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### Honors Capstone Proposal

I will be conducting basic and clinical research on “The Phoenix Sign” under Dr. Stephen Barrett, DPM, FACFAS. This neurological phenomenon, which was discovered in 2017, has shown significantly consistent results for confirming lower extremity peripheral nerve focal entrapments of the Common Fibular (Peroneal) Nerve (CFN) in patients who do not show the typical, identifying clinical signs (e.g. no Tinel’s Sign or Provocation Sign and little or no EHL motor function) (Barrett et al., 2019). Nerve entrapments at this level are often difficult to definitively diagnose, so many clinicians perceive patients’ nerve palsy as severe damage that cannot be fixed with decompression surgery. However, this test allows clinicians to differentiate a focal nerve compression peripherally versus a central CNS manifestation, and it is also being used as a predictive outcome of surgical nerve decompression of the CFN.

To determine whether or not a patient with a suspected CFN focal nerve entrapment has a positive Phoenix Sign, an ultrasound guided infiltration of a subanesthetic dose of 1% lidocaine, usually less than 5cc’s, is administered at the level of the fibular neck, adjacent to the CFN. The patient’s EHL (Extensor Hallucis Longus) and TA (Tibialis Anterior) muscle motor strength is tested before and approximately 4 minutes after infiltration on a 1-5/5 scale and with a dynamometer. If there is an improvement in motor strength, it is considered a positive Phoenix Sign, and if there is no improvement in motor strength, it is considered a negative Phoenix Sign. It has been observed that patients with a positive Phoenix sign tend to also show an increase in sensation and vascularity distal to the nerve block, but the effects usually last only 10 minutes

(Barrett et al., 2020). These observations have been demonstrated clinically along with EMG (electromyography) monitoring which measures electrical activity in response to a nerve's stimulation of the muscle (Kieffer, 2015). Therefore, it is hypothesized that the vasodilatory nature of the local anesthetic is responsible for the temporary improved nerve function. In order to test this hypothesis, eligible subjects will undergo the Phoenix Sign test with an infiltration of either lidocaine or papaverine, two known vasodilators.

I will be working on this project with Dr. Barrett and his eligible patients at the US Neuropathy Center in Atlanta along with a small group of co-investigators. It is an IRB approved, double blinded study so that the clinician and the patient do not know what infiltrate is being used on a group of approximately 10 subjects. I will be helping to collect and organize the data which will be used to further support or refute the hypothesis. The results will also help to formulate more predictions on the physiological effects of the Phoenix Sign so that future studies may be conducted to fully understand the nature of this new test. I plan to present the results from this study at the Spring 2021 Symposium of Student Scholars as part of my final product. This will give me the opportunity to practice putting together and explaining in detail a formal research presentation on a topic that interests me. It will allow me to demonstrate my ability to translate the material I am learning alongside Dr. Barrett and his team to others in a way that they can understand and follow along with which is a vital aspect of research.

Entrapment of the CFN is the most common nerve entrapment in the lower extremity, and it may also be the most underrecognized and misdiagnosed nerve entrapment in patients (Barrett et al., 2020). Therefore, it affects many lives, including fall patients, knee and hip drop feet patients, and diabetic feet patients which can lead to chronic pain. The results from previous studies have shown that there is a high correlation of a positive outcome after neurolysis for

patients who demonstrated a positive Phoenix Sign. The prognosis has been greater than 90% that the patient will gain improvement in motor function of the dorsiflexors of the lower extremity after surgical decompression. Thus, this technique does not only have the potential to be used as a powerful additional level of diagnosis and assessment for confirming if a patient has a true focal entrapment of the CFN, but it also provides value in the surgical decision-making process. These interventions can enhance patients' quality of life as well as prevent more serious medical problems from developing, such as ulcerations and ultimately amputation in some diabetic cases (Jacobs et al., 2019). As a future clinician, I believe it should be strongly encouraged to utilize research studies such as this one to allow for better care of chronic pain sufferers. Basic research on nerve decompressions has allowed physicians like Dr. Barrett to begin conducting clinical research which has the potential to ultimately improve patients' overall health.

I am currently pursuing an undergraduate degree in Pre-Med Biology which I plan to use to become a Physician Assistant, a PA. This career is very versatile in regard to specialties since PAs are able to practice in all areas of medicine. I believe I will hone in on what specialty suits me best once I have obtained sufficient experience, but, as of now, I have been leaning towards internal medicine. This particular specialty involves the application of scientific knowledge and clinical expertise in order to provide comprehensive, long-term care for patients suffering from common and complex health issues (Physician assistants in internal medicine, 2016).

This project gives me the opportunity to work under an experienced physician and professor to learn more about the foundations and advantages of clinical research. Being able to properly evaluate the strengths and weaknesses of similar research in the future will provide me with the potential to increase my patients' quality of life or provide them with additional

resources for evaluating a medical decision that may change their lives. Research is constantly being published, reviewed, and critiqued, so I must be willing to keep myself in the loop of new discoveries and breakthroughs. This project will also give me the opportunity to strengthen my communication skills with different types of patients, which I believe is one of the most important skills for health care providers. Effective communication involves knowing what questions to ask patients before and after treatment, knowing how to best explain procedures and outcomes, knowing how to comfort patients, and everything else in between. This gives me the chance to develop a rapport with patients which leads to even better, individualized communication skills which will ultimately improve patient care and advocacy. Thus, this project will be extremely advantageous for obtaining my future goals and shaping me into an exceptional PA.

The time I spend working with the project's human subjects and Dr. Barrett in order to collect data on "The Phoenix Sign" will require me to display my strengths in effective communication and professionalism. It is important that I am able to easily discuss the project details and voice any concerns with Dr. Barrett and the other co-investigators since we will be working collaboratively on this project. Healthcare providers seldom work alone – they are often in a team environment that requires cooperation. Being able to listen to others, communicate to others, and solve problems together will ultimately reflect back to the patient. It is also important that I am able to maintain professional etiquette throughout my time in the clinic since I will be working with Dr. Barrett's eligible patients who chose to consent to this prospective study. Demonstrating my integrity, respect, honesty, and compliance throughout my duration inside and out of the clinic will not only reflect back to me, but everyone else involved. Therefore, behaving

appropriately will give me an opportunity to reflect the type of student I am and the type of PA I will be in the future.

My interest in this research project began before I knew it would become part of my Honors capstone. This research has been an ongoing area of study for KSU students approved to enroll in BIOL 4450, Intro to Clinical Medical Research, which is instructed by Dr. Barrett himself. As an experienced, practicing physician, Dr. Barrett introduced medical topics I had not thought much about until I took his class – topics such as the consequences of unconscious bias in research, the corollaries of research, and most importantly, how to critically analyze published research. There are so many factors that go into trying to perfect research, and the truth is, research will always be imperfect due to many uncontrollable factors. However, being aware of these flaws allows me to be better suited to judge the outcomes of future research studies that may be beneficial to all kinds of patients. This potential to impact many patient's lives in the future is what distinguishes my capstone from others. I will continue building my critical analysis skills so that I can not only use them for myself as a PA, but so that I can also assist my peers on how to take advantage of the amazing studies taking place around the world. Being informed and up to date on new procedures, technology, interventions, treatment plans, and pharmaceuticals ultimately improves healthcare services and patient outcomes.

Healthcare is complicated, yet we have had so many breakthroughs which have originated from quality research studies that have saved many lives. As we are currently living through a pandemic and testing COVID-19 vaccines, I find it even more necessary to stress the importance of being able to interpret the research being used to transform healthcare policies and patient care. For example, increased PPE requirements, decontamination policies, and social distancing have decreased the spread of the virus, but there has also been a large spread of

misinformation to the public. Therefore, I believe it is my responsibility as a future clinician to be able to distinguish what the best advice is to relay to my patients. My competence in evaluating research projects' experimental design, methodology, results, references, and overall quality will make me a better health care advocate.



