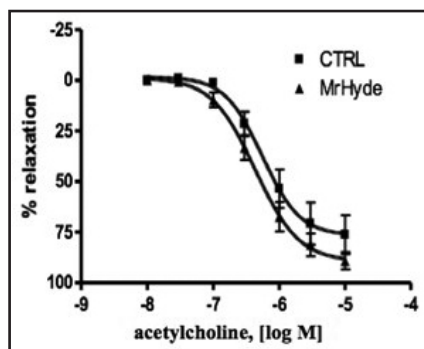


Figure 10: Acetylcholine, femoral dose-response curve.

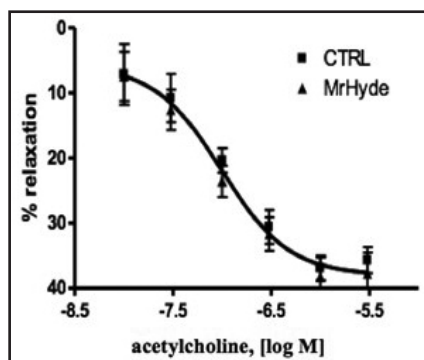


Figure 11: Acetylcholine, aortic dose-response curve.

of body weight. Each climb was separated by a 2 min rest interval. When necessary, a spray of cool water was used to motivate the animals.

### Supplementation.

The recommended serving of Mr. Hyde for a human is 7.1g. Under the assumption that the average male weighs 81.6466kg, rats were dosed using a proportion. For example,  $7.1g/81646.6g = x g / \text{average weight of all 24 rats g}$ . The control group was supplemented with a dextrose solution.

### Vascular Reactivity.

Twenty-four hours following the last exercise animals were anesthetized with a ketamine/xyazine cocktail and femoral arteries were removed and placed in saline solution at 37 degrees celcius. Vessels were cleaned of adherent fat and connective tissue and cut into two, 2 mm rings. The remainder of the femoral artery was frozen in liquid nitrogen for future analysis. The rings were mounted using small wires on stainless steel holders in muscle baths on a DMT610 myograph for isometric force recording. Muscle baths were filled with physiological salt solution (PSS) consisting of: 130 mM NaCl, 4.7 mM KCl, 1.18 mM KH<sub>2</sub>PO<sub>4</sub>, 1.17 mM MgSO<sub>4</sub>·7H<sub>2</sub>O, 1.6 CaCl<sub>2</sub>, 14.9 mM NaHCO<sub>3</sub>, 5.5 mM dextrose, and 0.03 mM Na<sub>2</sub>EDTA heated to 37°C and aerated with 95% O<sub>2</sub>/5% CO<sub>2</sub>. The rings were stretched to an optimal resting tension (5MN) and allowed to stabilize. After equilibration, constrictor responses to phenylephrine were determined using cumulative doses ( $10^{-7}$  to  $10^{-4}$  M). Relaxation responses to cumulative doses of acetylcholine (Ach,  $10^{-7}$  to  $10^{-4}$  M) and sodium nitroprusside (SNP,  $10^{-9}$  to  $3 \times 10^{-4}$  M) were determined following precontraction with  $10^{-4}$  M phenylephrine with ~30 min of recovery between each drug until the resting tension stabilized. The bathing medium was changed every 5 min during the recovery periods.

### Renal Function Analysis.

Twenty-four hours following the last exercise animals were anesthetized with sodium pentobarbital (40 mg/kg, i.p.) and urine samples were collected from the bladder. The samples were frozen in liquid nitrogen and used for a urinary creatinine test. Creatinine concentration was determined by a coupled enzyme reaction, which results in a colorimetric (570 nm)/fluorometric ( $\lambda_{ex} = 535/\lambda_{em} = 587$  nm) product, proportional to the creatinine present.

### Muscle Excision.

Twenty-four hours following the last exercise animals were anesthetized with sodium

pentobarbital (40 mg/kg, i.p.). The soleus, plantaris, flexor digitorum longus, and extensor digitorum longus were removed, weighed, and frozen in liquid nitrogen.

### Statistical Analysis.

The reported values represent means  $\pm$  standard error (SE). To determine whether there was a significant difference among groups after 6 weeks of resistance training, two-way ANOVA tests were used to analyze the results. A P-value of  $<0.05$  was used as a limit for statistical significance.

## Results

ANOVA revealed a significant ( $P < 0.05$ ) main effect of MH on amount lifted; in other words, cumulatively more weight was lifted each day in the MH groups than the control group, but no specific day was different and the maximal amount of weight at the end of six weeks was not significantly different (i.e. no post-hoc test for each individual time point revealed significance) (see figure 3). No significant differences ( $P > 0.05$ ) were observed in skeletal muscle weight (indicating no hypertrophy) (see figures 4-7). No significant differences ( $P > 0.05$ ) in vascular function measured by dose response curves to PE, Ach, and SNP (no change in IC50 or in the maximal response) (see figures 8-13). Urinary creatinine levels in the MH group were significantly ( $P < 0.05$ ) increased (see figure 14). Taken together, these data suggest that 6 weeks of pre-workout supplementation in rats undergoing resistance training resulted in modest efficacy with improvement in weight lifted with no change in muscle size or vascular reactivity. The significant increase in urinary creatinine levels suggests potential renal health issues; however, more renal function tests need to be conducted for further elucidation of this claim.

## Discussion

A PubMed search for 'pre-workout supplement' and 'resistance training' yields 21 items. An additional PubMed search for 'pre-workout supplement' and 'safety' yields 11 items. The relevant, yet scarce, literature that explores the effects of pre-workout supplementation on exercise performance and safety establishes some consistent trends. First, the majority of these studies have demonstrate that pre-workout supplementation enhances exercise performance — whether it is statistically significant or a trend. A recent randomized study sought out to explore the effect of pre-workout supplementation on power and strength performance.<sup>5</sup> The researchers studied a popular

supplement called MusclePharm Assault™ and divided subjects into a placebo (PL) and supplement group (SUP). The researchers noted that the supplement group yielded significant differences in Wingate Anaerobic Power Test (WAnT), anaerobic mean power, and base line performance. However, no significant differences were observed for upper body power, upper body strength, or upper body strength.<sup>5</sup> This study showed that the acute ingestion of PWSs can significantly improve both anaerobic peak power and mean power in recreational trained males.<sup>5</sup>

Another experiment, conducted by Kedia et al, explored the effects of a pre-workout supplement on lean mass, muscular performance, subjective workout experience, heart rate, blood pressure, ECG, and comprehensive blood chemistry and blood counts.<sup>6</sup> The researchers studied the popular, yet controversial, pre-workout supplement known as Craze — in October 2013, Craze was banned after researchers discovered that N, $\alpha$ -diethyl-phenylethylamine (N, $\alpha$ -DEPEA), a methamphetamine analog was not listed on Craze's ingredient label. Figure 15 represents the ingredients label — notable ingredients include creatine, caffeine, betaine, and Dendrobex (a herbal medicine that might have blood pressure-lowering effects while serving as a stimulant).<sup>6</sup> The researchers noted a significant increase in systolic and diastolic blood pressures in the SUP group, whereas the PL group had non-significant reductions. The researchers reported significant improvements in subjective energy and concentration. At week 6, body composition was measured via dual-energy x-ray absorptiometry (DEXA) and did not reveal improvements in measures of body composition. Thus, the researchers concluded that pre-workout supplementation increased energy and concentration, but did not yield improvements in performance or body composition.<sup>6</sup>

Another study evaluated the effects of a proprietary blend containing creatine monohydrate, beta-alanine, L-taurine, L-leucine, and caffeine on anaerobic power, muscular strength, body composition,

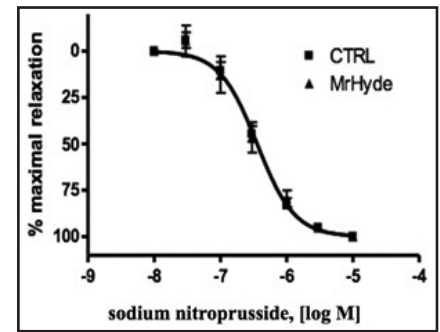


Figure 12: Sodium Nitroprusside, aortic dose-response curve.

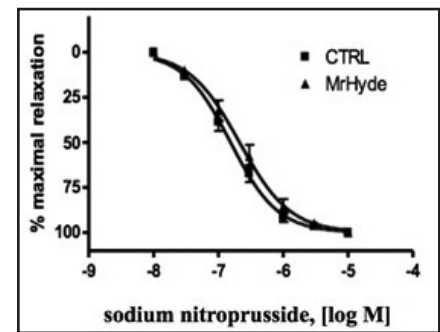


Figure 13: Sodium Nitroprusside, dermal dose-response curve.

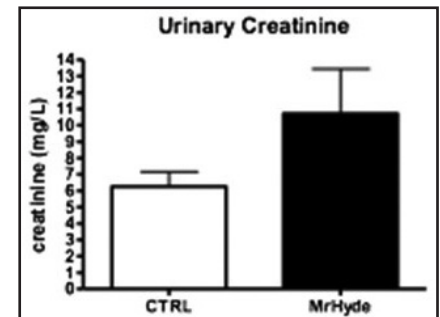


Figure 14: Creatinine (mg/L) levels between CTRL and MrHyde.

45 Servings Candy Grape	
Serving Size: 1 Scoop (5.3 grams)	
Servings Per Container: 45	
Amount Per Serving	% Daily Value
Vitamin C (Ascorbic Acid)	250 mg 417%†
Kinesis™ Proprietary Blend	4,580 mg †
Creatine Monohydrate, Trimethylglycine (Betaine Anhydrous), L-Citrulline, Dendrobex™ (Dendrobium Extract) (Stem) (Concentrated For Alkaloid Content Including Dendrobine, Dendroxine, Dendramine, B-Phenylethylamine, N,N-Dimethyl-B-Phenylethylamine, And N,N-Diethyl-B-Phenylethylamine), B-Phenylethylamine HCl, Citramine™ (Citrus Reticulata Extract) (Fruit) (Concentrated For N-Methyltyramine Content), Caffeine Anhydrous	
† Percent Daily Values are based on a 2,000 calorie diet.	
‡ Daily Value not established.	
<b>Other Ingredients:</b>	
Citric Acid, Malic Acid, Natural & Artificial Flavors, Sucralose, Acesulfame Potassium, FD&C Red #40, FD&C Blue #1	
Allergen Information: This product was manufactured on equipment that processes products that may contain milk, egg, soy, tree nuts, peanuts, wheat, fish, crustaceans & shellfish.	

Figure 15: Ingredients label of the popular PWS, Craze.

and mood states.<sup>8</sup> The subjects in the SUP group were asked to complete a workout that consisted of bench and leg press repetitions to failure. The researchers found no significant improvements in body composition or performance; however, they did note trends indicative of improvement that is consistent with the findings in our study.<sup>8</sup>

In addition to exploring strength and muscle hypertrophy, there have been a few studies examining the biological markers of safety. All of these studies have concluded that there is not a clinically significant risk of acute pre-workout supplementation. In our study, urinary creatine and vascular reactivity were selected as biological markers of safety. In congruence with the few studies available in the literature, we did not reveal significant differences in urinary creatinine levels or differences in vascular functions tests.

Interestingly, there was a unique study that explored the safety of differing doses of the popular pre-workout supplement, MusclePharm Assault™.<sup>9</sup> Prior to and following the supplementation period, the researchers measured vital signs and analyzed hematological and clinical chemistry panels — all of which remained within the clinical reference ranges.<sup>9</sup> Similar to the results in our present study, the researchers in this group concluded that both one-serving and two-servings of SUP consumed daily for 28 days was deemed to be safe for heart, liver, and kidney function.<sup>9</sup>

While researching the acute affects is the first logical step in garnering a better understanding of pre-workout supplements, more studies need to be conducted in order to delineate the long-term effects. The body of literature is scarce and we cannot infer a scientific consensus based off the current data. There is a plethora of different pre-workout formulas sold throughout the United States and establishing the relative safety from a few products cannot be generalized to the entire industry. For example, the proprietary blend in Mr. Hyde contains many unique ingredients — especially in its ‘intensity matrix’ — that have never been tested in human subjects. Thus, the current study is a novel study because it is the only study that independently analyzes Mr. Hyde. Furthermore, it is one of the only animal models in the scarce body of literature. While animal models cannot be directly applied to humans, using rats yields some advantages. For example, all of the rats were genetically similar and lived in a controlled environment. The reduction of environmental confounding factors allowed us to study Mr. Hyde in isolation. Another

advantage of using an animal model was the opportunity to euthanize the rats, extract tissue, and run vascular reactivity tests, and follow up biochemical analysis of tissues. Currently, this study is the only study that analyzes vascular reactivity; although there was no significant difference, it still has pioneering characteristics.

## Conclusion

This study explored the effects of Pro Supps Mr. Hyde on muscle hypertrophy, renal function, and vascular reactivity. The Vitamins, Minerals, and Supplements (VMS) industry is essentially unregulated by the FDA and has a history of mislabeling supplements, including banned substances, and causing adverse side effects to consumers. Pro Supps Mr. Hyde is just one example of a product that contained banned supplements — such as picamilon — and mislabeling ingredients — such as picamilon and yohimbine. Furthermore, the pre-workout supplement contains a proprietary blend of ingredients that have a scarcity of scientific evidence regarding their efficacy and safety. Some ingredients, especially those listed in the ‘intensity matrix’ of MH, have never been tested in human subjects. What is even more troublesome is that there are virtually no studies that examine the biological synergisms of this unique proprietary blend. Our study utilized an animal model to determine the efficacy and safety of Mr. Hyde. After 6-weeks of resistance training, there was no significant increase in exercise performance, or muscle hypertrophy — but there was a significant lift main effect that is congruent with other studies that study pre-workout supplements and resistance training. Regarding renal function, the supplement group demonstrated an increase in urinary creatinine; however, after reviewing the literature surrounding creatine supplementation and creatinine levels, this trend is expected and is not a conclusive biological safety marker. Regarding vascular reactivity, there were no significant differences between the groups; however, the analysis of vascular reactivity and pre-workout supplementation is the first of its kind and serve a pioneering role. Hence, this study served a preliminary role to establish the efficacy and safety of six-weeks of preworkout supplementation in resistance trained rats. More studies need to be conducted to determine the long term effects of pre-workout supplementation and to analyze the interactions between the understudied ingredients in such supplemental proprietary blends.

*(continued on page 26)*

# Medical Update

## **Feasibility of a Community Paramedicine Program in New Castle County, Delaware**

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### **Abstract**

With many people throughout the United States over utilizing the emergency department, costs are rising, and patient satisfaction is falling. Many solutions have been attempted, but the problem persists. A new solution, Community Paramedicine, is growing in popularity across the nation. No such program has been attempted in New Castle County, Delaware. This thesis examined the population of the county, and analyzed Medicaid data to propose a Community Paramedicine pilot program.

Census data for New Castle County and the United States as a whole were compared to provide a clear picture of the population of New Castle County in comparison to the nation. Medicaid data was then collected from the University of Delaware's database. The data was ordered by ICD9 Codes to determine a disease population for which to attempt a pilot protocol for a Community Paramedicine program. The Medicaid data indicated that a common disease that generates Medicaid claims is asthma. This would be a good disease to focus on for the pilot protocol because it is chronic in nature and without proper management, it can flare up and a life-threatening situation can arise. An analysis of the number of claims per patient revealed that a small percentage of the Medicaid population created an incredibly large portion of the claims. This group of high utilizers would also benefit greatly from such a program.

The data also revealed that Medicaid patients who self reported themselves as being "black" generated twice as many claims as would be expected based on the percentage of the population that they represent.

### **Introduction**

Emergency department overcrowding in the United States of America is a rapidly

growing issue in healthcare. Many patients seek out care at the emergency department (ED) for non-emergent health issues, and this causes costs to increase as well. Patients who over utilize the ED typically also abuse the 911 system as a "taxi" to the hospital. This ties up ambulances, emergency department beds, and hospital staff in an effort to treat a non-emergent patient in an emergent setting. Costs skyrocket while ED efficiency and patient satisfaction suffer. Many solutions have been attempted to mitigate this issue, but the problem persists.

A new solution, Community Paramedicine, has been rapidly spreading throughout the United States, but no such program has been explored in New Castle County, Delaware. In a Community Paramedicine program, experienced paramedics visit these high utilizers in their homes on a non-emergent basis to help prevent them from becoming acutely ill and requiring a trip to the hospital.

Community Paramedics assess the patient's health, ensure they are compliant with their prescribed treatments, and educate patients on their health conditions. The program has been shown to be extremely successful elsewhere in the U.S. Thus, this investigation will explore the feasibility of a Community Paramedicine program in New Castle County, Delaware.

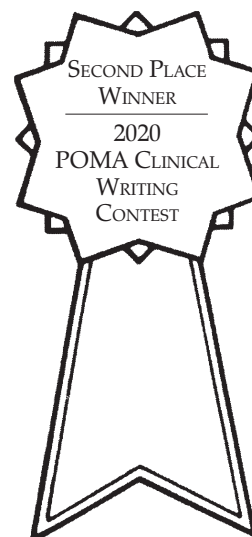
In order to bring Community Paramedicine to New Castle County, a pilot protocol will need to be put into place so that a small scale investigation of its efficacy can be performed. In order to effectively implement this pilot protocol, it is essential to use a data-driven selection process for determining the target patient population.

This study will provide the foundational evidence needed to select the target population that can be used in a pilot Community Paramedicine project in New Castle County, Delaware.

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by Jeffrey M.  
Kalczynski,  
OMS-IV

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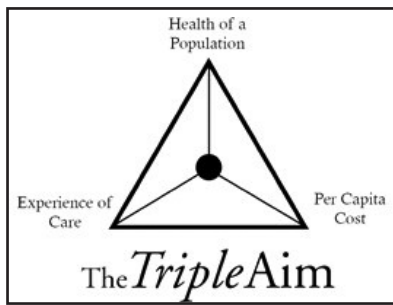


Figure 1: The Triple Aim identifies areas to focus on in order to improve healthcare.<sup>3</sup>

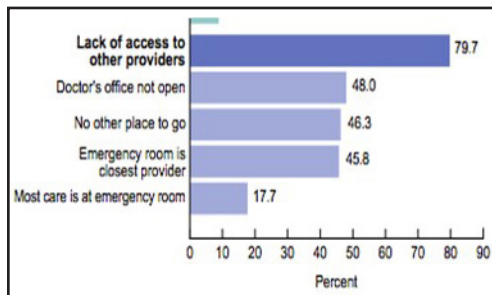


Figure 2: "Why I Went to the ER" shows the most common reason that patients chose to be seen in the Emergency Department rather than another healthcare facility.<sup>4</sup>

## Background

### The Problem: Emergency Department Overcrowding

The state of healthcare in the United States is tumultuous at best. Emergency department (ED) wait times are skyrocketing due to the increased volume of patients. In fact, ED visits increased by 36% between the years of 1996 and 2006.<sup>1</sup> Hospitals have an extremely tough time keeping up with the increased volumes. As a

consequence, wait times and patient experience have suffered. Studies have shown that an alarmingly large portion of visits to the ED come from patients who do not have health issues severe enough to warrant a trip to the emergency room. One study determined that between 14 and 28 percent of the patients seen in EDs could have been treated elsewhere without negative outcomes.<sup>2</sup>

These patients could have been treated just as effectively by their primary care physicians, in an "urgent care" clinic, or in another retail medical facility. The study asserts that not only would the patient care outcomes have been similar, but would have also resulted in less cost for the patient and their insurance company. In fact, it was estimated that 4.4 billion dollars could have been saved if these patients in question had not received care at the ED.<sup>2</sup> Furthermore, the "healthcare experience" would have also been better for the patient because they would avoid the overcrowded ED waiting rooms.

Avoiding the ED for these patients would satisfy all three points of "The Triple Aim" triangle (Figure 1). The Triple Aim is the three goals that the Institute for Healthcare Improvement has set for all new healthcare endeavors. It is postulated that if healthcare systems achieve all three goals, it will improve healthcare as a whole in the United States. The patients would accrue less cost for the care rendered (decrease the per capita cost), have shorter wait times (increase experience of care), and receive equal care to that of the ED (health of a population).<sup>3</sup> Because the care is held constant for these patients, the net effect of seeking alternative treatments is similar care for less money and a better patient experience.

So why aren't more people seeking alternate care? It seems that many people live in

areas that the US Department of Health and Human Services have deemed as "Health Professional Shortage Areas" or HPSAs.<sup>4</sup> HPSAs are defined as an area of the country where there were more than 3,500 patients for every physician. There are currently 6,100 areas designated as HPSAs in the United States, affecting 54 million Americans that live in these areas.

The Department of Health and Human Services estimates that 8,200 additional primary care physicians would need to be added in order to eliminate all of the HPSAs.<sup>4</sup> Due to this shortage of primary care physicians (or their equivalent), patients seek care in whatever form they can get it: even if it means astronomical emergency room costs and congested wait rooms. In fact, it seems that the most common reason that patients visit ED is not because of the severity of their health condition.<sup>5</sup> Figure 2 shows that the most popular reason that people visited the provider was "lack of access to other providers." The following answers to the question also seem to show that people are not going to the ED because they believe they need emergency room quality care, but because it is most convenient.

### Current Solutions

Many different solutions to the issue of ED overcrowding have been attempted. The most popular and effective strategies attempt to treat patients at alternate facilities, or in some cases, in the patient's home. One popular alternative plan of care is visiting nurse services. This is not a new plan: the first visiting nurse agency called "friends of the poor" was founded in New York City in 1909 to serve the homeless and poor citizens of the city who could not afford healthcare.<sup>6</sup> It blossomed from there and now there are many commercial visiting nurse agencies all across America. This service is attractive to many elderly or bedridden patients because it allows patients to be treated in the comfort of their own home. Visiting nurses have the ability to monitor patients and ensure that they do not require more advanced care. The visiting nurse also has a unique opportunity to get to know patients and develop a rapport with them. A major downside to visiting nurses is the immense costs associated with compensating the nurses and providing transportation.

Another solution to the problem takes aim not at keeping patients out of the ED, but rather attempts to increase efficiency of doctors in the ED. Many hospitals have found that the documentation aspect of a doctor's job takes up a considerable amount of time. This causes



providers to see fewer patients, decreasing efficiency. Many doctors now have “scribes” who shadow them as they see patients and write their patient care reports. An interview with an ED scribe, Audrey Snyder, explains a bit more about how scribes improve the efficiency of the ED: “I accompany a doctor or P.A. throughout their shift and help them with their PCR (patient care report). We are able to see more patients in a shift and this really helps to keep the waiting room as empty as possible. With so many patients coming in, I don’t think the providers would be able to keep up with the volume of patients we see here.”<sup>7</sup> When asked about how critically ill most of her patients are, she asserted, “most people should probably have gone to an urgent care... the amount of ‘flu like symptoms’ charts I write is outrageous.”

Another more unorthodox solution to the problem is being attempted in Bangor, Maine. Their fire department receives many non-emergent calls for service, so they are considering adding additional fees for these unnecessary calls. For example, there is an individual who dialed 911 to request an ambulance 171 separate times in the past year. There has been some backlash, but they assert that it is costly and dangerous to tie up an ambulance for so long when the call is such a low priority. Should an actual emergency arise, there would be no available ambulances to respond in a timely manner.<sup>8</sup>

### Community Paramedicine

Community Paramedicine, also known as Mobile Integrated Healthcare, is a newly emerging field in the emergency medical services. Paramedicine itself is actually only about 45 years old: it was started in the 1960’s as a response to car crashes on the country’s highways. It quickly evolved to include more advanced practices and standardized training.<sup>9</sup> Paramedicine continues to evolve today all over the nation as the scope of practice of paramedics and EMT’s is slowly growing to include more non-emergent treatment options. This paved the way for EMT’s and paramedics to begin visiting patients with a high risk of activation of the 911 system on a non-emergent basis. These programs are rapidly spreading across the nation, but none have appeared in the state of Delaware. One program has been particularly successful, so we will examine it in more detail to help determine the feasibility of a similar one in New Castle County.

Seven years ago, a novel solution to the problem of ED overuse was piloted in Fort Worth, Texas. A company called MedStar EMS

launched a program called Mobile Integrated Healthcare/Community Paramedicine. This program takes aim at high utilizers of the 911 system.<sup>10</sup> The goal of the program is to reduce the frequency of unnecessary 911 calls by enrolling “frequent flyers” in a program where community health paramedics (CHPs) visit them at home on a non-emergent basis. Patients enrolled in this program “typically do not have health insurance and rely on EMS and emergency departments for their healthcare.”<sup>11</sup> This results in “higher costs and the diversion of valuable resources away from true emergencies” according to the Agency for Healthcare Research and Quality.<sup>10</sup>

The program has three goals:<sup>11</sup>

- 1) Reduce the probability of providing acute emergency medical care for at-risk patients and the medically underserved, thereby reducing unnecessary health care expenditures.
- 2) Increase the outreach activity and public education components of EMS providers.
- 3) Generate a potential revenue stream, including reimbursement for services as permitted by agreements with payers.

The CHPs typically visit enrolled patients a few times per week and perform actions detailed in Table 1. They help to ensure that the patient is not acutely ill, will not become acutely ill, and will receive the long-term preventative care that they need. The efficacy of the program has been confirmed by a study of its enrollees: graduates of the Community Paramedicine program activated the 911 system 90% less frequently than they did before enrolling.<sup>1</sup> MedStar estimates that this freed up 14,000 emergency department bed hours and reduced ED charges by 9 million dollars between July 2009 and August 2011.<sup>10</sup> What’s more? The program only cost Medstar EMS \$46,000 to start, and did not increase their annual staffing costs.<sup>1</sup> Although Community Paramedicine has been extremely successful elsewhere in the United States, no such program has been attempted in the state of Delaware. This thesis will focus on examining the feasibility of bringing Community Paramedicine to New Castle County.

## Methods

### Specific Aim 1: Describe the overall population of New Castle County

Before trying to describe the population of patients presenting

Assessment	-Checking vital signs -Blood pressure screening and monitoring -Prescription drug compliance monitoring -Assessing patient safety risks (e.g., risk for falling)
Treatment/ Intervention	-Breathing treatments -Providing wound care, changing dressings -Patient education -Intravenous monitoring
Referrals	-Mental health and substance use disorder referrals -Social service referrals
Prevention and Public Health	-Immunizations -Well Baby Checks -Asthma management -Fluoride varnishing and oral health activities -Disease investigation

Table 1: Expanded EMS Functions.<sup>1</sup>

to the ED, it is important to understand the population of New Castle County as a whole. In order to describe New Castle County, online data from the United States Census Bureau was accessed. The data set on their website allowed researchers to specify the area of interest, and provided multiple pieces of data. This project will utilize facts such as the age distribution, gender distribution, race, ethnicity, and income level of citizens of New Castle County. These values were also compared to the national averages that the Census Bureau publishes. Knowing what the average citizen of New Castle County looks like helped to draw conclusions about the population that utilizes the ED.

**Specific Aim 2: Identify and describe patients who present to the ED most commonly**

In order to accomplish specific aim number 2, data from the Delaware Medicaid Claims Data Set was used. Mary Joan McDuffie from the University of Delaware’s Center for Community Research and Services was integral in obtaining this data. Ms. McDuffie is a senior research associate in the center’s health policy research group. The data is provided to the University on a weekly basis, then was aggregated into data for the fiscal years of 2013 and 2014. The data was restricted to only show claims in which the “place of service” was the ED. This filtered out all claims that were made outside of the ED, allowing the data to only reflect the claims we are concerned with. A similar restriction was placed on the county code, so only New Castle County emergency department claims were reflected in the data. Since the Delaware Medicaid Claims Data Set does not include any demographic information (just payment information), the claim numbers were merged with a client file that

included gender and race of the client. Due to HIPPA issues and the University’s policies, patients over the age of 89 had their age reported as 89. The idea behind this was to protect the identity of the elderly, because there are theoretically fewer of them and it would be easier to identify a patient of advanced age due to the scarcity of patients with higher values for the

age category. Additionally, date of claim was removed from the data set. A claim order number replaced this, and if multiple claims were made on the same day, they were assigned the same number. For example, if two claims were made on January 2nd and another was made on January 8th they would be reported as 1, 1, 2. Additionally, each of the patients was assigned a Master Client ID by the Medicaid program, and this is traceable to each patient. This ID was removed and replaced with a randomized study ID that is not traceable to any specific individual. Each individual claim was accompanied by the primary diagnosis code. An ICD-9 codebook was provided in order to decipher what disease each diagnosis code indicates. The billed amount, gender of the patient, and race of the patient were also attached to each claim. The data set was password protected so that only members of the research group would be able to access it.

After the data was received, it was imported into JMP, a statistical analysis program that the University of Delaware provides to all students. With the help of Dr. Papas, the data was analyzed to show which primary diagnosis codes were represented the most frequently. The data was sorted by the most frequently occurring ICD-9 codes for the entire set of data. The top 15 codes were then searched in the codebook to discover what the actual diagnosis is for each individual code. The data was then analyzed by gender using the same methods. This helped to isolate the target population for the pilot protocol. Age and race statistics were also analyzed to be even more specific in choosing the patient population.

**Specific Aim 3: Propose a pilot protocol for a Community Paramedicine Program in New Castle County**

In order to propose a pilot protocol, one specific disease from the top diseases discovered by specific aim 2 was selected. The ideal disease for a pilot protocol would be a chronic disease that caused patients to have “flare ups” when the patient did not comply with their prescribed treatments (i.e. checking blood glucose in a diabetic patient). These chronic diseases can be well managed if patients are educated about their condition and know how to manage their illness properly, so a community paramedicine program would be most effective for these patients. Once a disease is selected, other successful Community Paramedicine programs were examined in order to design a proposal for a Community Paramedicine program in New Castle County.

	New Castle County	United States Average
Population Estimate (7/1/2015)	556,779	321,418,820
Persons Under Age 18	22.2%	23.1%
Persons 65 Years and Over	13.8%	14.5%
Race is “White”	67.1%	77.4%
Race is “Black”	24.9%	13.2%
Race is “Asian”	5.2%	5.4%
Veterans	6.1%	6.4%
Foreign Born Persons	10.0%	13.1%
Median Gross Rent	\$1,030	\$920
Persons Per Household	2.62	2.63
Speak Language Other Than English at Home	15%	20.9%
High School Graduate (over age 25)	89.8%	86.3%
Have a Disability (under age 65)	7.9%	8.5%
Does Not Have Health Insurance	10%	12%
Per Capita Income	\$32,616	\$28,555
Persons in Poverty	12.3%	14.8%
Population Per Square Mile	1263.2	87.4

**Table 2: Demographic characteristics of New Castle County, Delaware and the United States as a whole.**

## Results

### Specific Aim 1: Describe the overall population of New Castle County

The information reported in Table 2 was obtained from the US Census Bureau.<sup>12</sup> Statistics for New Castle County, Delaware are compared to the United States as a whole.

### Specific Aim 2: Identify and describe patients who present to the ED most frequently

Data from this section (Table 3) reflects the Medicaid data obtained from the University of Delaware’s Center for Community Research and Services. Data was reported examining the most common diagnoses for patients utilizing the ED who reside in New Castle County, Delaware. (Data re-examined overall, as in Table 3 and by gender.) The top diagnoses for males are listed in Table 4 and for females in Table 5.

## Data Analysis

### Specific Aim 1: Analysis of New Castle County

From the data obtained from the United States Census Bureau’s website, we can draw many conclusions about New Castle County. Obviously, Delaware is a small state relative to the rest, but New Castle County is actually quite representative of the population of the entire country. Statistical measures such as age distribution (percent of people under 18 or over 65 years of age) are very similar to the United States average. Other benchmarks such as the high school graduation rate and monthly average rent are also very similar to national averages. The mean per-capita income is slightly above the national average.

Some of the data points, however are quite different from the averages. People who identify their race as Black represent 24.9% of the population, and the national average is 13.2%. Fewer people in New Castle County do not have health insurance, and fewer people live in poverty. The most striking difference is the population per square mile. New Castle County has 1263.2 residents per square mile, while the national average is 87.4.

### Specific Aim 2: Characterizing the patients who make Medicaid claims

The data from the University of Delaware’s Center for Community Research and Services was imported into the JMP software, which was used to analyze it. The ICD- 9 codes were ordered by the frequency they appeared. This was repeated for both males and females. Not surprisingly, the top complaint for males, females and the entire population was “chest pain NOS.” This complaint will not be focused on as far as a community paramedicine pilot pro-

gram goes because of the presumed acuity of the patients with this complaint. This is a group of patients that should most likely be treated in the emergency room. Abdominal pain is the next most popular complaint in both males and females, but again, this is not a complaint that a Community Paramedic would likely be able to remedy, so we will not focus on it. Males and females typically presented with similar complaints throughout the rest of the list.

Obviously, females presented with “pregnancy complications” more often than males. Another interesting code that was present for males but not females was “alcohol abuse.”

The diagnosis codes are somewhat vague, which makes determining exactly what the patient’s disease diagnosis is. For example, the “abdominal pains NOS” diagnosis code could be caused by a plethora of different conditions. Due to the ambiguity of the codes, it is slightly more difficult to determine for sure which disease is causing the complaint. Only one diagnosis on the list of the top 15 is specific to any individual disease: this is asthma. Fortunately, asthma is a perfect condition to treat outside of the emergency department. It is a chronic condition that flares up if not properly managed. When patients become acutely ill from asthma, it becomes a life-threatening situation. There are many long-term treatments for asthma such as Atrovent or Singulair. When used properly

ICD-9 Code	Diagnosis	Count (#)	Percent (Data Set)	Percent (Total)
78650	Chest Pain, Not Otherwise Specified (NOS)	12800	17%	5%
78909	Abdominal Pain, Other Specified State	10229	14%	4%
7840	Headache	5821	8%	2%
4659	Acute URI NOS	5477	7%	2%
78060	Fever NOS	5010	7%	2%
78605	Shortness of Breath	4840	6%	2%
64683	Pregnancy Complications	4747	6%	2%
78900	Abdominal Pain Unspecified	3845	5%	1%
9597	Lower Leg Injury NOS	3774	5%	1%
95901	Head Injury NOS	3688	5%	1%
78703	Vomiting Alone	3546	5%	1%
3829	Otitis Media NOS	3336	4%	1%
7295	Pain in Limb	3061	4%	1%
49392	Asthma NOS	2817	4%	1%
7242	Lumbago (Lower Back Pain)	2750	4%	1%

Table 3: Most common diagnoses in NCC Emergency Departments – whole population.

ICD-9 Code	Diagnosis	Count	Percent (Data Set)	Percent (Total)
78650	Chest Pain NOS	5100	17%	4%
78909	Abdominal Pain, Other Specified State	2888	10%	3%
4659	Acute URI NOS	2537	9%	2%
78060	Fever NOS	2453	8%	2%
95901	Head Injury NOS	1805	6%	2%
78605	Shortness of Breath	1798	6%	2%
9597	Lower Leg Injury NOS	1667	6%	1%
3829	Otitis Media NOS	1638	5%	1%
7840	Headache	1627	5%	1%
78703	Vomiting Alone	1531	5%	1%
30500	Alcohol Abuse	1403	5%	1%
49392	Asthma NOS	1367	5%	1%
78900	Abdominal Pain Unspecified	1362	5%	1%
7295	Pain in Limb	1339	4%	1%
78039	Convulsions	1287	4%	1%

Table 4: Top diagnoses in NCC Emergency Departments – males only.

ICD-9 Code	Diagnosis	Count	Percent (Data Set)	Percent (Total)
78650	Chest Pain NOS	7700	16%	5%
78909	Abdominal Pain, Other Specified State	7340	15%	4%
64683	Pregnancy Complications	4747	10%	3%
7840	Headache	4194	9%	3%
78605	Shortness of Breath	3042	6%	2%
4659	Acute URI NOS	2938	6%	2%
78060	Fever NOS	2557	5%	2%
78900	Abdominal Pain Unspecified	2483	4%	2%
9597	Lower Leg Injury NOS	2107	4%	1%
64403	Threatened Premature Labor	2023	4%	1%
78703	Vomiting Alone	2015	4%	1%
5990	Urinary Tract Infection NOS	1994	4%	1%
95901	Head Injury NOS	1883	4%	1%
7295	Pain in Limb	1722	4%	1%
3829	Otitis Media NOS	1698	4%	1%

Table 5: Top diagnoses in NCC Emergency Departments – females only.

Mean	30
Standard Deviation	21
Max	89 (supressed)
Min	0
25th Quartile	13
75th Quartile	46

Table 6: Age statistics.

Race	Number of Claims	Percent
Asian	3025	1%
Black	137856	48.4%
Caucasian	98270	35.2%
Hispanic	39515	14.2%

Table 7: Number of claims by race.

Average Claims Per Patient	4.95
Standard Deviation	10.85
25th Quartile	1
75th Quartile	5
90% number of claims	10
97.5% number of claims	27
Maximum number of claims	244

Table 8: Number of claims per patient.

the treatments are quite effective in preventing flare-ups, but without compliance to treatment plans, life-threatening events can occur. We can conclude that asthma patients would be a good group of patients to focus on for the Community Paramedicine pilot protocol.

The statistics for age and race of patients who generate Medicaid claims were also analyzed using the JMP software. The age of patients was not surprising, as the distribution of age of patients who generated claims was very representative of the overall population of the county (Table 6). Analysis of the race variable, however, revealed some interesting facts about the population that generates Medicaid claims. Patients identifying as “Black” generated 48.4% of claims, followed by “Caucasians” (35.2%), “Hispanics” were next with 14.2%, and “Asians” accounted for the final 1% of claims (Table 7). These percentages are of interest because they do not correlate well with the percentage of each race that resides within New Castle County. “Blacks” generated almost half of the Medicaid claims but only make up about one quarter of the population. This may indicate that people who identified as “Black” generate on average more Medicaid claims, so this group may be a good population to focus on for the pilot program.

Another aspect that was analyzed was the “Claim Number.” This reflects the number of claims that the patient made throughout the time period of the data set, so the higher value for Claim Number indicates that an individual generated more Medicaid claims (Table 8). After analyzing the spread of claims, it seems that the vast majority of patients (90%) generated a reasonable number of claims (less than 10 over a 2 year period.) It is important to note that the 97.5% group jumps to 27 claims per year. This demonstrates that abnormally large portions of the claims are being made by a small (2.5%) group of patients. This group of patients will be an excellent group to target for enrollment in a community paramedicine program because they generate so great of a portion of the total cost.

**Specific Aim 3: Propose a pilot protocol for a Community Paramedicine Program in New Castle County, Delaware**

In order to bring a full fledged Community Paramedicine program to New Castle County, it will be necessary to put a pilot program in place in order to demonstrate its safety and efficacy. It was decided that one specific disease should be targeted for the pilot protocol, and that a small group of about 25 patients will be enrolled initially. This group of patients will

be patients with asthma that have generated multiple Medicaid claims during the time period studied. These patients could not be identified based on the data collected by the University of Delaware’s Center for Community Research and Services because the patient’s Master Client IDs had been removed and replaced with a study ID. Due to this, an additional study will be needed to recruit patients for the pilot program. Once patients who would benefit from this program have been identified, it will be necessary to conduct a chart review of their visits to the ED. This will help to ensure that when they visited, no advanced care was administered. If advanced care was given, we may want to avoid this patient population because keeping them out of the ED may be dangerous. Specific markers for “advanced care” such as admission to the hospital, intubation, and CPAP therapy would contraindicate treatment outside the hospital. If it is found that the patient was assessed and treated quickly and discharged without complication, it could be concluded that there is little risk in preventing their ED visit. A community paramedicine pilot protocol should be attempted in New Castle County, Delaware after the above research has been conducted.

The pilot protocol should be a small-scale operation consisting of about 30 patients. The enrollees should all have the same chronic disease, such as asthma, in order to simplify the program while it is still new. The healthcare providers should be at the advanced life support (ALS) level, because ALS level providers can administer far more drugs and perform more advanced patient assessment than a basic life support (BLS) provider could. The units would travel to the patient’s homes in a non-transport capable vehicle, as this is cheaper and requires less maintenance than an ambulance. Should a patient require more advanced care, such as the emergency room, a county ambulance could be summoned to transport the patient. Patients would be enrolled in the program for 30 days, with three visits per week from the community paramedics. In order to determine the effectiveness of the program, the patient’s number of trips to the ED in the three months prior to the program will be compared to the number of ED visits after graduation from the program. This will allow calculation of ED bed hours saved and dollars saved will be possible.

**Conclusions**

After analysis of the data, it can be concluded that New Castle County, Delaware has a population of patients who over utilize

the Emergency Department. This drives up cost and lowers patient satisfaction. The most common disease diagnosis that is acceptable to treat out of the hospital is asthma, so this would be an excellent disease to focus on for a Community Paramedicine pilot program. An analysis of the number of claims per patient reveals that the top 2.5% of Medicaid patients generate more than 27 claims every two years (the average is 5). These patients would also be good candidates to recruit for the pilot protocol.

Further research should include a chart review of the patients who are selected for the pilot program. This will ensure that no advanced care is being rendered in the ED. Should the chart review reveal that advanced care is being rendered, then the patient should be excluded from the pilot program because of the severity of their illness. After the chart review, the pilot protocol should be published and current paramedics should be retrained as Community Paramedics. Many programs throughout the nation share their training manuals free of charge, so setting up a training program in New Castle County would not be difficult. Once the new Community Paramedics are trained, they can begin seeing patients. After the patients graduate from the program, an analysis can be conducted to determine how effective the program was. Should the results be positive, the program could be expanded to include more diseases.

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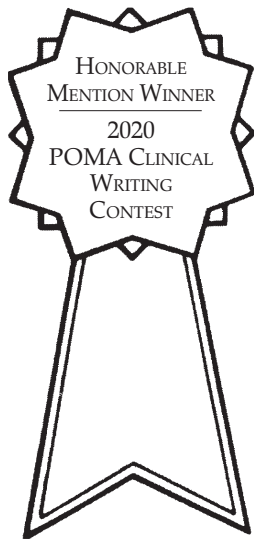
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# Medical Update

## Determining Reason for Flu Shot Refusal

by Jacob W. Matsil, DO



### Introduction

Influenza virus is a devastating virus that led to 500,000 to 600,000 hospitalizations and significant health care burden in the 2017-2018 flu season. According to the CDC, the influenza vaccine was between 40-60% effective, and prevented over 8,000 deaths and 100,000 hospitalizations in the 2017-2018 flu season.<sup>1</sup> The burden on health care has increased over the 2018-2019 season with 17-20 million medical visits related to influenza, 530,000-647,000 hospitalizations and between 36,400 and 61,200 deaths from the influenza virus.<sup>2</sup> Despite this, the rate of patients who refuse immunization is rising. In the 2017-2018 flu season only 37.1% of patients received the flu shot, an all-time low, with higher percentages of patients greater than 65 years old receiving the shot and lower percentages of patients aged 18-49 receiving it.<sup>3</sup> According to electronic quality measure data at Eastside Medical Center in Erie, Pennsylvania, only about 20% of the patients in the practice received immunization against influenza during the 2018-2019 season which is below the annual national average of 37%.

### Methods

An anonymous survey was provided to patients at Eastside Medical Center who refused the flu shot and had not received a shot at any other location within the 2018-2019 flu season as seen in Figure 1. Once completed, the survey was collected by the author and put in an anonymous survey box within the clinic and collected when the vaccination was no longer supplied on March 20, 2019. Upon collection, the surveys were sorted and analyzed by the answer choices given.

### Results

Of the 72 responses, five surveys were discarded because the respondent selected more than two boxes. As seen in Figure 2, the most common reasons for vaccine refusal at Eastside Medical Center were perceived risk of adverse reactions, including perceived illness from the

shot, personal beliefs and no given reason. The reasons for refusal were further categorized into misperceptions about shot ineffectiveness or potential health risks, Figure 3, 25% of the reasons given for refusal were related to misconceptions about the vaccination causing harm, or related to efficacy of the shot.

Eastside Medical Center 2019

**Why did you refuse the flu vaccine today?**

- I don't think it works
- I still got the flu after vaccination
- I became ill from the shot in the past
- I don't believe I will get the flu
- I believe it contains toxic materials which can cause physical harm
- Cultural/religious belief precludes me from receiving it
- Personal belief
- Other reason: \_\_\_\_\_

Thank you for participating! Your response is anonymous. Please fold and leave this form in the box labeled "Flu Survey" in the hallway upon leaving the clinic.

Figure 1. Survey provided to patients at Eastside Medical Center with 8 answer choices for refusal of immunization.

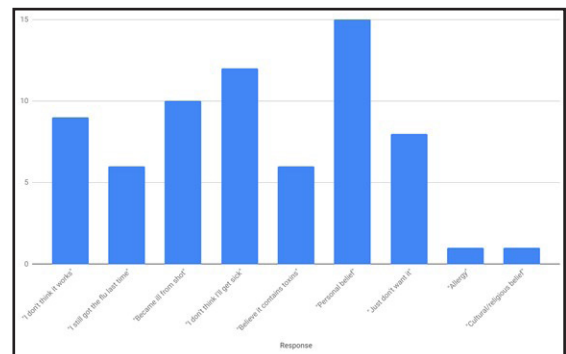


Figure 2. Frequency of individual responses on survey.

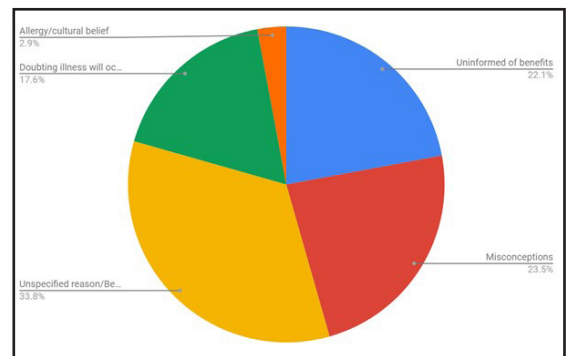


Figure 3. Reasons for flu immunization refusal given. "Uninformed of benefits" category calculated as the sum of "I don't think it works" and "I still got the flu last time". Misconceptions category calculated as sum of "It contains toxins" and "Became ill from shot". Unspecified reason calculated as "Just don't want it" and "Personal belief". Allergy/cultural belief is sum of the "allergy" and "cultural belief" answer choices.

## Conclusion

Related to the trend of flu shot refusal is the anti-vax movement, in which groups of parents refuse childhood immunizations for their children based on fallacious reasoning. Some misconceptions popular among the trend include notions that vaccines cause diseases, such as intellectual disability or dystonia, the disbelief that their child will contract the illness, or that their child's immune system would benefit from contracting the preventable illness. The same misconceptions may lead to refusal of the flu shot: lack of information about the vaccination or the burden and severity of the influenza virus, personal or religious belief, or concerns about safety. In the case of our clinic, fear of becoming ill from the flu shot accounts for about a quarter of the documented reasons patients refused it. This culture of fear among anti-vaxxers leads to decreased immunization and increases in hospitalizations and preventable disease burden on the health care system. While the flu vaccine is historically only 40-60% effective, because only 37% of the nation receives the shot, there is a large amount of preventable disease burden in the country. Improving shot compliance is a topic that must be addressed.

Lack of awareness is the biggest barrier. A study by Dr. Edwards showed that parents who refused vaccination did not typically know the contents of the vaccination or what diseases the vaccination prevented. It also showed that parents' opinions of childhood vaccination was strongly influenced by a favorable opinion of a physician, while unfavorable parent's opinion seemed to be related to hearing stories of harm from another parent, or via social media. A recent study by the American Academy of Pediatrics shows that parents who relate their beliefs about vaccinations on social media are more likely to have their beliefs reinforced, whether positive or negative.<sup>4</sup>

Eastside Medical Center serves primarily Medicaid patients. Because of the lower economic status populus, many of the patients

may simply be undereducated about the benefits and lack of risks of getting the flu vaccine, as almost a third of patients indicated a personal belief that the shot was not efficacious. Techniques such as a patient education program, personalization (suggesting you yourself received one) or positive reinforcement (my patient's do not tend to get ill or complain of adverse effects) are all strategies that may be considered to increase the compliance rate. The author will follow this study in the 2019-2020 flu season with an educational program consisting of a pamphlet containing statistics and reinforcing the low risks along with a short educational talk with the aim of improving flu shot compliance at our clinic. Education is our only tool to fight the fear and disbelief of vaccination effectiveness that has become widespread, and to decrease the annual burden of disease on the health care system.

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# Guest Column

## ***Big Data and the Use of Machine Learning in Medicine***

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*by Pamela S.N.  
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### **The Problem**

According to Center for Medicare and Medicare Services (CMS), the National Health Expenditure in 2019 grew 4.6% to a total of \$3.8 trillion, which equates to \$11,582 per person, and accounts for nearly 18% of the U.S. Gross Domestic Product (GDP). It is projected that health care spending will increase at a rate of 5.4% annually over the next decade. This projection will have the U.S. spending over \$6.2 trillion on healthcare by 2028.<sup>1</sup>

In an effort to reign in healthcare expenditures, especially for the most costly care such as cancer treatments, renal replacement therapies (hemodialysis) and chronic co-morbid conditions, the Affordable Care Act (ACA) of 2010 (aka “ObamaCare”) put into place a federal incentive program to change from a manual medical record to an electronic health record. One of the drivers behind this move is the ability to collect massive amounts of healthcare data for the purpose of analyzing the health of the country and determining in which areas of medicine the money spent. Data used to create the ACA showed that most Americans were receiving little or no preventative healthcare. As a result, many people presented to the doctor for the first time with expensive-to-treat, end-stage disease that could have been prevented or the progression slowed if diagnosed at an earlier stage. The ACA puts an emphasis on proven preventative care strategies such as smoking cessation, weight loss, and mammography, to name a few examples. It measures the result of spending a little up front to prevent costly treatments towards the end of life. All of these data points are entered into your electronic health record (EHR) system and available for inclusion in Big Data.

### **A Solution**

With the extremely large volumes of data found in the healthcare and wellness industries, Big Data collection is the best way to take these data and input them into computers for analysis. Big Data is the term used to define

“data that contains greater variety, arriving in increasing volumes, and with ever-higher velocity.”<sup>2</sup> Once the data is collected, the real value of these data points lies in the analysis of the information. Big Data analysis extracts patterns and develops predictive behavior models that can be helpful in providing potential solutions or alternatives to expensive healthcare.

Big Data is collected through your office or health system EHR as well as from medical devices in your patient’s home, including an electronic home glucose monitor that records downloadable data. We voluntarily collect wellness data through the use of wearable technology such as a smart watch, smart phone, fitness tracker, electrocardiogram monitor, or other health-measuring devices. Many of us jumped at the opportunity to measure our steps per day, our daily weights, our sleep cycles, and our food intake. In 2020, over 60 million people or 24% of the population in the U.S., used a wearable technology device.<sup>3</sup>

Big Data is put into computers that gather the information and process it. A type of artificial intelligence (AI), known as Machine Learning (ML), processes and analyzes the huge amount of data that is beyond the scope of human capability. Machine Learning through predictive algorithms provide clinical decision recommendations, disease risk stratification, and access to current clinical trial data. It has the potential to enhance the doctor-patient experience by looking at every data point in your patient’s chart to help you to develop a clinical care plan. As an example, instead of reviewing the last three blood pressure readings in the EHR, ML has the ability to take the last 30 in-office measurements, analyze them in context of laboratory results, take into account demographics and family history, and compare these data to the results and recommendations from recent clinical trials. The advanced analytics can provide risk stratification for stroke or renal failure, recommend an optimal medication regime, and provide a best-practices clinical treatment plan including



cost for each option. The use of ML along with Big Data can be a powerful tool in the quest to reduce cost to the healthcare system and improve health outcomes for patients.

## The Challenges

The data analysis is only as good as the data input. Electronic health records are filled with free text opportunities. They are purported to be filled with cut/paste and carry-over errant data. Medication lists are only as accurate as the patient's confirmation. EHR programs do not communicate with each other, making it difficult to obtain updated information from providers outside your health system or office. These human inputs cause errors in the analysis of the data and deep learning of the machine, leading to errant conclusions and potential patient harm. It is key to know your input data is good, known as data veracity, and to understand the limitations of the output the analytics provide.

Development and use of ML in healthcare will increase as technology and access to more data increases. However, there are ethical and legal considerations to the data. Who owns the data collected by your smart watch? What will be done with the data? Will the data be sold to third parties for the purpose of marketing products? Will the data be sold to life or health insurance companies and limit/prohibit your ability to get affordable insurance? While there may be a privacy policy in place today for the device you are using, it is subject to change. In the recent Google acquisition of Fitbit, Inc, a wearable device company with more than 29 million active users worldwide, one of the sticking points was maintaining the privacy of the user data with reassurances given (for unknown period of time) that the acquisition was not about the data, rather about the technology.<sup>4</sup>

## Machine Learning Success

Machine Learning works best with huge amounts of input data. It is being used in the fields of Radiology and Pathology to identify abnormal images. This may lead to earlier detection of disease. In 2017, Google computers were able to achieve an 89% accuracy of finding cancer pathology on slides viewed at 40x magnification compared to physician accuracy that was 73%.<sup>5</sup> Relying on billions of images to deep learn what pathology looks like, Google was successful in programming the computer to essentially program itself to autonomously learn to identify cancer on pathological slides. Similarly, Stanford University was able to suc-

cessfully create an algorithm to correctly identify skin cancers just as well as dermatologists.<sup>6</sup>

Because of the advances in ML and AI, the image-filled specialty of Radiology will likely change in the future. Radiology already uses computer-aided detection, though some radiologists choose not to rely on the computer reading. In the instance of mammography, ML does not specifically compare the individual's own prior images to their current image. This is a common practice by radiologists. Also, the computer cannot physically see the patient if there is an abnormal finding and determine if the finding is an error of the image or something to be concerned about. While no one is suggesting that machine autonomy of image analysis without human participation is on the horizon, the field will likely change to embrace the AI technology as an adjuvant to the radiologist reading with opportunity to improve productivity, image quality, and patient safety.<sup>7</sup>

Machine Learning is successfully used in several areas of medicine and healthcare. The Human Genome Project identified many specific gene-sequencing patterns as they relate to diseases. These patterns are accessible to AI and genomic tumor sequencing is possible as the technology is advanced by a partnership of IBC Watson Genomics and Quest Diagnostics. Through the use of predictive analytics, people with mental health concerns, such as depression, are identified earlier. The field of Oncology is seeing success with clinical trial matching with cancer patients. Even in the pharmaceutical industry, ML is in use for drug discovery to predict potential success of drug compounds.<sup>8</sup>

## Conclusion

Predictive analytics using Big Data and technological advances in ML can positively impact healthcare in the U.S. by driving down cost and improving outcomes. As ML becomes more advanced, it will be available as a tool to help with diagnosis and treatment of many diseases. It can quickly provide cost estimates for treatment plans that may factor into the treatment shared decision-making process with patients and physicians. There are several ethical considerations and uncertainty of privacy of the data provided through EHR and wearable technology. As we advance in use of AI in all aspects of our lives, we can expect health and wellness to improve as well.

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## **Pre-workout Supplementation in Resistance Trained Rats** *(continued from page 14)*

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## **LECOM DEAN** *(continued from page 6)*

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By July of 2020, clinical and in-class instruction resumed and students were back on rotations. Hybrid educational models remain in place, allowing students to successfully undertake in-class and remote learning. Throughout the entire ordeal and at all times, the Governor's rules and CDC guidelines were followed by the College and extensive testing has been ongoing.

Administration and faculty worked diligently to ensure that students would remain on track to graduate, leveraging the online curricular components in clinical education to best serve the students academically.

Many of these technologies have become part of the new frontier of medical education. LECOM had sharpened the axe.

## **PCOM DEAN** *(continued from page 7)*

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agant conferences after March 2020. Travel, time off from work, travel reimbursements, skimming off a day for personal exploration in an exotic setting--all gone. These were replaced quickly with online practical options to participate in conferences. Perhaps, you have been able to attend virtual conferences you simply couldn't attend in years past. Starting as simple Zoom meetings, these virtual CME conferences quickly evolved. New industries were born: virtual conference providers and online conference platforms.

**Much gained.** Out of necessity, we quickly adopted many technologies in our everyday lives--technologies previously available but underutilized in the medical profession. We learned to benefit from these conveniences. We also learned technology is everyone's responsibility. Patients, clinicians, students, faculty, administrators are all required to take responsibility for using and learning technology.

**Much lost.** Many of these technologies were adopted to help us stay connected with each other during a crisis, but they are certainly not a substitute for human interaction. Consider

in-person visits with patients, clinical skills labs for students, mingling with colleagues at a conference. None of these can or should be replaced entirely with technology, yet technologies now allow us to evade these important human interactions. In this year of technology, we have also seen new challenges emerge such as widening disparities and inequality, isolationism, technology fatigue, password overload, and poor mental health outcomes.

**Next steps.** As we emerge from this pandemic and social distancing, we need to keep the good, abandon the bad, and find a "new normal." A sense of urgency and necessity drove us to adopt technologies for health care, health sciences education and continuing education. We cannot, nor should we, return to the "good old days," but we also shouldn't allow unchecked technology to drive our social and human interactions. We have been given an extraordinary opportunity to leverage technology while maintaining the human connection and balance. As we begin to see our way out of this challenging period, the fun work begins.

# JPOMA Readership Survey

It has been quite some time since we did a *Journal of the POMA* readership survey and we want to make sure we consider your opinions and suggestions as the publication evolves to better serve you. Your participation will help us gain a clear understanding of what you expect to see and how you want to see it, which will help us produce a publication that is a true reflection of interests and concerns of POMA members.

Please take a few moments of your time to complete this survey. Responses may be faxed to (717) 939-7255 or emailed to [poma@poma.org](mailto:poma@poma.org). **The survey can also be completed online at <http://bit.ly/IPOMASurvey>**

Thank you for your time and input!

Tell us a little bit about yourself.

Age \_\_\_\_\_ Specialty(s) \_\_\_\_\_ Practice Type \_\_\_\_\_

How do you generally get information about POMA?

	All information	Most information	Some information	No information	No opinion
JPOMA print publication					
POMA e-newsletters (POMA Newsletter, Under the DOME, COVID Update)					
Emails from us					
Our website					
Our social media sites					
Word of mouth/colleagues					
Other, please specify:					

How do you prefer to receive information from POMA?

\_\_\_ Print \_\_\_ Email \_\_\_ Text \_\_\_ Social media \_\_\_ Website  
\_\_\_ Other, please specify: \_\_\_\_\_

How many issues of the JPOMA do you typically read per year?

\_\_\_ All 4 issues \_\_\_ 3 issues \_\_\_ 2 issues \_\_\_ 1 issue \_\_\_ 0 issues

How much of each issue do you read?

\_\_\_ All of it \_\_\_ Most of it \_\_\_ Some of it \_\_\_ None of it

Where do you prefer to receive your printed copy of the JPOMA?

\_\_\_ Work \_\_\_ Home \_\_\_ Email

How do you prefer to read the JPOMA?

\_\_\_ Print \_\_\_ Digital \_\_\_ Both

Would you read the JPOMA if it was only delivered electronically?

\_\_\_ Yes \_\_\_ No \_\_\_ Maybe

If there is a link to additional content for the *JPOMA* available online only, how likely are you to use the link to access this content on the website?

Very likely     Somewhat likely     Somewhat unlikely     Very unlikely

Would you pay for a printed copy of the *JPOMA* to be mailed to you?

Yes     No     Maybe

Do you think the *JPOMA* is too short or too long?

Too short     Too long     Just right

How many times a year do you think the *JPOMA* should be published?

1     2     3     4     Other

Which sections of the *JPOMA* interest you most?

	Very interested	Interested	Somewhat interested	Not interested	No opinion
POMA news & events					
Columns written by the editor, deans, students, pre-med students, etc.					
Medical/research articles					
Op-Ed submissions					
CME quiz					

Please rate your interest in knowing about the following topics:

	Very interested	Interested	Somewhat interested	Not interested	No opinion
POMA news					
POMA leadership messages					
POMA strategic plan & updates					
Recent medical research					
Legislative/advocacy updates					
News from Pennsylvania's osteopathic medical colleges					
In memoriam					
Letters to the editor					

Additional topics of interest:

Please rate the quality of the *JPOMA*:

	Excellent	Good	Average	Poor	No Opinion
Content					
Cover					
Ease of reading					
Sections of interest					
Layout and design					
Writing					

When you hear the name *The Journal of the POMA*, do you think of the Pennsylvania Osteopathic Medical Association?

Yes  No

Please indicate your agreement with this statement: The *JPOMA* strengthens my personal connection to POMA.

Strongly Agree  Agree  Disagree  Strongly Disagree  No Opinion

What actions have you taken as a result of reading the *JPOMA*? (check all that apply.)

Attended a POMA event

Volunteered for POMA

Renewed my POMA membership

Recommended POMA to a colleague

Followed POMA on social media

Visited POMA's website

Completed the CME quiz

Contacted the *JPOMA* editor

Discussed or linked to an article or issue

Submitted a piece for printing in POMA publications and/or recommended a colleague do the same

Submitted a piece for printing in another publication

Connected with a classmate, friend or colleague

None of the above

Other, please specify

Have you ever submitted a piece to POMA for publication?

Yes  No

What do you like most about the *JPOMA*?

What do you like least about the *JPOMA*?

Are there any changes or improvements to the *JPOMA* you would like to suggest?

Do you have any additional comments you would like to share with POMA?

Thank you for participating in POMA's Journal publication readership survey!  
Your input will help us provide the kind of publication you want to read.



### What is POMPAC?

POMPAC is POMA's political action committee and the political voice of the osteopathic profession in Pennsylvania.

### What does POMPAC do?

POMPAC takes in monetary donations from DOs across the state and contributes those funds to targeted state candidates for public office.

### Why do we need POMPAC?

POMA has many friends in the state elected office holders that support DOs and the excellent patient care they provide. POMPAC provides monetary donations to assist targeted candidates with their election efforts.

### How can I contribute to POMPAC?

Contributing to POMPAC is simple. There is an online option and a paper option to make regular contributions or a one-time contribution. Please note, contributions are not tax deductible.

### Have questions?

Please contact [asandusky@poma.org](mailto:asandusky@poma.org) or call (717) 939-9318 x111.

# CME Quiz

Name \_\_\_\_\_

AOA # \_\_\_\_\_

1. What effect did MH pre-workout supplementation have on amount of cumulative weight lifted?

- a. MH Pre-Workout group lifted less cumulative weight than control group.
- b. MH Pre-Workout group lifted the same cumulative weight than control group.
- c. MH Pre-Workout group lifted more cumulative weight than control group.

2. What effect did MH Pre-Workout Supplementation have on urinary creatinine levels?

- a. MH Pre-Workout group had lower urinary creatinine levels than control group.
- b. MH Pre-Workout group had the same urinary creatinine levels than control group.
- c. MH Pre-Workout group had higher urinary creatinine levels than control group.

3. Which patient would be most appropriate to enroll in a community paramedicine program?

- a. 12 year old male with conjunctivitis
- b. 72 year old male with congestive heart failure
- c. 88 year old female with osteoporosis
- d. 32 year old healthy female

4. Chest pain would be an ideal diagnosis to target for a pilot protocol of a community paramedicine program.

- a. True
- b. False

5. Patients are often well informed when it comes to vaccination, and the reason for vaccination.

- a. True
- b. False

6. The use of social media has not been linked to increased rates of immunization non-compliance.

- a. True
- b. False

**To apply for CME credit, answer the questions in this issue and return the completed page to the POMA Central Office, 1330 Eisenhower Boulevard, Harrisburg, PA 17111; fax (717) 939-7255; e-mail [cme@poma.org](mailto:cme@poma.org). Upon receipt and a passing score of the quiz, we will process 0.5 Category 2-B AOA CME credits and record them in the POMA CME portal and forward them to the AOA.**

**\* New In 2021 \***  
**Complete the CME quiz for this issue of the JPOMA online — <http://bit.ly/jpoma2021-1>**

### Answers to Last Issue's CME Quiz

- 1. True
- 2. a
- 3. a
- 4. d
- 5. True

*(Questions appeared in the December 2020 Journal.)*

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