Each spring the College of Allied Health Professions sponsors a forum. This interprofessional event is intended as an opportunity for students and faculty in all CAHP programs to share scholarly activity that supports evidence-based clinical practice.

The primary goal of the scholarly activity that is presented in the forum is to promote the understanding of the research process in allied health. The ultimate goal is the continuous updating of best practices in clinical settings. The following research projects, critical reviews of the literature, and educational exhibits are organized by topic.

Posters with an asterisk (*) will be displayed in Kearney.

The book of abstracts is online at: www.unmc.edu/alliedhealth/research/forum
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The College of Allied Health Professions would like to thank the faculty and staff who have contributed time and effort to the success of this Forum.
CARDIOVASCULAR

ABSTRACT #1

Infrared Temperature measurement
Ralph Abalo, David Holt. Clinical Perfusion Education program, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Clinical Relevance: To evaluate the non-invasive temperature measurement that use infrared, (Nubee) in surgical application, four different lights were tested: xenon light, which was used as the surgeon’s head light, incandescent, halogen, and fluorescent lights. Four different temperatures were set and Nubee that uses infrared radiation is compared to mercury thermometer and thermistor of the heart lung machine and see if the infrared will be influenced by the light sources.

Methods: To achieve this objective four temperatures are settled: 0°C, 19°C, 30°C, and 37°C using Alpha Omega heater/cooler to establish and maintain the temperature of the water bath in which cow’ hearts were emerged, for one combination of temperature and one lighting condition, six temperatures would be collected with each device in random order for total of 12 observations to achieve a power greater than 0.8. This would be repeated for the other combinations of factors in the experimental design. So, with 4 temperatures and 3 lighting conditions.

Results: The temperature means for the two light sources in each comparison have very small difference, non-significant differences between all of them, indicating the estimation of temperature across all four light sources are not significantly different from each other. One difference that stands out is the comparison of Fluorescent and Xenon with the Nubee thermometer, as the adjusted p-value is 0.051, which is small enough to be of interest in this situation, considering how close temperature is measured with each device and light source. However, since the difference is less than 0.1 degree, it may not be a practical difference in the conditions under which the temperature is measured.

Conclusion: Non-invasive temperature measurement using infrared radiation (Nubee) was compared with traditional methods used in the cardiac surgery mercury thermometer and the thermistor of the heart lung machine with no major differences. The lights used in the operation don’t influence the infrared when measuring the temperature.

ABSTRACT #2

Flow Awareness Technology as a New Safety Device for Cardiopulmonary Bypass
Jacki Brolhorst, Brittnie Peterson, David Holt. Clinical Perfusion Education program, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Introduction: New safety devices such as bubble detectors and level detectors have reduced the risks associated with gaseous emboli during cardiopulmonary bypass; however the risk has not been eliminated. This research explored a new safety device designed to further reduce these risks. This technology visually alerts the perfusionist when the ratio of venous return does not equal the amount of arterial flow.

Methods: To determine the efficacy of this device, 33 participants with no perfusion background were randomly assigned to Group A (Flow Awareness only), Group B (level detector only), or Group C (control). These participants were instructed to turn off the arterial pump when they noticed that the fluid in the venous reservoir began to drop or if their assigned safety device was triggered. The venous line was fully occluded at times unknown to the participants. These times coincided with before, during, or after times that the participants were expected to paper-chart known values. Each participant’s amount of fluid lost (in ml) from the reservoir and reaction time (in seconds) to shut off the arterial roller pump were measured.

Results: Group A lost an average of 80.8 ml, Group B lost an average of 173.6 ml, and Group C lost an average of 140.3 ml. Average measured time for each group is as follows: Group A took 2.16 sec, Group B took 4.31 sec, and Group C took 4.09 sec to shut off the arterial pump. All three groups were evaluated together for analysis of before, during, and after charting. Participants lost an average of 97.1 ml before charting, 152.4 ml during charting, and 145.2 ml after charting. It took 2.85 seconds for participants to shut off the arterial pump before charting, 3.92 second during charting, and 3.79 seconds after charting.

Conclusion: Statistics support the hypothesis that Flow Awareness technology significantly reduces the reaction time to an adverse event such as a sudden occlusion of the venous line. Thus Flow Awareness reduces the amount of fluid lost during such an event. Statistics also show that participants were significantly faster and lost significantly less fluid when not actively engaged in paper charting.
ABSTRACT #3

Bio-Coated Platelet Rich Plasma Processing Kits vs. Non-Coated
Patrick Prasch, Kavya Chebrolu, Morgan Leder, David Holt. Clinical Perfusion Education program, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Background: Platelets are cytoplasmic fragments of megakaryocytes, formed in the marrow and contain more than 30 bioactive proteins. Many of which have a fundamental role in hemostasis or tissue healing. Platelet Rich Plasma (PRP) therapy is used to preserve these proteins to improve the healing and tissue regeneration process. The process of PRP exposes platelets to foreign surfaces which leads to premature activation, platelet damage, and compromised function. Although anticoagulants are administered in draw syringes to prevent coagulation and premature platelet activation, blood still comes into contact with artificial surfaces which can cause the coagulation and complement process to become activated. However, activation of this process can be prevented with the use of a surface that is of non-activated endothelial cells. The goal of this study is to determine if a bio-coating in PRP preparation tools will reduce contact activation of platelets and preserve platelet function.

Methods: Two venipuncture blood draws of 60ml each, total 120ml, will take place with a non-coated and coated needle and syringe. Each 60ml sample is then divided equally into two 30ml centrifugal tubes, one non-coated and one bio-coated. Centrifugation is used to separate blood components and produce PRP. 1ml of PRP from each sample will be added to medical Kaolin tubes. Two 340 microliter samples will be pipetted from each PRP sample to be tested with TEG to measure Maximum Amplitude (MA).10 volunteers will provide 20 significant mean data points (n=20) compared in a two-sided paired t-test.

Results: The MA value of the TEG results displayed a p value for all coated PRP preparation tools to have an alpha greater than 0.05. The results showed p values greater than 0.05, thus we cannot reject the null hypothesis and there is significant difference between the means and conclude that no significant difference exists.

Conclusion: It was concluded due to the data recovery and statistical analysis that bio-coating in PRP preparation tools was not significantly effective in the preservation of platelets.

ABSTRACT #4

Assessing DEHP and MEHP Leakage in Wet-Primed Extracorporeal Oxygenation Circuits
Justin Schiess, Jordanna Glock, David Holt. Clinical Perfusion Education program, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

As a primary and often emergently employed therapeutic modality, extracorporeal membrane oxygenation (ECMO) circuits are regularly wet-primed and kept on standby. Wetpriming storage protocols and maximum standby times for ECMO circuits vary across institutions. Leakage of the commonly used plasticizer di(2-ethylhexyl) phthalate (DEHP) from PVC-based circuit components into priming solutions and subsequent patient exposure to this phthalate remains a concern. This study was designed to assess the prevalence of and to quantify DEHP leakage in wet primed ECMO circuits. 59 samples of priming solutions across four hospitals in eastern Nebraska were collected from June-July 2017. DEHP, as well as mono(2-Ethylhexyl) phthalate (MEHP) concentrations, were measured in 52 of the collected samples via high-performance liquid chromatography (HPLC). 94% of samples collected and analyzed were found to contain either DEHP or MEHP. A positive Spearman correlation coefficient of 0.28712 was found between MEHP sample concentration and wet-prime circuit standby time (P=0.0455). No correlation was found between DEHP sample concentration and wet prime circuit standby time. No significant differences were found in D/MEHP sample concentrations across institutions. Our results suggest that phthalate leakage into wet primed circuits is prevalent and that increased storage time may exasperate phthalate leakage. However, our results demonstrate that phthalate leakage associated with wet-primed ECMO circuits is of minimal quantity and likely does not warrant a significant change in clinical practice.

ABSTRACT #5

Improving Hemolysis Levels Associated with Cardiomyotomy Suction
Halle Swann, Jared Arensdorf, David Holt. Clinical Perfusion Education program, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

The major source of hemolysis during cardiopulmonary bypass (CPB) remains the cardiomyotomy suction [1]. Previous research has shown that the combination of negative pressures and the massive air-
blood interface exponentially increases hemolysis in suctioned blood. This research aims to decrease hemolysis by eliminating the air to blood interface by implementing the Venturi effect to create powerful suction. We hypothesize that this Venturi suction will result in less hemolysis, indicated by lower plasma-free hemoglobin levels (PFH), compared to current vacuum suction. We hypothesize a Paradigm approach to cardiotomy suction that utilizes the Venturi effect with shorter tubing lengths and weighted sucker tips will further reduce hemolysis.

The vacuum suctioned blood showed PFH levels significantly increased from baseline levels (p = 0.0039). Neither the Venturi or Paradigm groups showed PFH levels significantly increased from baseline levels (p = 0.0625 and p = 0.125 respectively). There was a significant difference in PFH levels between the three conditions (p < 0.0001). The vacuum condition showed significantly higher levels of PFH compared to both the Venturi and Paradigm conditions (p’< 0.001). There was no significant difference in the PFH levels between the Venturi and Paradigm groups (p = 1.00).

We conclude that vacuum suction causes excessive hemolysis. A Venturi powered suction system does not cause hemolysis and can be employed to reduce the damaging effects of vacuum suction on blood.

**ABSTRACT #6**

**Effects of ECMO Simulations and Protocols on Patient Safety**

Fedelyne Thomas, Sunyoung Kim, David Holt. Clinical Perfusion Education program, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Clinical Relevance: The use of extracorporeal membrane oxygenation has greatly increased over the years; however, the survival rate is only slightly above 50%. This study focuses on the use of simulations and protocols to improve the safety of patients on ECMO to ultimately increase the survival rate.

Methods: Perfusion and non-perfusion students from the University of Nebraska Medical Center were recruited to participate in three simulation trials. The trials consisted of five different tasks that are commonly required when managing catastrophic events on ECMO. A pre and post simulation survey was also used to acquire demographic and subjective information from the subjects.

Results: The perfusion students had significantly shorter times when comparing the different trials for the circuit set-up simulation. There was a decrease in priming time from the 1st vs 3rd trial and for the pump change. The non-perfusion students had a significant decrease in time for the circuit set-up. There was a decrease in time for the pump change, tubing change, and errors for the tubing change in the non-perfusion students. When comparing the groups, the perfusion students had less errors when priming during the 1st trial and less errors when conducting the tubing change during the 2nd trial compared to the non-perfusion students. Both groups felt more confident after the simulations and the non-perfusion students specifically indicated that they were more familiar with the purpose of ECMO after the simulation.

Conclusion: Simulations and protocols improve patient safety by strengthening the skills needed for rapid management, less errors, and higher levels of confidence during the management of ECMO and catastrophic events. With the increase of ECMO cases in the many institutions and other medical professionals taking on ECMO roles, incorporating simulations and protocols into practice should be highly considered.

**ABSTRACT #7**

**Simulation for Perioperative Blood Management Protocols**

Adam Young, Keely Mosizek, Aaron Youngberg, Madison Ropp, Valerie Shostrom, David Holt. Clinical Perfusion Education program, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Background: Perioperative blood management (PMB) is used routinely in cardiac surgery to help minimize and improve the utilization of blood products and includes cell salvage to harvest the patient’s own blood loss for reinfusion. Training personnel to utilize this technique can be optimized through the use of simulation training and protocols by allowing for repetitive attempts to accomplish the task (1) and a standardization of the process. High-fidelity simulation is widely used in medical education (2) and has been utilized to train airline pilots for some time (1).

Methods: The purpose of this research was to test the use of protocol simulation for Perioperative Blood Management (PBM) autotransfusion to determine if simulation can improve time and accuracy of the setup portion of operation. This test involved the comparison between two groups whom have had no previous experience with autotransfusion. The control group received the set of protocol instructions to carry out a specific scenario, but no teaching. The experimental group would get the same protocol instructions to carry out the same scenario, but with teaching and direction
of the autotransfusion prior. There were three defined scenarios to compare between the two groups.

Results: As a group, individuals who were taught the protocols presented significantly faster operation of the protocols in all scenarios and were more accurate in scenario 1. Participants seemed more confident and relied less on the protocol instructions during the trials.

Conclusion: In an effort to improve the proficiency in using autotransfusion, we further pursue our goal of increasing patient safety. Training of PBM protocols in a simulation environment can better prepare medical personnel for situations that arise in the future.

ABSTRACT #8

The Best Way to Diagnose and Treat Acute Strokes
Matt Spaulding. Magnetic Resonance Imaging program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

A stroke is one of the deadliest pathologies in modern medicine. Not only does it affect one of the most critical organs in the body, but it strikes quickly. Brain tissue cannot be without oxygen for long. Therefore, the diagnosis and treatment of a stroke must be immediate and thorough. Two tests stand out above the rest when diagnosing strokes, and each has its own merits. A computed tomography (CT) scan or a magnetic resonance angiogram (MRA) are two imaging tests that are used most prevalently in modern medicine when diagnosing a stroke. The question is, what are the differences and similarities. What test should be ordered in what circumstance?

ABSTRACT #9

Check the Beat: A Comparison of Screening Methods for Diagnosing Atrial Fibrillation in the Asymptomatic Adult over 65
Daniel Stepan. Division of Physician Assistant Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Atrial fibrillation is a common cardiac dysrhythmia that can cause serious morbidity and mortality in those that are affected with it. Paroxysmal atrial fibrillation is especially a problem as its transient nature makes diagnosis very difficult in an office visit. Clots formed during periods of fibrillation may leave the heart and cause ischemic injuries in the brain. Atrial fibrillation creates a five-fold risk of ischemic stroke and the prevalence atrial fibrillation doubles every decade after 50 years of age.1 The risk of TIA and CVAs can be significantly decreased in these patients with current anti-coagulation treatment. With current clinical practice of assessing vital signs with automatic blood pressure cuffs and pulse oximetry, it is easy for providers to not have a chance to detect irregular pulses. The purpose of this study is to use published clinical screening trials to evaluate the effectiveness of different atrial fibrillation screening methods to see which methods may best detect atrial fibrillation. The methods include point of care ECG testing in a clinic, pulse assessment at a flu clinic followed by future ECG for identification of irregular pulses, 24 hour Holter monitor assessment, and home handheld ECG assessment for two weeks to one month.

Upon review of 5 studies, different populations were assessed, but all had the goal of identifying atrial fibrillation. One study looked at the general rate of atrial fibrillation during screening in adults over 40, including those with previously diagnosed atrial fibrillation to gather a baseline of atrial fibrillation prevalence. The other four studies excluded those with known atrial fibrillation and assessed the screening method to new diagnosis of atrial fibrillation. Overall the studies showed that using continued intermittent ECG assessment over a period of 2 weeks to 1 month had a higher rate of atrial fibrillation detection.

ABSTRACT #10

The Effects of a High-Intensity Interval Training Program Compared to a Continuous Training Program for Individuals with Heart Failure
Nolan Border, Henry Ott. Division of Physical Therapy Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Purpose: This critical review evaluates the effects of a high-intensity interval training program compared to the typically used continuous aerobic training program for individuals with heart failure.

Methods: Medline (via PubMed), Cochrane Library and Google Scholar were accessed for randomized controlled trials (RCTs) that compared the results of a high-intensity interval training program with the results of a moderate intensity continuous training program for individuals with heart failure. Dependent variables included: VO2 peak, left ventricular function and quality of life.

Results: Three peer-reviewed articles were evaluated for this review. Two of the articles suggested that high-intensity interval training provided significant improvements in aerobic capacity for individuals with
heart failure when compared to a moderate continuous training program. One study found that the interval training group significantly improved VO2 peak, compared to the continuous training group. A second study indicated that left ventricular ejection fraction improved for the interval training group compared to the continuous training group. The third study revealed that both methods were equally effective in improving quality of life and functional capacity in individuals with heart failure.

Conclusions: While both types of aerobic training have proven to be effective in improving cardiovascular function in individuals with heart failure, high-intensity interval training may be superior to a more moderate continuous training program.

**ABSTRACT #11**

**Medical Imaging in TAVR**

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The purpose of this poster is to highlight the different imaging modalities used during transcatheter aortic valve replacement (TAVR). This information was obtained through scholarly articles and academic journals. TAVR is a procedure that is done in place of an open-chest aortic valve replacement surgery in patients that are in too poor condition to undergo such a serious surgery. TAVR is performed on elderly patients who are suffering from severe aortic stenosis. With the help of medical imaging modalities, such as fluoroscopy, ultrasound, computed tomography, and magnetic resonance imaging physicians are able to correctly plan and measure for the placement of the new mechanical aortic valve. Imaging modalities are used before, during, and after the procedure to ensure the best results for the patient. During the procedure they are even used simultaneously and superimposed on one another to provide extremely accurate placement of the valve.

**ABSTRACT #12**

**Atrial Septal Defect: Definition, Diagnosis, and Treatment**

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Congenital heart disease (CHD) is one of the most common types of birth defects in the United States. Atrial septal defect (ASD) is the most common type of CHD in the United States accounting for about 8-10% of all CHD cases. With the technologies available to doctors ASD is a very treatable defect with a very low rate of mortality and complications. Most cases of ASD are not discovered until adulthood around the age of 30, because that is when signs and symptoms start to show. If left untreated, ASD can lead to very serious problems to the heart and lungs which can shorten life. ASD’s are treated today by a transcatheter procedure where the doctor goes in through the femoral vein typically, and inserts a device which occludes the hole. This is a very successful procedure that does not have many complications or side effects.

**ABSTRACT #13**

**Treatment Methods for Abdominal Aortic Aneurysms**

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An abdominal aortic aneurysm is a highly fatal condition, especially in cases of a ruptured aneurysm. In a healthy individual, the abdominal aorta has the ability to expand and recoil with the pulsating blood flowing through it. However, this wall can become weakened and begin to expand. If the expansion reaches 6 cm or greater, it is diagnosed as an aneurysm. The objective of this exhibit is to review two of the main treatment methods for abdominal aortic aneurysms. Open surgical repair has traditionally been the method of choice, but more surgeons are opting for endovascular aneurysm repair due to its less invasive approach. Many cases go undiagnosed due to a lack of presenting symptoms or receive diagnosis because of an incidental finding. Imaging modalities assist in the diagnosis, screening, treatment planning, and follow-up monitoring, which are all key for improved survival rates.
DIABETES

ABSTRACT #14

The Correlation of Hemoglobin A1C in Relation to Calcium, Protein, and Vitamin D Intake in Adolescents Diagnosed with Type 1 Diabetes Mellitus
Jenna Roeding, Laura Armas, Corrine Hanson. Medical Nutrition Education program, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Introduction: Adolescents with diabetes mellitus (DM) are at increased risk for osteoporosis. Osteoporosis can be prevented by adequate intake of calcium, vitamin D, and protein.

Objective: The primary objective of this study is to examine the correlation between HbA1c levels in adolescents with Type 1 Diabetes Mellitus (T1DM) and intakes of calcium, vitamin D, and protein.

Methods: Calcium, vitamin D, and protein intake was collected on seven patients utilizing a revised food frequency questionnaire (FFQ) from the Block Screener. Patients were asked about their intake of common foods containing calcium, vitamin D, and protein. A retrospective chart review was conducted to gather pertinent labs for this study, including hemoglobin A1C (HbA1c). Correlation coefficients were run using a Spearman’s Rho test on the FFQ nutrient data and the patients HbA1c levels.

Results: No significant correlations between nutrient intakes and HbA1c levels were observed. There was a positive insignificant correlation between calcium and HbA1c (R2 = .49, p = 0.081) and protein and HbA1c (R2=.69, p = 0.085), and a negative insignificant correlation between vitamin D and HbA1c (R2=.45, p = 0.311).

Conclusion: Intake of nutrients associated with the prevention of osteoporosis did not appear to be significantly correlated with HbA1c levels in this small study of adolescents. With a larger sample size, increasing the power, these results may become significant in future studies.

GERIATRICS

ABSTRACT #15

Percutaneous Endoscopic Gastrostomy Tube Placements in Patients with Dementia at the Nebraska Medical Center
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Background: Percutaneous endoscopic gastrostomy (PEG) tubes were first used beginning in the 1980s and since then, the number of PEG tubes placed has increased quite significantly. PEG tubes are used for a variety of disease states but research has found that PEG tubes are not equally beneficial or indicated for all conditions.

Purpose: The purpose of this study was to: 1. Determine the number of percutaneous endoscopic gastrostomy (PEG) tube placements in patients with a dementia diagnosis treated at the Nebraska Medical Center (NMC), and 2. To evaluate the need for standardized education materials regarding PEG feeding tube placement in patients with a dementia diagnosis treated at the NMC.

Methods: 265 subjects with a diagnosis of dementia or Alzheimer’s disease were included in this study. Data collected includes demographic, anthropometric, PEG tube placement, and education records. All data was collected at two time points for each subject: at diagnosis and at most recent appointment prior to the study end-date (5/1/2017). For those subjects who underwent PEG tube placement, additional data was collected at the time of PEG tube placement.

Results: Of the 265 subjects included in this study, 4 (1.5%) of the subjects received a PEG tube. All 4 of these subjects had a dementia diagnosis, versus a diagnosis of Alzheimer’s disease, and 2 of these subjects continued to lose weight following PEG tube placement. In total, there were 2 subjects who received education on PEG tubes. 1 of these subjects subsequently underwent a PEG tube placement while the other did not. The type of education materials used was not specified for either subject.

Conclusions: The number of PEG tubes placed in patients with dementia at the Nebraska Medical Center (NMC) is very small, which is in accordance with the recommendations from the literature. However, the amount and types of education provided to patients is variable, and patients and their caregivers could benefit from more consistent, patient-centered education in respect to PEG tubes with dementia.
ABSTRACT #16

Mind Over Body? A Review of Balance Training Versus Cognitive Behavioral Therapy in Falls Outcomes in Geriatric Populations
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Purpose: Fear of falling has been identified as a contributing factor to increased fall risk for older adults. This critical appraisal evaluates the research literature for evidence to determine if exercise combined with cognitive behavioral therapy (CBT) has an impact on fear of falling and falls-related clinical outcomes.

Methods: A database search of MEDLINE and CINAHL was performed to identify studies that compared a standard balance and mobility program for older adults to a similar intervention combined with CBT. The search yielded five peer-reviewed articles, from which two randomized, controlled trials and one case study were most appropriate for review.

Results: Two studies found that CBT combined with an exercise program decreased subjects' fear of falling (measured by the Falls Efficacy Scale, Modified Falls Efficacy Scale or Geriatric Fear of Falling Measure). The remaining study identified that the addition of CBT improved the participant's sense of well-being as measured by Personal Wellbeing Index (PWi-CV). The standard physical therapy intervention involving exercise-based balance and gait training was found to decrease risk of falls overall as indicated by improvements on clinical outcome measures assessing balance and gait.

Conclusions: CBT should be considered as an adjunct intervention in addition to a comprehensive balance and gait training program to decrease the risk and fear of falling with older adults.

ABSTRACT #17

How Does Dual Task Training Impact Gait Speed and Cognitive Function in Patients with Mild to Moderate Alzheimer’s Type Dementia?
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Introduction: The geriatric population is increasing dramatically, creating the need to identify effective rehabilitation interventions that will enhance functional mobility and quality of life. Because patients with mild to moderate dementia are at a higher risk for falls, evidence for the effectiveness of dual-task training (which includes both physical and cognitive activities), is clinically important.

Purpose: This critical review evaluates the scientific literature for evidence regarding dual task training and its effect on gait speed and cognitive function in patients with mild to moderate Alzheimer’s type dementia.

Methods: A search of scientific literature was completed using MEDLINE, CINAHL, and Wiley Library; key terms included: dementia, Alzheimer’s, dual task, gait speed, multi modal, and physical therapy. Three randomized controlled trials were selected because of their direct evaluation of dual task training in patients with mild to moderate Alzheimer’s type dementia.

Results: Studies found improvement in different domains. A decrease in dual-task “cost” and an increase in gait speed, stride length, and single support parameters of gait were revealed in two studies; improved cognitive function (frontal lobe) was also identified.

Conclusions: These studies suggest that dual task training may be significantly better in improving several elements of gait and decreasing dual task cost than traditional exercise alone. However, there is some conflicting evidence about the ability to improve gait speed. Further research in therapeutic environments with this population and treatment type would be beneficial to elucidate conflicting results and guide treatment for the healthcare professionals.

MUSCULOSKELETAL

ABSTRACT # 18

The Effectiveness of Cervical Manual Therapy in Treating Lateral Epicondylalgia
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Purpose: This critical appraisal reviews current literature regarding the treatment of lateral epicondylalgia, specifically comparing cervical manual therapy with exercise. Lateral epicondylalgia is a common disorder of the lateral aspect of the elbow, presenting with pain and decreased grasp function, affecting activities of daily living.

Methods: Three articles were appraised after searching research databases for evidence focused on the effectiveness of cervical manual therapy for treating lateral epicondylalgia. Studies compared cervical manual therapy as an intervention alone, and as an additive intervention to exercise. Two randomized controlled trials assessed exercise and cervical manual therapy as
independent interventions. A retrospective analysis looked at the efficacy of cervical manual therapy in addition to local management of the elbow.

Results: For exercise alone, there was a greater and more rapid improvement in pain, but no significant increase in muscle strength. For cervical manual therapy alone, a significant increase in pain thresholds and pain-free grip strength was identified. In addition, a direct comparison of cervical manual therapy to exercise revealed need for fewer clinical visits to achieve successful outcomes.

Conclusion: Many intervention options may be appropriate for patients with lateral epicondylalgia. This appraisal indicates the potential for positive effects on pain, grip strength and functional impairments with the use of cervical manual therapy.

ABSTRACT # 19

Heal Pain or Heel Pain? Comparing Ultrasound Therapy to Manual Therapy Techniques for Improving Plantar Heel Pain and Function
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Introduction: Plantar heel pain is very common in individuals who stand for long periods of time, are overweight or obese, and who recently increased physical activity level. Traditional treatments for pain include ultrasound, stretching, strengthening of the intrinsic musculature of the foot, and manual therapies. This condition often becomes chronic, so identifying effective intervention and prevention of symptom recurrence is important.

Purpose: This critical review compares the effectiveness of manual therapy vs. ultrasound for individuals with plantar heel pain. Method: Search of scientific databases identified two randomized controlled trials and one comparative study that considered the effects of manual therapy to the foot and ankle (including myofascial release, stretching and mobilizations with/ without exercise), compared with ultrasound therapy on pain and functional disability.

Results: A comparison of myofascial release and ultrasound revealed a significantly greater decrease in pain and functional disability for subjects receiving myofascial release (MR). The MR group also had a significant increase in pain pressure threshold when compared to the group receiving ultrasound. The second study showed that mobilizations and exercise resulted in significant improvements in pain and function compared to intervention consisting of ultrasound and exercise. An additional study revealed improvement in both groups over treatment time; however, the manual therapy group demonstrated a greater magnitude of improvement when compared to ultrasound.

Conclusion: Incorporation of manual therapy intervention for patients with plantar heel pain, may significantly improve function and decrease pain when compared to prescription of ultrasound and exercise alone.

ABSTRACT # 20

For Return to Previous Level of Function, is Reconstruction of the Anterior Cruciate Ligament Always the Best Option?
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Introduction: Over 200,000 injuries of the anterior cruciate ligament (ACL) of the knee occur in the US every year, with the majority of these patients electing to undergo reconstructive surgery. However, new evidence is now suggesting that non-operative treatment should be considered as the first line of treatment after acute ACL tears.

Purpose: This critical review investigates whether ACL reconstruction compared to conservative treatment results in improved ability to return to previous level of function.

Methods: Medline (via EBSCO Host and PubMed was accessed; most relevant articles were found using the heading "ACL reconstruction AND conservative treatment". The search was initially limited to randomized control studies published within the past five years, but was expanded to include all study designs to improve yield.

Results: Two prospective randomized control trials and one longitudinal prospective study were chosen for critical appraisal. Both RCTs compared subjective outcome measures between operative and non-operative treatment groups, while the longitudinal prospective study focused on the long-term outcomes of patients who opted for non-operative treatment. The first RCT found a significant difference between the mean values of International Knee Documentation Committee (IKDC) scores in favor of the ACL-reconstruction group. Both groups were found to have a similar incidence of radiological osteoarthritis. In contrast, the second RCT found no significant group differences between the operative and non-operative treatment groups on the Knee Injury and Osteoarthritis Outcome Score (KOOS), any of the KOOS subscales,
SF-36, Tegner Activity Scale, or radiographic osteoarthritis of the knee. During the longitudinal prospective study, subjective outcomes (Lysholm score and Visual Analog Scale for pain) improved between the 12th and 27th year after ACL tear. At the same time, activity level (measured by Tegner activity scale) decreased. Arthritis, measured by Sherman Score, worsened over time. Twenty-seven years after injury, 90% of the patients rated their ACL-deficient knee as normal or almost normal; 10% of the patients rated it as abnormal. The findings of this review show that there is a subgroup of patients with ACL tears who are well treated with physical therapy alone, without ACL reconstruction surgery.

**ABSTRACT #21**

**The Influence of Sport Related Activity in Addition to Traditional Physical Therapy on Patient Outcomes with Achilles Tendinopathy**  
JD Freeman, Jason Krings. Division of Physical Therapy Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Purpose: This critical review evaluates whether or not the addition of sport related activities, such as running or jumping, have a negative effect on Achilles tendinopathy rehabilitation when compared to traditional physical therapy.

Methods: Literature search revealed three articles for evaluation, two of which compared two different Achilles tendinopathy rehabilitation protocols (exercise versus active rest), and an additional study involved a 5 year follow-up.

Results: Outcomes for patients with Achilles tendinopathy who continued sport-related activity and used a pain-monitoring model during rehabilitation were overwhelmingly positive. One study showed significant improvements in VISA-A (index of severity scale) scores, pain during hopping, and work performed during a toe-raise when compared to baseline scores. There were no significant differences in the rate of improvement when compared to an active rest group. When these groups were re-evaluated after 5 years, there were no significant differences between exercise and active rest groups in terms of new symptoms, VISA-A scores and function. Another study revealed significant decreases in pain and symptoms during activity, as well as an increase in function and strength when performing an eccentric-biased exercise protocol as compared to the control.

Conclusion: Significant improvements were identified for sport-related rehabilitation groups, although no significant differences were found in rate of improvements. No negative effects were evident from continued Achilles tendon loading activities with the use of a pain-monitoring model during treatment. Additional research may further evaluate the inclusion of return-to-sport activities during rehabilitation of Achilles tendinopathy.

**ABSTRACT #22**

**Effects of Neuromuscular Training Compared to Strength Training on Movement Asymmetries after ACL Injury**  
Katelyn Hedlund, Emilie Hicks. Division of Physical Therapy Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Background: People who have sustained injury to the anterior cruciate ligament (ACL) are at a high risk for secondary injuries and osteoarthritis. A probable explanation for this is the presence of movement asymmetry between limbs during functional and sport activities. In ACL injuries, movement asymmetry is defined as differences between limbs during gait (joint moments, joint angles) and during functional activities such as in the single-leg hop tests. These differences are due to imbalances in strength and neuromuscular activation of muscles including the quadriceps, hamstrings, and gastrocnemius. Discovering interventions that decrease these asymmetries, and when these interventions are most useful, could improve long-term outcomes.

Purpose: This critical review investigates neuromuscular training in comparison to a traditional strength training program on lower extremity movement asymmetries after ACL injury. The secondary purpose compares these interventions for non-operative and post-operative patients.

Clinical Significance: Methods: Three randomized control trials published between 2000-2017 were chosen from a literature database search comparing neuromuscular training programs and strength training programs in improving movement asymmetries after ACL injury. The search was limited to studies that used functional hop tests as the outcome measure.

Results: Neuromuscular training was equally effective as strength training after ACLR. However, neuromuscular training is shown to be superior to strength training for patients who did not receive surgical intervention after injury. Neuromuscular training should be integrated into rehabilitation strategies to decrease movement asymmetries both non-operatively and post-operatively in patients with ACL injuries.
ABSTRACT #23

Effect of Vestibular Rehabilitation on Return to Play in Young Athletes with Concussion
Luke Lyons, Daniel Buss. Division of Physical Therapy Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Introduction: Concussion is a common injury in sport-related activities. Dizziness and imbalance are common symptoms associated with concussion, and both can improve with vestibular rehabilitation. Although the body of research is growing and the clinical practice is developing, the use of vestibular rehabilitation for management of concussion is underutilized.

Purpose: This critical review evaluates research literature concerning vestibular rehabilitation for youth concussion management and its effect on time to return to sport.

Method: Medline (via PubMed) and the Cochrane Collaboration were accessed to identify randomized, controlled trials (RCT) focused on sport related concussion in males and females ages 15-25 years. Two retrospective studies and an RCT published after 2007 were selected for appraisal due to the use of vestibular rehabilitation for treatment of concussion in young athletes.

Results: The findings from the research provided evidence of the most commonly used interventions of vestibular rehabilitation and the effect vestibular rehabilitation had on symptoms and return to sport. The primary treatments included eye-head coordination, standing static balance, and ambulation exercises. Of subjects receiving cervicovestibular rehabilitation, the majority returned to sport within 8 weeks compared to the control group. The main finding is that people with persistent dizziness and imbalance post-concussion improved with vestibular rehabilitation, especially children.

Conclusions: Vestibular rehabilitation to treat dizziness and imbalance in youth athletes with concussion needs to be considered for physical therapists as a management option. It has been shown to improve post-concussion symptoms, while also decreasing time to return to sport. Understanding specific prescriptions that are successful in treating vestibular impairments provides a valuable resource to physical therapists for management of individuals with concussion.

ABSTRACT #24

The Effect of Open Kinetic Chain Exercises after ACL Reconstruction
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Background: The anterior cruciate ligament (ACL) of the knee is a major joint stabilizer, preventing the tibia from anteriorly translating on the femur. The ACL is a frequently torn ligament, resulting from pivoting, rotational cutting, or lateral contact to the lower leg. Currently, there is no consensus on which type of exercise is more beneficial in the ACL rehabilitation process. Closed kinetic chain (CKC) exercise consists of the knee bending on a fixed distal segment, such as a standing squat, and is traditionally considered the safer approach. Open kinetic chain (OKC) exercise allows the distal segment of the limb to move freely, such as during seated leg extension. OKC exercise has been thought to increase strain through the repaired graft, which may result in abnormal laxity and graft failure. The primary focus of ACL rehabilitation is to protect the graft site while normalizing range of motion and quadriceps strength, as compared to the contralateral side. The purpose of this critical review is to identify evidence comparing the effectiveness of OKC versus CKC exercises in the early stages of rehabilitation following ACL reconstruction.

Method: Medline was accessed via PubMed, excluding designs that were not randomized, controlled trials. The search yielded twelve articles and the three most closely related to the clinical parameters were appraised.

Results: There was no increase in knee laxity when comparing the use of OKC to CKC exercises. Researchers agreed that there was no detriment to knee function and laxity when using OKC exercises and found a sufficient increase in quadriceps strength with OKC exercises. An earlier rate of return to pre-injury level sport in OKC groups compared to CKC exercise was also identified.

Conclusion: Both open and closed kinetic chain exercises are beneficial while rehabilitating a patient with ACL reconstruction. Because OKC exercise does not appear to increase risk of the graft site, inclusion of OKC exercises may create a more dynamic rehabilitation protocol. However, additional studies are needed to determine long-term effects of these different treatment approaches.
ABSTRACT #25

Are Thrust Manipulations More Effective than Non-thrust Mobilizations in the Treatment of Patients with Neck Pain?
Tracy Meyer, Sara Hohenstein. Division of Physical Therapy Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Background: Neck pain is a common complaint of patients presenting to physical therapy (PT), and it often limits normal function and active participation in daily activities. Common PT interventions include: manual therapy to the cervical and/or thoracic spine, cervical traction and active exercises.

Purpose: This critical review appraised research regarding the effectiveness of non-thrust mobilizations versus thrust manipulations to the cervical and/or thoracic spine for the treatment of neck pain. Method: CINAHL and MEDLINE via bothEBSCO Host and PubMed were searched. While multiple articles were found, three randomized controlled trials measured pain rating. Neck Disability Index (NDI) measures and subjective patient outcomes following intervention. The first study compared upper cervical and upper thoracic thrust manipulations versus non-thrust mobilizations in the same regions. The second study compared cervical non-thrust mobilization/active exercise versus groups receiving the same intervention with the addition of thoracic thrust manipulation. The third study explored thoracic thrust manipulation versus cervical spine thrust manipulation for the treatment of patients with acute neck pain.

Results: The thrust manipulation group demonstrated greater short-term improvements in pain reduction and NDI scores post-intervention. The inclusion of cervical and thoracic thrust manipulations led to clinically significant change in short-term pain and NDI scores.

Conclusions: Overall, the results favored using thrust manipulations for the treatment of patients with mechanical neck pain. When comparing thrust manipulations in the thoracic versus the cervical spine, the cervical spine showed greater short-term improvements. These studies evaluated short-term effects on pain and neck disability following differing manual therapies, but further research is needed to determine the long-term effectiveness of manual therapy to improve patient outcomes.

ABSTRACT #26

Does Dry Needling Improve Back Pain and Function?
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Introduction: Back pain is a common diagnosis with significant economic and quality of life costs. While manual therapy and exercise are commonly used rehabilitation interventions, dry needling (DN) is emerging as a technique to help physical therapists (PT) treat back pain. Due to its recent popularity, there are few published studies addressing the effectiveness of DN on improving back pain and function.

Purpose: This critical review investigates dry needling (DN) and the effects it has on back pain and function.

Method: Research literature was accessed on Medline (via PubMed), yielding 16 articles with initial search parameters. Final article selection was based on design, including randomized controlled trials (RCT) and a quasi-experimental study focused specifically on use of DN for treatment of low-back pain and function.

Results: All three studies revealed improvements in pain and/or function for patients with back pain. The first RCT study showed that pain intensity and disability scores improved significantly in the experimental group, immediately post-intervention and at two month follow-up. The second RCT study showed that the experimental (DN) group improved in areas of pain, trigger point related variables and fear of movement. Although results of the quasi-experimental study did not find between-group differences immediately following intervention, greater improvements in lumbar multifidus contraction were evident after one week.

Conclusion: The review indicates that DN was effective in improving pain and/or function in patients with back pain under study parameters. Further research is needed to confirm these promising outcomes, as well as to determine long-term effects of the intervention.

ABSTRACT #27

Improving Gait Characteristics in Children with Spastic Diplegia Cerebral Palsy: Strength Training vs. Aerobic Training
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Introduction: Clinical relevance: Cerebral palsy (CP) is a movement disorder caused by a neurological
ABSTRACT #28

Is Aerobic Exercise Better than Aquatic Therapy in the Reduction of Pain and Improvement in Function in Middle Aged Females with Fibromyalgia?
Kristin Ramirez, Megan Hedges. Division of Physical Therapy Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Purpose: This review evaluates the research literature for evidence comparing aquatic versus aerobic exercise in reducing pain and improving function in patients with fibromyalgia.

Methods: The authors searched Medline (via PubMed) for articles that 1) compared aquatic to aerobic exercise, aerobic exercise alone, and aquatic therapy alone and 2) used pain and improvement in function as outcome measures.

Results: Three articles showed a reduction of pain in women with fibromyalgia who participated in either aquatic or aerobic exercise. Two studies revealed significant improvement in function as measured by SF-36 and FIQ scores. When comparing pain outcome measures with aquatic and aerobic exercise intervention, no significant difference was found. For aerobic exercise alone, walking promoted a beneficial response in lowering psychological stress and pain ratings. In an aquatic, respiratory exercise-based program alone, patients experienced improvements in pain, quality of life, functional capacity, reduced anxiety, and improved quality of sleep. When comparing aerobic to aquatic exercise, deep water running (DWR) was found to be just as effective as land-based exercises (LBE) for decreasing pain in women with fibromyalgia. However, DWR has been shown to offer more advantages related to the emotional aspects of these patients. Regardless of symptom improvement, aerobic gain was similar for both exercise groups. Therefore, DWR could be studied as an exercise option for patients with fibromyalgia who have lower limb limitations or problems adapting to LBE.

Conclusions: Aerobic exercise and aquatic therapy are both beneficial for reducing pain and improving function in middle aged females with fibromyalgia. The decision of which mode of exercise to use depends on the individual’s abilities and preferences for exercise.
ABSTRACT #29

The Effect of Physical Activity compared to Biofeedback on Decreasing Pain in Patients with Fibromyalgia
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Background: Fibromyalgia is a syndrome characterized by widespread pain, tender points, sleep disturbances and fatigue. Symptoms affect every aspect of the patient’s life including physical functioning, social interactions, family and leisure activities. Treatments are directed at improving all areas of function and often include exercise, cognitive behavioral treatment programs, medication, biofeedback, massage and alternative therapies. Biofeedback and physical activity are two treatment options that physical therapists (PT) can implement; however, literature to date is inconclusive as to which treatment option is more effective in the reduction of pain.

Purpose: This critical review describes studies comparing the effectiveness of biofeedback and physical activity on decreasing pain in patients with fibromyalgia.

Method: Scientific literature was accessed in Medline (via PubMed) and EBSCO Host. Publication results were limited to studies within the previous 12 years, those including only biofeedback and/or physical activity as interventions, and participants who were middle aged and diagnosed with fibromyalgia. These criteria identified two applicable studies, so the timeframe was broadened to identify studies that evaluated both interventions.

Results: Three articles were appraised, all measuring pain by use of the Visual Analog Scale (VAS). Biofeedback alone decreased pain and number of tender points when compared to sham biofeedback. Aerobic and resistance exercise effectively decreased fibromyalgia symptoms, including pain relief and improved quality of life. When comparing both of these interventions alone and in combination, a third study reported that biofeedback and structured exercise programs both produced short and long-term improvements in pain, self-efficacy and disease severity. These studies have shown clinically significant improvements in pain in subjects treated with biofeedback, physical activity or a combination of both treatments. In conclusion, these studies may justify the utilization of both interventions to decrease pain in patients with fibromyalgia; however, physical activity has not been shown to be superior when compared to biofeedback. There is a lack of evidence regarding both biofeedback and physical activity as interventions in this population. In general, an individualized, comprehensive PT protocol that includes biofeedback and low to moderate intensity physical activity may be beneficial to decrease pain and increase physical functioning in patients with fibromyalgia.

ABSTRACT #30

Mobilization with Movement is an Effective Treatment for Improving Lateral Epicondylalgia Pain and Function
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Introduction: Lateral epicondylalgia is a common musculoskeletal condition that is characterized by pain over the lateral epicondyle, mechanical hyperalgesia, motor control deficits, marked functional impairments and muscle strength changes. The primary involved structure is the tendon of the extensor carpi radialis brevis muscle. The condition is commonly associated with painful wrist or finger extension and gripping activities that decrease functional capacity and quality of life for the patient. The literature to date has advocated for many physical therapy interventions, but none are supported by rigorous research evidence.

Purpose: This critical review evaluates scientific literature that considers the effect of mobilization with movement (MWM) lateral glide at the elbow on changes in pain reduction, pain pressure threshold and pain-free grip strength.

Method: MEDLINE via Pubmed and the Cochrane Library were searched with parameters that yielded six studies. Three research articles were identified for review based on inclusion/exclusion criteria, reliability, validity, treatment methods, and applicability to the research question.

Results: Pain free grip strength improved significantly in all studies, indicating that MWM can be a useful technique to eliminate pain with functional movements. There were no consistent benefits for the placebo or control groups when compared to MWM groups. Pain free grip strength and maximal grip strength improved immediately after the MWM intervention. Pressure-pain threshold (minimum force applied that induces pain) did not improve significantly. Corticosteroid injections and no treatment (letting the condition run a natural course of healing) are common treatment methods for lateral epicondylalgia. One study demonstrated the effectiveness of MWM as being a superior treatment at both six weeks and one year by increasing pain free grip strength sooner than no treatment and maintaining those benefits longer than
pain control following corticosteroid injection. In conclusion, there are beneficial effects of physical therapy using techniques such as a lateral glide MWM for short and long term relief to decrease pain and increase function, indicating that MWM is an effective treatment for lateral epicondylalgia. Long term benefits should be further explored.

**ABSTRACT #31**

**A Comparison of Strength Training versus Standard Physical Therapy on Functional Improvement following Total Hip Arthroplasty**

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Purpose: This critical review evaluates the research evidence to identify whether strength training combined with standard physical therapy (PT) intervention results in improved functional outcomes when compared to standard PT alone for people following total hip arthroplasty (THA).

Methods: The authors searched online scientific literature databases for studies that 1) directly compared standard PT alone with standard treatment augmented strength training and 2) studied patients post-hospital discharge.

Results: Search strategies yielded one study comparing patients in the outpatient setting, who completed either maximal strength training or participated in conventional physical therapy for 3 months duration. Another study compared home-based progressive resistance training with outpatient or home health standard rehabilitation for 6 weeks. The third study explored progressive resistance training completed in a public fitness center with PT supervision compared to unsupervised home based exercise for 10 weeks. All of which demonstrated improvements in function for patients who completed either the strength training intervention or standard treatment. In one study, the maximal strength training group exhibited increased strength in hip/knee extensors and hip abductors at 3 and 6 months postoperatively, but there were no significant differences between groups on 1-year follow up measures. There were no differences in pain, or on outcome measures 6-Minute Walk Test, Hip Disability & Osteoarthritis Outcome Score, or the Harris Hip Score at any time point. In another study, both groups showed equal and marked progressive improvements in a variety of outcome measures one year after surgery, with no significant difference in improvement between groups. The third study demonstrated that all subjects significantly improved in the primary outcome measure of leg extension at 10 weeks post-operatively, with no difference between groups. However, the progressive resistance training group showed significantly more improvement in the functional outcomes of maximum walking speed and stair climbing performance.

Conclusions: Although both standard treatment alone and strength training improve function in patients one year post-THA, physical therapy combined with strength training may be superior to standard treatment alone. Evidence suggests that strength training may result in more rapid functional gains, which may reduce healthcare costs by earlier discharge from the hospital environment.

**ABSTRACT #32**

**Does Continuous Passive Motion Improve Functional Outcomes Following Total Knee Arthroplasty?**

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Introduction: Total knee arthroplasty (TKA) is the most common elective surgery performed in the United States, especially for people with severe knee osteoarthritis. Post-operative protocols incorporate physical therapy (PT) for early mobility, and some include the use of continuous passive motion (CPM); however, results of using CPM are variable. In 2014, the American Physical Therapy Association’s Choose Wisely campaign stressed that physical therapists and patients should question a few common practices, including the use of CPM for post-operative management of patients following uncomplicated TKA.

Purpose: This critical review compares CPM use when combined with standard PT intervention to standard PT only for patients post-TKA.

Method: Medline (via PubMed) was searched for randomized controlled trials (RCTs) from 1998-2018 involving use of CPM. The search yielded 19, but three were identified for appraisal as they directly compared the interventions in question.

Results: The studies show no clinically significant differences with CPM use on functional and impairment-based outcomes using measures such as the: Timed Up and Go (TUG), Western Ontario and McMaster Universities index (WOMAC), and Functional Independence Measure (FIM), as well as impairment-based outcomes, such as pain and knee range of motion, in either acute or inpatient rehabilitation settings. Moreover, the results prompted two of the hospitals involved in the RCTs to terminate use of the additional intervention. Results of these studies bring
into question the cost benefit of using CPM devices, especially in the case of patients with uncomplicated TKA. In conclusion, CPM may not offer short or long-term significant benefits when used in conjunction with PT, and continued use should be reconsidered during post-operative care for people following TKA.

ABSTRACT #33

Cleidocranial Dysplasia
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Cleidocranial dysplasia is a rare genetic skeletal disorder. This condition is characterized by multiple skeletal and dental anomalies such as abnormally short or absent clavicles, impacted and extra supernumerary teeth, as well as decreased facial height, and open sutures and fontanels. Other characteristic features include osteoporosis, hearing loss, sinus infections, and scoliosis. Through radiographic and ultrasound imaging, the key features of the disorder can be found for diagnosis. Cleidocranial dysplasia is caused by mutations in the runt-related transcription factor 2 (RUNX2) gene and is inherited from an affected parent. This gene is used to control osteoblast and chondrocyte formation and maturation. There is no cure for cleidocranial dysplasia but treatment includes management of symptoms through dental treatments and therapy.

NEUROLOGIC

ABSTRACT #34

Concussions and Their Potentially Short-Term and Long-Term Adverse Effects: What Can MRI Tell Us?
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Many questions surround the topic of traumatic brain injuries, specifically concussions. A sports-related concussion is one of the most complex sports-related injuries clinicians manage. The symptoms can present broadly and recovery can difficult to define. Previous research has provided answers to many questions surrounding concussions; however, many questions still exist. Through the review of current research, it has been found that magnetic resonance imaging (MRI) has become a key player in the study of concussions. MRI offers anatomical, structural, functional, physiological and metabolic information in regards to the adverse effects of concussions, both short-term and long-term. The primary purpose of MRI is correlating cognitive deficits with neuroimaging findings in concussed patients, with emphasis on the structural alterations of brain tissue, as opposed to functional changes.

ABSTRACT #35

What is the most effective management of post-stroke aphasia?
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 Aphasia is a language disorder commonly occurring after a stroke that happens in the left, or dominant hemisphere of the brain. It can affect the speaking, understanding, reading, or writing aspects of language. However, the most common impairment of language in post-stroke aphasia is anomia, or inability to name things. The current standard of care remains intensive speech therapy each week. I wanted to investigate alternative treatment options for post-stroke aphasia because of the significant impact it has on patients’ quality of life. My purpose was to analyze the effectiveness of two different treatment options: transcranial direct current stimulation (tDCS) and repetitive transcranial magnetic stimulation (rTMS). I used systematic reviews, meta-analyses, and randomized controlled trials to compare the effectiveness of these therapies. Each of these treatment options are neuromodulating tools with the prospect of being adjunct therapies to the current standards.

Upon review of several studies, I found variable results. The primary outcome of most of the studies was an improved naming ability, since anomia is the most common deficit found with aphasia. There were a few studies that strongly advocated for the use of rTMS and tDCS saying that they found positive outcomes in their research and would conclude that it is a viable option for adjunct therapy. However, upon a Cochrane systematic review, it was concluded that the evidence wasn’t strong enough to draw the same conclusions. Overall, most studies were in agreement that additional research with more sound methodology would improve the research greatly, likely leading to the recommendation of rTMS and tDCS as adjunct treatment.
ABSTRACT #36

The Efficacy and Safety of Ketamine for Use in Treatment-resistant Depression
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Major depressive disorder (MDD) is a condition that significantly impacts countless individuals, both directly and indirectly. Globally, MDD ranks third among disease burden. Current first-line antidepressants relying on the monoamine pathway have various downsides including delayed onset of action, poor remission rates, and limited options for treatment. In addition, these medications have shown to provide relief in only 54% of patients, leaving a large population susceptible to further suffering and risks such as suicidal ideation. Ketamine, an N-methyl-D-aspartate (NMDA) receptor antagonist, is an FDA-approved anesthetic that has been used extensively since 1970. Low-dose ketamine has recently become of interest as a novel therapy for treatment-resistant depression. Although it’s mechanism of action is currently unclear, ketamine has been shown to increase glutamate levels when administered at subanesthetic doses, which is important because glutamate regulation and expression are altered in patients with MDD. Other proposed mechanisms include ketamine’s actions as a stimulant, an opioid receptor agonist, or as having direct effects on the reward circuit in the brain. The purpose of this study is to use published systematic reviews and meta-analyses to provide further information on the efficacy and safety of the use of ketamine for treatment-resistant depression, ultimately providing a recommendation regarding this form of treatment.

The targeted population in the 7 meta-analyses and systematic reviews analyzed was adults with treatment-resistant depression or suicidal ideation. Significant response rates and symptom remission rates have been observed for up to 1-2 weeks after initiation of therapy in patients with treatment-resistant depression. Ketamine has a rapid onset of action and has been shown to improve many critical depressive symptoms including sadness, suicidality, helplessness, and anhedonia which may be crucial for quickly providing treatment to those at risk of suicidal ideation. Low-dose ketamine for treatment of MDD has been shown to be safe, with trials having produced a lack of significant side effects. Very few studies have been done on the use of ketamine for treatment of patients with MDD, and there is great heterogeneity when comparing the design of many of the studies. Future studies for better recommendation of ketamine monotherapy are warranted.

ABSTRACT #37

The Influence of Hippotherapy on Participation and Function in Children with Cerebral Palsy
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Background: Cerebral Palsy (CP) is an umbrella term encompassing a group of permanent neurological disorders impacting gross motor function and posture. CP is the most common pediatric movement disorder and affects 1 in every 323 children. Hippotherapy is an innovative treatment approach that involves therapeutic horseback riding accompanied by a licensed physical therapist who has been specially trained.

Objective: Our objective was to review the current literature in search of evidence on the effects of hippotherapy on gross motor skills and participation in children with CP, to determine if it is an appropriate supplement to traditional physical therapy intervention. There is a plethora of research on hippotherapy and its effect on motor impairments, but there is very limited research linking the effects to improvements in activity limitations and participation restrictions. Since hippotherapy is not considered a covered insurance benefit, it is especially important that these improvements in gross motor function effectively carry over into the child’s daily activities in order to be a valuable investment for the family.

Methods: Three research articles (one case report, one randomized control trial, and one quasi-experimental study) were identified by via search of scientific literature databases. The yield was critically appraised for the effect of hippotherapy on gross motor function and participation in children with CP. The articles were chosen for their use of CP and pediatric specific outcome measures, level of external validity and applicability, and publication dates within the past 10 years; articles were all selected from peer-reviewed journals.

Results: Each study found significant improvements in outcome measures (i.e., Gross Motor Function Measure 88 and 66; Pediatric Balance Scale; Pediatric Evaluation of Disability Inventory-Functional Status Scale, and the child’s competence and social acceptance) for the participants who received a hippotherapy intervention.

Clinical Relevance: This critical review indicates that hippotherapy has the potential to significantly improve gross motor skills and level of participation for children with Cerebral Palsy. Hippotherapy may be considered a valid supplement to physical therapy and is an approach that families could strongly consider when
deciding to access appropriate rehabilitation interventions.

**ABSTRACT #38**

Is Physical Therapy Indicated in Patients with Normal Pressure Hydrocephalus Following Surgical Shunt Placement?

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Normal pressure hydrocephalus (NPH) is caused by abnormal buildup of cerebrospinal fluid and enlargement of the ventricles in the brain. The triad of NPH symptoms are urinary incontinence, cognitive decline, and gait disturbance may present as an initial problem requiring treatment. Although gait disturbance is a major symptom, common medical intervention for people with NPH involves surgical placement of a shunt to drain excess fluid from the ventricles, and patients are not typically referred for physical therapy (PT). The purpose of this critical review is to determine the role for physical therapists (PT) following shunt placement in NPH.

Method: Medline database search yielded four articles for appraisal based on application to patients with NPH, or the triad of symptoms present in NPH and the clinical feasibility for PT.

Results: Database search revealed that very few related studies exist; however, a study did identify that gait mechanics and velocity are positively affected by elective lumbar drainage (ELD), a prognostic test that determines an individual’s response to shunt implantation. A second study assessed the prognostic abilities of PT and OT functional outcome measures in identifying patients who will exhibit functional improvements post-shunt. An additional study examined the short and long-term effects of shunt placement on mobility, and research is beginning to identify patient responses to exercises based on vascular endothelial growth factor (VEGF) levels.

Appraisal revealed approximately 1/2 of people under study who received a shunt demonstrated improvements in gait. Three rehabilitation outcome measures (FIM, TUG, Tinetti) effectively predicted functional improvements in mobility following shunt implantation. Long term decline in the gait improvements following shunt placement alone were noted (3, 12 and 60 months). The last study found that a patient’s VEGF level may predict his/her potential reaction to exercise. Applicability: Although there is very little published research considering PT for NPH, these studies indicate that PT outcome measures may assist the neurologist in predicting patient functional response to shunt implantation, and future research may identify a relationship between VEGF levels and the patient’s ability to benefit from exercise-based interventions for gait and mobility.

**ABSTRACT #39**

Is Constraint-induced Therapy More Effective than Conventional Rehabilitation in Improving Upper Extremity Limb Function within 9 Months Post-stroke?

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Introduction: There are approximately 15 million people worldwide who are diagnosed with cerebrovascular stroke each year. Of those, 5 million experience permanent disability, involving functional impairments of the affected upper extremity. Constraint-Induced Movement Therapy (CIMT) and modified CIMT (m-CIMT) focus on intense repetitive training and behavioral shaping of the involved limb by immobilizing the uninvolved extremity, thus “forcing” use of the limb with impairment.

Method: A critical review of the scientific literature accessed Medline via PubMed, with key search terms including: “constraint induced movement therapy,” “stoke,” “acute,” “subacute,” “stroke rehab,” and “hemiparesis.” Results were narrowed to articles published after 2000, those in which free access, patient average age of 60, and RTCs and case studies. Articles were also found through a Cochrane Systematic Review (2015). Four research articles were identified as most closely related to the clinical question, evaluating upper extremity motor function using the Motor Activity Log, Wolf Motor Function Test and Fugl-Meyer Motor Assessment.

Results: The studies included in this critical review support that CIMT is superior to conventional rehabilitation in improving upper extremity (UE) function post-stroke. While many studies have shown short term improvements in UE function, a recent study identified continued improvements in UE performance and paresis one year after termination of CIMT. Researchers postulate that CIMT may reverse “learned-disuse” that commonly accompanies hemiparesis. Key elements of the CIMT approach include extended time of massed practice, increased awareness of the affected upper extremity, and behavior training that teaches task-specific practice of ADLs with the affected UE. Physical therapists should consider using the CIMT approach
when planning interventions for patients within nine months status-post stroke.

**ABSTRACT #40**

*Normal Pressure Hydrocephalus: Can Physical Therapy Play a Role in Functional Assessment and Intervention?*
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Background and Purpose: Normal Pressure Hydrocephalus (NPH) is being identified more often now in an older population. The physical therapist’s (PT) role has not been clearly defined, but PT can be an important part of care for people with NPH by assessing functional changes and facilitating improvements in gait and mobility. This critical review evaluates the research literature to determine how PT may play a role in assessment and treatment of patients with NPH.

Method: The authors critically appraised several articles from various databases including Medline via PubMed, CINAHL, Cochrane Library, and Google Scholar to identify research regarding the PT’s role in assessment and treatment of patients with NPH. The search was narrowed by excluding pediatrics and by including functional assessment outcomes and interventions commonly performed by physical therapists.

Results: One study described the importance of surgical implantation of shunts for improving functional impairments in patients with NPH. Two studies determined that specific physical therapy outcome measurements may be used to assess baseline functional status and predict improvements in functional mobility following shunt placement to drain cerebrospinal fluid (CSF). An additional case study introduced exercise-based physical therapy interventions for gait and balance, following CSF drainage, to improve functional patient outcomes.

Conclusion: Currently, there is very limited evidence considering rehabilitation-based interventions for NPH, although gait and mobility deficits are cardinal diagnostic indicators. New evidence, although limited in generalizability by the descriptive methodology, illustrates that physical therapists may implement interventions focused on postural alignment and dynamic balance training (using auditory and visual cuing) to mitigate gait and balance deficits once shunting has occurred. It is clear that standardized tests commonly used in physical therapy evaluations (i.e., Tinetti and Timed Up and Go) may offer the physician valuable information for quantifying baseline functional level and predicting functional performance for patients following shunt implantation.

**ABSTRACT #41**

*Is Functional Electrical Stimulation Effective for Improving Upper Extremity Function Following a Stroke?*
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Introduction: The loss of upper extremity (UE) function is a common finding post-stroke that can affect a patient’s independence and decrease quality of life. Functional electrical stimulation (FES) is a promising intervention physical therapists can utilize to help patients recover UE function post-stroke. FES provides stimulation of target muscles through surface electrodes applied to the skin during functional tasks such as reaching or grasping. Various studies have looked at the use of FES in rehabilitation of upper extremity post-stroke, and the purpose of this review is to synthesize this research to determine if functional outcomes can be improved by using FES.

Methods: A literature search was conducted to find the most relevant scientific evidence available on the effect of FES on upper extremity function. Articles were selected based on the population, study design, publication year, and measures used. Three articles were critically reviewed for reliability, validity, and applicability to current practice. Two articles compared FES to conventional therapy and the third evaluated FES during task-oriented therapy (TOT) compared to conventional TOT.

Results: All three articles examined the acute or sub-acute stage of recovery and found improvements in upper extremity function in both the experimental and comparison group when comparing outcome from baseline to post-intervention. Two studies found the group participating in FES experienced a statistically significant increase in upper extremity function compared to the conventional therapy group. The study examining FES during TOT versus conventional TOT found an improvement in upper extremity function for the FES group; however, it was not statistically significant.

Conclusion: Results suggest upper extremity function will improve in the acute and subacute stages of stroke recovery with physical therapy intervention, but functional electrical stimulation might enhance recovery when used in conjunction with standard interventions. This literature review found few RCTs examining the
effects of FES in this population; therefore, future studies with a larger sample size would be beneficial to determine the effectiveness of FES.

**ABSTRACT #42**

**Balance Performance for Community Dwelling Older Adults: A Comparison of Dual vs Single Task Training**

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Background: The cost of falls in the elderly population result in an increasing burden on health care cost. With age, balance, cognition and motor function deteriorate, increasing risk for falls in older adults. This decrease in function requires higher attentional resource demands to completion of a single task. Tasks requiring a more complicated focus, such as walking and talking concurrently, split attention, resulting in less attention allocated to one task. Decreased attention increases the likelihood of missing an obstacle, resulting in a fall. Dual task training is a popular intervention for improving function and decreasing fall risk; dual task training consists of simultaneous performance of motor and a cognitive tasks.

Purpose: This critical review evaluates the research literature to compare single task and dual task training for improving balance in community dwelling older adults.

Methods: A literature review was conducted, identifying articles that directly compared single task and dual task training on balance outcomes for older adults. Three studies were selected for appraisal, all of which were randomized control trials from peer-reviewed journals, published within the past ten years.

Results: All three studies demonstrated significant improvements with balance and/or gait speed, but gait speed had more improvement from the dual task training than single task training. One study found that dual task training effect was found to be maintained after 12 weeks. The third study found improved balance in single and dual tasks after training from the single training cognitive group but did not find that dual task training carried over to novel dual task activities.

Conclusions: Although both approaches improve balance, evidence suggests that dual task training may be superior to single task training to improve parameters of overall balance.

**ABSTRACT #43**

**The Use of Vestibular Rehabilitation versus Non-Vestibular Rehabilitation in the Management of Post-Concussion Syndrome in Young Athletes**

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Purpose: This critical review assesses current evidence comparing vestibular rehabilitation to non-vestibular rehabilitation in managing patients with Post-Concussive Syndrome (PCS). Specifically, research literature evaluates whether vestibular rehabilitation is more effective than other treatments (medical or cognitive) commonly used to treat symptoms and hasten return to sport for young athletes following a concussive event.

Methods: Scientific literature databases were searched for studies meeting the following criteria: 1) Comparison of effectiveness of vestibular rehabilitation to traditional treatments (not including vestibular rehabilitation) used to treat patients post-concussion, 2) Use of return to sport (RTS) or dizziness intensity or frequency as primary outcome measures and 3) Publication dates within the past ten years.

Results: Current evidence comparing vestibular rehabilitation to a non-vestibular rehabilitation group for symptom relief or RTS in PCS athletes is scant. However, several studies supported the effectiveness of vestibular rehabilitation as part of a multimodal treatment plan for athletes post-concussion. A retrospective chart review found patients receiving vestibular rehabilitation after concussion had improved self-report, gait, and balance measures with significantly higher reduction in dizziness intensity in children versus adults. One RCT found individuals receiving postural education, range of motion exercise and cognitive and physical rest, in addition to vestibular and cervical spine rehabilitation, were more likely to be medically cleared for RTS earlier than those not receiving the vestibular rehabilitation and cervical spine treatment. A 2017 systematic review found that moderate evidence supporting cervical and vestibular physiotherapy being superior to typical rest followed by graded exertion in terms of medical clearance for RTS. Additionally, commonly prescribed treatments for vestibular symptoms in athletes post-concussion, such as vestibular suppressant medications and prolonged physical or cognitive rest, may exacerbate symptoms and prolong recovery.

Conclusion: Vestibular rehabilitation appears to be a safe, effective treatment option versus traditional cognitive or medical treatments for the athlete post-
conussion, when utilized in a multimodal fashion with other impairment-based treatments.

**ABSTRACT #44**

**Accuracy of bedside examination for balance impairments: Finding the best screening assessment as an alternative to Berg Balance Scale**

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Purpose: Balance impairments are prevalent in the general population, and can increase fall risk. Although Berg Balance Scale (BBS) is a well-validated and popular tool for balance assessment among physical therapists (PTs), it is lengthy, time-consuming, and requires the scale in hand for reference. In our practice, PTs could choose different balance screening tools for bedside examination, such as standing on one leg, standing unsupported with eyes closed to quickly evaluate balance-impaired patients; however, the accuracy parameters (sensitivity, specificity, etc.) of those screening tools are largely unknown. Our study aimed to reveal the validity of widely used bedside balance examinations, using BBS as gold standard.

Subjects: Sixty-five subjects participated in the study. Forty-four of them had complaints of balance impairment, and 21 were spousal controls without imbalance complaints.

Methods: Subjects were evaluated by multiple bedside balance examinations, including truncal sway, UPDRS-raising (from the Unified Parkinson’s Disease Rating Scale), stance base, standing with feet close eyes closed/open, standing with feet apart eyes closed/open, line and ambulation, arm swing, pause after turning, tip-toe walking, heel walking, tandem walking, UPDRS-pull test, 3-, 5- and 10-hop unipedal jumping, BARS-gait (from Brief Ataxia Rating Scale). Bedside examinations were conducted and graded by physicians, and the BBS was administered by blinded physical therapists as gold standard. The screening ability of each bedside test (alone or in combinations) was calculated using the BBS cutoff point of 45. We applied two-sided independent samples t test and Mann-Whitney test in demographic description of subjects.

Results: High-sensitivity tests (over 90%) included: stance base, standing with feet close eyes closed, standing with feet apart eyes closed, standing with feet close eyes open, general gait, pull test (0=normal), 10-hop unipedal jump. High-specificity tests (over 90%): truncal sway, UPDRS-raising, and the pull test (0, 1=normal). The combined procedure of 3-hop unipedal jumping and pull test (0, 1=normal; failed in either one counted as balance impairment) showed 89% sensitivity and 83% specificity.

Conclusions: The best bedside screening tools for imbalance include the UPDRS-pull test, the BARS-gait, standing with feet apart-eyes closed, and the 10-hop unipedal jump (each with a sensitivity over 95%).

**ABSTRACT #45**

**Mastoid Vibration Affects the Postural Control in Healthy Young Adults during Standing**

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Background: Vestibular dysfunction could lead to chronic dizziness and imbalance that can have a significant impact on fundamental activities of daily living. During the research, the role of the vestibular system in postural control during standing was tested in healthy individuals with the use of galvanic and caloric stimulation. However, both types induced uncomfortable sensations of pain. Anxiety due to discomfort may compromise subject responses, and therefore, the usability of these approaches to study the true effects of the vestibular system on balance and postural control during standing is questionable. Therefore, the current study attempted to provide a novel mastoid vibration to examine the contribution of the vestibular system to postural control during standing in different sensory conflicted conditions. Methods: The Sensory Organization Test (SOT) was conducted using Balance Master System 8.4. Two force plates were used to collect center of pressure. The Mastoid vibration (MV) was generated by mechanical vibrotactile stimulus. Eighteen conditions combined 6 SOT conditions and 3 different MV types (no MV, bilateral MV and unilateral MV). For Participants were instructed to “stand still as possible as you can.” Each SOT condition lasted 90 seconds. The dependent variables were the travel distance of COP in anterior-posterior and medial-lateral directions. Two-way repeated measure ANOVAs were performed to determine statistical significance. When significant main or interaction effects were determined, post-hoc comparisons were performed using the Tukey method.

Results: A significant SOT main effect was found in total traveling distance of COP in anterior-posterior (p < 0.001) and medial-lateral directions (p <
0.0001). In addition, a significant MV main effect was found in total traveling distance of COP in anterior-posterior (p < 0.0001) and medial-lateral directions (p = 0.021). A significant interaction between SOT effect and MV effect was found in total traveling distance in anterior-posterior direction (p < 0.0001). The total traveling distance of COP was much longer when receiving unilateral MV than bilateral MV or no stimulus.

Conclusion: MV produced significant increases for total traveling distance of postural sway during standing. For all conditions where visual and/or somatosensory manipulations were also introduced, MV augmented the effect of increasing postural sway regardless if was presented unilaterally or bilaterally.

ABSTRACT #46

An In-Depth Overview of Diffuse Intrinsic Pontine Gliomas
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Tumors that appear in the midbrain, pons, and medulla oblongata hold to be 10 to 25% of all tumors that occur in the central nervous system (CNS). Throughout this poster the potential causes of diffuse intrinsic pontine gliomas (DIPG) will be identified, the presenting symptoms of this brain tumor will be expanded upon. Next, the importance of medical imaging modalities for the use of diagnosis for this brain tumor will be highlighted. Following, the options that for treatment for DIPG will be exhibited. Finally, prognosis of life expectancy will be reviewed. This will review all past and current knowledge regarding high grade brainstem gliomas.

ABSTRACT #47

Imaging Depression with CT & PET: What Can We See?
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The purpose of this poster is to describe depression, computed tomography, positron emission tomography, and how both imaging modalities can be used to determine characteristics of the brain when it is depressed. By determining what depression is doing to the brain, it is possible to find treatments and test whether those treatments will work. Depression is a very serious medical disease that can be difficult to cure for some people. It affects the way people think, act, and feel on a daily basis. There are a variety of treatments to look into and try in order to find the correct one based on each person. Many researchers have been using radiology imaging to determine certain changes in the brain due to depression or due to the treatment for depression. The imaging modalities this poster focuses on are computed tomography (CT) and positron emission tomography (PET). Both imaging modalities have made great contributions to brain imaging. CT scans have provided measurements of different areas in the brain along with the cerebral blood flow in those parts of the brain. PET scans have provided measurements on how well treatments like electroconvulsive therapy are working to help with the effects of depression. With continued research and the help of radiologic imaging, depression will be a well-known disease that can be quickly treated.

ABSTRACT #48

Adenomas of the Pituitary Gland
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The purpose of this literature review is to gain valuable and reliable information on the different types, diagnoses, and treatments of pituitary adenomas. Literature shows that the most common types of pituitary adenomas are prolactinomas, growth hormone secreting adenomas, adrenocorticotropic secreting adenomas, and non-function adenomas respectively. The different methods used to diagnosis these types of adenomas consist of medical and physical exams, blood and urine tests, as well as various imaging tests, and diabetes insipidus testing. These tumors each have their own unique symptoms which make treatment very individualized for each type of pituitary adenoma. Overall, an abundant supply of data and information can be gained from this literature review which is essential for a knowledgeable and up-to-date medical professional.
ABSTRACT #49

The Role of Ultrasound in Anencephaly Diagnosis
Alexa Kasl. Radiography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Kearney, NE

Neural tube defects occur when the neural tube fails to close during development of the fetus. There is no known cause of these defects but they remain prevalent in pregnancies around the world. One of the main types of neural tube defects is anencephaly. Anencephaly is a defect that results in the fetus missing its forebrain and large parts of the skull and scalp. Without these parts of the brain, the baby does not have the functions to sustain life which results in death shortly after birth. Anencephaly can be seen during prenatal ultrasound screenings and has characteristics that can be used to diagnose the defect including the ‘Mickey Mouse’ sign, reduced crown-rump length, absence of cerebral hemispheres, and the appearance of frog eyes. By catching these conditions early, families have more time to receive counseling and decide on a treatment plan before birth of the child.

ABSTRACT #50

The Importance of Medical Imaging in Diagnosing Zika Virus in Fetuses and Neonates
Kelsey McCann. Radiography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Due to the recent epidemic of the Zika virus and its link to brain abnormalities in fetuses and neonates, several studies have been conducted using medical imaging to diagnose and monitor brain development of those infected. This exhibit discusses the background of Zika and also the role of medical imaging in the diagnosing aspect of this infectious disease. Imaging modalities used in these studies include ultrasound, magnetic resonance imaging, and computed tomography. The brain abnormalities consistently found include microcephaly, brain calcifications, cortical atrophy, ventriculomegaly, and corpus callosum dysgenesis.

ABSTRACT #51

The Importance of Magnetic Resonance Imaging in the Diagnosis of Multiple Sclerosis
Nikki Ohlinger. Radiography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Multiple Sclerosis (MS) is an immune-mediated, idiopathic disease of the central nervous system. This disease acts by causing a widely destructive path of the myelination that covers nerve fibers and sometimes reaches to the nerves themselves. The criterion for a positive diagnosis of multiple sclerosis rests on evidence of inflammatory disease activity in the central nervous system and progressiveness over time. Magnetic Resonance Imaging (MRI) is one of the most widely used tools aiding in the diagnosis of multiple sclerosis. In order to make a definitive diagnosis, damage must be found in at least two separate areas of the central nervous system in an MRI scan, the damages must have occurred at least one month apart and all other possible diagnoses must be ruled out. Along with diagnosis, MRI is especially helpful in simplifying the decision making process regarding treatment initiation as well as locating clinically silent, asymptomatic lesions in the brain and spinal cord. This exhibit will go in depth on the MRI imaging techniques that are most beneficial in an early, definitive diagnosis of multiple sclerosis as well as its techniques use to monitor progressiveness over time.

ONCOLOGY

ABSTRACT #52

Correlation of Afirma® Molecular Thyroid Testing with Surgical Outcomes in Indeterminate Thyroid Fine Needle Aspiration Cases
Noha Mohamed, Erin Kew, Donald York, Ronelson Hermosilla, Stanley Seko, Alaa Afify. Cytotechnology program, College of Allied Health Professions, Satellite Site: University of California, Davis Medical Center, CA

Introduction: Fine Needle Aspiration (FNA) of thyroid nodules has shown to accurately classify up to 85% of cases. However, 15% of aspirates may yield the diagnosis of Atypia of Undetermined Significance (AUS). This creates a dilemma for clinicians regarding the management of these cases, and possibly leads to unnecessary surgical thyroid resection. Molecular analysis by Afirma measures the expression of 167 genes, which aid in classifying the cytologic diagnosis of
AUS. The aim of this study is to correlate the Afirma results with surgical outcome in patients at our institution.

Materials and Methods: We performed a retrospective study (2014-2017) by retrieving thyroid cases with the AUS diagnosis from our Laboratory Information System (LIS). Only cases with corresponding Afirma testing were included in the study. Afirma results are classified into three categories: benign, suspicious, and malignant. Correlation of the Afirma results with corresponding surgical pathologic findings of thyroidectomy was performed.

Results: A total of 43 cases (ages 18-80), were identified from the laboratory information system. Of these cases, six were reported as insufficient RNA for Afirma testing, and the remaining 37 cases were included. Eighteen of these cases were benign, and 19 were reported as suspicious by Afirma. Of the benign cases, one revealed papillary thyroid carcinoma (PTC) upon surgical pathologic examination. Of the suspicious cases, eight did not have surgical pathologic follow up, and the remaining 11 had surgical pathologic follow up. Of these 11 cases, one case was diagnosed as non-neoplastic (benign nodular hyperplasia, or BNH), and the remaining 10 revealed neoplasms: three adenomas, seven PTC.

Conclusion: Afirma aids in clarifying the nature of thyroid nodules when the diagnosis of AUS is issued by the cytopathologist. Clinicians should be aware of the availability of the test in order to triage samples for Afirma molecular testing.

ABSTRACT #53

Phyllodes Tumor - A Closer Look
Anna Burk, Emily Buck, Diagnostic Medical Sonography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Phyllodes tumors are a rare breast tumor composed of two types of tissue, connective and glandular tissue. “Phyllodes” originates from the Greek term leaf-like, describing the tumor’s growth pattern. While most phyllodes tumors are usually benign masses, in some cases they have the potential to become malignant. Unlike carcinomas, phyllodes tumors develop inside ducts and lobules, originating in the breast’s connective tissue. They tend to grow quickly and require surgical intervention to reduce the risk of recurrence. This case study describes a rare case of phyllodes tumor. Multiple imaging modalities, including ultrasound, were used in the diagnosis of the tumor.

Ultrasound utilizes non-ionizing radiation and serves as a secondary screening exam for breast pathology in its early stages. The general prognosis is dependent on the stage of the phyllodes tumor and serves as a reminder of the importance of annual breast screening.

ABSTRACT #54

Imaging in Multiple Myeloma
Lynnae Beiermann, Radiography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Multiple Myeloma is a disease of the plasma cells in the bone, where they grow out of control and displace normal blood cells. The most common sign of Multiple Myeloma is bone pain caused by the cancerous plasma cells weakening the bones. The diagnosis of the disease requires extensive lab testing and some medical imaging. Imaging includes the use of conventional radiography, computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography-computed tomography (PET-CT). Each imaging study has its benefits and gives different information about the disease process, such as conventional radiography demonstrating the osteolytic lesions and PET-CT demonstrating the metabolic activity of the disease. Multiple Myeloma has been researched throughout the years and new advances in imaging technology are giving a hopeful outlook to patients and their families.

ABSTRACT #55

Shear Wave Elastography: A Non-Invasive Diagnosis for Thyroid Nodules
Emily Jensen, Radiography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Thyroid nodules are a common occurrence in adults and usually are harmless. However, over the past few decades there has been a dramatic increase in the detection of thyroid nodules. This is due to the increased utilization of medical imaging in present day, especially ultrasound. Ultrasound is the primary modality used for detecting nodules. Technology has become more enhanced and increased sensitivity is able to identify smaller thyroid nodules. After detection of a nodule, fine needle aspiration is the method of choice to diagnose the nodule as benign or malignant. However,
this procedure is invasive and is often inconclusive. Shear wave elastography is a new ultrasound technique that is being utilized to diagnose nodules as benign or malignant. Extensive research could prove that shear wave elastography is a better option over fine needle aspiration. It would create a better experience for patients and provide more accurate results.

**ABSTRACT #56**

**Volumetric Intensity Modulated Arc Therapy Compared with Intensity Modulated Radiation Therapy**

Daniel Sullivan. Radiography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

This presentation covers the topics of volumetric intensity modulated arc therapy (VMAT) and intensity modulated radiation therapy (IMRT). It discusses the benefits and detriments of each therapeutic plan. Different types of cancer are discussed throughout the paper and how the different therapies will affect the cancer and tissues surrounding the cancer. Cancers discussed include: prostate and non-small cell lung. VMAT and IMRT are both effective forms of therapy. However, VMAT was more efficient in delivery of the dose and conformity of the dose in some cases. Furthermore, VMAT also irradiates surrounding tissues more in certain cases as well. Both VMAT and IMRT have their benefits and detriments.

**ABSTRACT #57**

**Leiomyosarcoma Diagnosis through Imaging**

Kelsie Valish. Radiography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Leiomyosarcoma is a malignant soft tissue mass seen in middle aged to older adults. The purpose of this exhibit is to describe the symptoms, diagnoses through imaging, treatment, and prognosis of leiomyosarcomas. Scholarly journals and online research were the main sources of information used for this exhibit. Diagnosis of leiomyosarcoma can be made through diagnostic radiographs, MRI’s, CT’s, ultrasounds, or PET images. The information about symptoms and images acquired can help better diagnose patients with leiomyosarcomas. It is better for people to be aware of these symptoms, and appearances on images so that an early diagnosis can be made, and patients are more likely to have a better prognosis.

**ABSTRACT #58**

**The Efficacy of Prone Breast Irradiation versus Supine Breast Irradiation: Dosimetric, Cosmetic, and Individualized Limitations**

Jaden Boudle, Travis Callender, Gabriela Villeata Astacio. Radiation Therapy program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Breast cancer is the most common malignant disease for women in the United States and is the second leading cause of death when it comes to cancer for women. Due to the incidence and mortality of breast cancer, it is imperative that the most effective and precise treatments for the disease are developed. Radiation therapy is now considered a gold standard of treatment for breast cancer making it crucial that the best methods of delivering radiation therapy are utilized. Delivering radiation in a prone position as opposed to a supine position has garnered a great deal of attention in recent studies. Prone breast radiation therapy is thought to be the superior method of delivering radiation by many researchers and oncologists due to its dosimetric advantages and ability to limit cosmetic side effects and skin toxicities. While using a prone treatment plan and setup instead of a supine treatment plan does have its dosimetric and cosmetic advantages, it is not something that can be standardized and generalized to every patient as there are individualized factors and reproducibility issues that must be accounted for when determining which type of treatment plan to develop and setup to use.

**ABSTRACT #59**

**Future Applications of Magnetic Resonance Imaging in the Field of Radiation Therapy**

Martina Graner, Ally Gilliland. Radiation Therapy program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Technology is improving day by day, and in the field of radiation therapy, this trend holds true. For years imaging procedures throughout the field have been evolving. In the beginning, x-rays have been utilized as
much as possible for diagnosis as well as throughout the treatment simulation process. Currently, computed tomography is used most commonly for treatment simulation, as well as daily imaging through cone beam computed tomography (CBCT). But the use of magnetic resonance imaging is making its way into the world of radiation oncology in a big way. The application of MRI in treatment planning and even more modern, in the treatment room, through MRI guided linear accelerators, this may be become a “new normal.”

ABSTRACT #60

A Comparison of Current Treatment Techniques for Left Sided Breast Cancer
Megan Mihulka, Bess Dobransky. Radiation Therapy program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Breast cancer is the second leading cause of cancer related deaths in women in the United States. Radiation therapy has been used as the mainstay of treatment following a mastectomy or lumpectomy. 3D-CRT, IMRT, and VMAT are the most common techniques used for radiation treatment. The importance of target and dose conformity is important to lessen the overall dose to critical structures and healthy tissue. IMRT and VMAT are have superior dose conformity over 3D-CRT; however, the low dose volumes to the contralateral heart and lungs are the highest in VMAT techniques. Low doses of radiation can cause damage and cellular mutations leading to secondary malignancies and ischemic heart disease. Even though IMRT and VMAT techniques lessen the dose to the ipsilateral lung and increase the tumor dose, 3D-CRT is the best option for treatment. This is because the risks of low dose cellular mutations in the contralateral heart and lungs is the lowest, lessening the risks of future secondary malignancies.

PREVENTION AND WELLNESS

ABSTRACT #61

Improving Patient Care with the Paris System for Reporting Urinary Cytology
Kayla Bacher. Cytotechnologist program, College of Allied Health Professions, Satellite Site: Carle Foundation Hospital, Urbana, IL

Introduction: Compared to previous urinary cytology reporting systems, The Paris System (TPS) for Reporting Urinary Cytology provides improved clarity and specificity for making cytologic diagnoses; however, it is necessary to consider the effect of this new system on patient care. Setting specific criteria for diagnosing “Atypical Urothelial Cells” (AUC) as well as taking advantage of the UroVysion assay should lead to fewer unnecessary surgical biopsies and ultimately improve patient care. UroVysion uses fluorescence in situ hybridization (FISH) to distinguish truly abnormal nuclei from reactive; since “AUC” diagnosis is difficult to handle, this assay allows the clinician to decide whether to watch and wait or take appropriate surgical action.

Materials and Methods: This project examines two sets of cases to determine the rate of “AUC” diagnoses at one institution before and after the implementation of TPS in August 2016. Data for each set includes up to 50 cases diagnosed as “AUC” with a six month follow-up. Cases for set “A” were taken starting January 1, 2015 and include follow-up surgical biopsy or cytology; this allows determination of follow-up surgical biopsy rate previous to the implementation of TPS. It is also necessary to evaluate the correlation of “AUC” diagnoses with UroVysion results and surgical diagnoses to determine the accuracy of The Paris System. The second set of cases includes the first 50 cases diagnosed as “AUC” beginning April 1, 2017 with a six month follow-up UroVysion or surgical biopsy. Results: Out of 337 total urine cases between January 1, 2015 and July 21, 2016, 44 cases were diagnosed as “AUC” and included follow-up information: 61.4% surgical biopsy follow-up and 38.6% cytology follow-up. Out of 169 total urine cases between April 1, 2017 and February 7, 2018, 38 cases were diagnosed as “AUC” with follow-up information: 10.5% surgical biopsy follow-up (only performed when UroVysion indicated “positive” or insufficient urine volume to perform assay) and 97.4% UroVysion follow-up. 2 cases revealed positive UroVysion results and corresponding surgical biopsies showed high grade urothelial carcinoma.

Conclusion: Overall, results obtained show a significant decrease in follow-up surgical biopsy with the help of UroVysion results and stricter criteria for “AUC” diagnoses.
ABSTRACT #62

Urethral Diverticulum in Women: Modality Choices to Diagnose
Emily Sybrant, Hannah Hammond. Diagnostic Medical Sonography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

The role of imaging modalities in diagnosis of urethral diverticulum in women does not have well-established protocols for this genitourinary disease. Even with significant developments of increased medical imaging sensitivity, not all modalities are accurate. Multiple imaging modalities are used in most cases to confirm the outcome of urethral diverticulum due to nonspecific presenting symptoms. This poster highlights a case study of a female in her late 60’s who presented with symptoms of hematuria, dysuria, dribbling, and decreased urinary stream. Multiple imaging modalities were used to confirm the diagnosis of urethral diverticulum.

ABSTRACT #63

Serum Tocopherols and Socioeconomic Status in Maternal-Child Pairs
Laura Evans. Medical Nutrition Education program, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Objective: The main objective of this cross-sectional study is to investigate serum levels of vitamin E tocopherol isomers (specifically alpha and gamma) in mothers and infants in relation to indicators of socioeconomic status.

Methods: This was a cross-sectional study of 184 mothers admitted to the Labor and Delivery Unit and their infants. Samples of maternal and cord blood were collected at the time of delivery, and a food frequency questionnaire (FFQ) was administered to the mother to measure maternal vitamin E tocopherol intake. Indicators of socioeconomic status, including, race, US household food security, and insurance type was obtained from the mothers. Serum tocopherols were measured in the Biomarker Research laboratory at the Harvard School of Public Health using high-performance liquid chromatography (HPLC). Descriptive statistic and Spearman correlation coefficients were calculated. P-value <0.05 was considered statistically significant.

Results: Of mothers enrolled, 59.2% were white and 40.8% were non-white. Vitamin E deficiency was present in 6.6% of mothers and 98.7% of infants. No significant correlations were found between maternal and infant serum α and γ-tocopherol levels and maternal α- and γ-tocopherol intakes were not associated with maternal or infant serum α- and γ-tocopherol levels. Additionally, there were no significant differences found between median serum α- or γ-tocopherol levels and food security or insurance type. However, a significance difference in median serum α-tocopherol levels was found between the white and non-white study participants (P=0.012).

Conclusion: There is a high prevalence of vitamin E deficiency in infants, but not in their motherly counterparts. White mothers had a significantly higher median serum α-tocopherol level than non-white mothers. Further research is needed to identify how to close the gap between differences in serum α-tocopherol levels in women of different racial backgrounds.

ABSTRACT #64

The Identification of the Predictors of Essential Fatty Acid Deficiency in Patients with Short Bowel Syndrome
Ashley Reese, Hilary Catron, Chris Wichman, Glenda Woscyna, Megan Timmerman, Corrine Hanson. Medical Nutrition Education program, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Background: Essential fatty acids are imperative for normal physiological function and include both linoleic acid (18:2ω-6) and α-linolenic acid (18:3ω-3). Because they are not synthesized by the body and only obtained through the diet, individuals who exhibit severe fat malabsorption, individuals on restricted or fat-free parenteral nutrition, or individuals consuming low-fat diets are at risk for development of essential fatty acid deficiency. Although it is known what populations may be at risk for the development of essential fatty acid deficiency based on their consumption and/or absorption of linoleic acid or α-linolenic acid, there is a significant knowledge gap in the literature regarding other factors that may predict the development of essential fatty acid deficiency.

Purpose: To identify predictors of essential fatty acid deficiency in patients diagnosed with short bowel syndrome enrolled in the Intestinal Rehabilitation Program at Nebraska Medicine.

Methods: A retrospective chart review of 47 parenteral-nutrition dependent subjects diagnosed with short bowel syndrome was completed with the primary outcome of a diagnosis of essential fatty acid deficiency.
using a clinical diagnosis or a triene to tetraene ratio. Descriptive statistics were calculated for all variables along with chi-squared tests, Wilcoxon summed rank tests, as well as logistical and linear regression models to determine unadjusted associations between explanatory variables and outcome variables.

Results: The frequency of parenteral nutrition lipid administration was associated with a clinical diagnosis of essential fatty acid deficiency, specifically with daily administration \( p=0.01 \). There was also significant association between serum mead acid level and the triene to tetraene ratio \( p=0.001 \) as well as the diagnosis of essential fatty acid deficiency \( p=0.035 \).

Conclusion: It was concluded that in patients with short bowel syndrome, those least likely to develop essential fatty acid deficiency were those who received daily parenteral lipid. It was also found that mead acid, was positively associated with the triene to tetraene ratio as well as a clinical diagnosis of essential fatty acid deficiency. Although few, these associations provide a starting point for researchers and clinicians alike, especially regarding the patient population diagnosed with short bowel syndrome.

ABSTRACT #65

Omega-3 Fatty Acid Intake in Midwest Postmenopausal Women and Associations with Asthma Diagnosis
Rachel Thiemann, Laura Bilek, Nancy Waltman, Corrine Hanson. Medical Nutrition Education program, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Objective: Intake of omega (n)-3 fatty acids has been associated with beneficial health effects in respiratory diseases such as asthma; however, this association has mainly been examined in children and adolescents. Currently, guidelines suggest a minimum intake of 250 mg of n-3 daily. Adults in geographic locations such as Midwestern states may have much lower intakes of n-3 because they have limited access to seafood. Therefore, the objective of this study was to determine average n-3 intake in a population of Midwestern postmenopausal women and the association of n-3 intake with a diagnosis of asthma.

Methods: This study evaluated baseline intakes of n-3 fatty acids in 70 female postmenopausal subjects. Data were obtained from women participating in a larger study – the Heartland Osteoporosis Prevention Study. The Willet food frequency questionnaire was used to measure dietary intake. Participants also completed an eleven-question respiratory health questionnaire including questions on the presence/absence of respiratory diseases such as asthma. Descriptive statistics were calculated, and the Mann-Whitney U test was used to determine the association between asthma diagnosis and n-3 fatty acids including eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA), and docosapentaenoic acid (DPA).

Results: Median intake of DHA+EPA was 210 mg/day. Over half of the women (55%) did not meet the recommended guidelines for n-3 intake. There was no significant association between the prevalence of asthma and EPA, DHA, DPA, or DHA+EPA \( p\)-value = 0.792, 0.681, 0.559, and 0.624, respectively. Of the 70 women in the study, only 5 individuals had a diagnosis of asthma.

Conclusion: This sample of Midwestern postmenopausal women did not meet recommended guidelines for n-3 fatty acid intake. It is possible n-3 fatty acid intake and the diagnosis of asthma in this population is too low to demonstrate an impact on respiratory symptoms.

ABSTRACT #66

Cardiac Magnetic Resonance Imaging: A Literature Review
Kaylee Samway. Magnetic Resonance Imaging program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Kearney, NE

Cardiac magnetic resonance imaging (CMR) is an emerging medical imaging technique that allows clear visualization of the cardiac tissue, chambers and blood flow. The detailed images and cine clips created with CMR enables clinicians to accurately diagnosis and treat disorders of the heart that can be difficult to quantify with other imaging examinations. This examination offers a diagnostic quality examination, free of ionizing radiation that allows optimal viewing of the beating heart. The cardiac imaging application for magnetic resonance scanners is becoming more common and more obtainable with increased technologist training. CMR examinations have been made easier for patients to participate. Cardiac MRI is expected to soon be the gold standard for imaging of the cardiac structures and function.
ABSTRACT #67

Reviewing the Effect of Exercise in Reducing Depressive Symptoms among Adolescents
Ekta Haria. Division of Physician Assistant Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

With increasing depression episodes and limited treatment options, there is growing interest in the potential role of exercise in the reduction of depressive symptoms. The aim of this meta-analysis was to examine whether exercise reduces depressive symptoms among depressed adolescents. Studies were reviewed and the analysis provides preliminary evidence that exercise is effective in reducing symptoms of depression among adolescents with clinical levels of depressive symptoms. However, it is limited by the generally low quality of included studies, high level of between-study heterogeneity and restriction of inclusion criteria to published studies.

ABSTRACT #68

The Effectiveness of a Community-based Exercise Program versus Home Exercise Program in Older Adults
Avery Dickinson, Alex Eilers. Division of Physical Therapy Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Purpose: Physical therapy (PT) interventions that include strengthening, balance and flexibility training are known to decrease fall risk in older adults, but to maintain improvements, exercise must continue following discharge from the skilled PT environment. Both community-based and home-based exercise programs are commonly prescribed to maintain the functional gains following discharge. The aim of this critical review is to determine if there is a difference in effectiveness between a community-based and home-based exercise program for older adults with regard to improvement in balance and mobility.

Methods: The Medline database was searched, and parameters were changed to narrow initial yield from 243 to 48 articles for consideration. Further limits identified three articles that directly compared home-based to community-based exercise programs with similar interventions.

Results: Significant improvements in all outcome measures (Elderly Mobility Scale, Berg Balance Scale, Numeric Pain Rating scale, 12-item Short-Form Health Survey, and the frequency of falls) were evident for community-based exercise programs, but not the home-based program. However, many patients who declined participation in a community program, did agree to engage in a home exercise program, indicating that home-based exercise programs may facilitate adherence, especially for older adults who understand that home exercise required no transportation, incurred no cost and could serve as an effective means to decrease risk of falling.

Conclusions: Although the community-based programs have been shown to offer better functional results, some patients may be more likely to participate in a home-based, no cost option. For the best outcome, program type and patient preference must be considered.

ABSTRACT #69

Effect of Different Viscous Foods and Liquids on Swallowing Sounds
Chun Feng¹, Jung Hung Chien¹, Cheryl Wagoner², Kathleen Volkmann¹, Ka-Chun Siu¹. 1-Division of Physical Therapy Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE; 2-Madonna Rehabilitation Hospital, Lincoln NE.

Background: Swallowing as a daily behavior happens on average of 585 times per day (range from 203 to 1008), which changes with age. However, it is unclear when the swallowing function specifically starts to decrease. Non-pathological features of the swallowing in healthy aging and the factors that influence an individual’s ability to eat and drink safely need greater understanding to prevent future dysphagia. Dysphagia is a particular concern of decreased swallowing function because it causes serious consequences. Individuals who have dysphagia regardless of severity or presence of aspiration are three times more likely to develop pneumonia than those without dysphagia. It also increases the risk of chest infection, dehydration, malnutrition and even death. Ample evidence supports that the swallowing pattern can be altered by manipulating the viscosity of food to decrease the risk of the aspiration/penetration.

Methodology: Nestle ThickenUp as a food thickener was used to thicken the liquids according to International Dysphagia Diet Standardization Initiative (IDDSI) respectively. Ten healthy subjects (5 middle-age, 5 young subjects) participated to swallow 5ml water, honey-like, pudding-like liquids and apple sauce in that order with their head-trunk in neutral position. The accelerometer (iASUS NT3-R Throat Mic Headset, CA, USA) recorded three trials of swallowing sounds of each liquid at the level of the cricoid cartilage in the anterior neck. Two-way repeated measures ANOVA was applied
to analyze the duration and mean frequency of swallowing sounds among young and middle-age subjects.

Results: Middle-age group showed no difference from young-age group when swallowing more viscous liquids, but the mean frequency of swallowing sound was lower among middle-age group than young-age group when swallowing water (p<0.05, mean frequency).

Conclusion: Swallowing sounds change from young to middle age, yet such change has no significant impact on swallowing function. Mean frequency of swallowing sounds among the young-age group was significantly higher than the middle-age group when they swallowed water, which may indicate young-age subjects have a stronger swallowing reflex than middle-age subjects. However, slight swallowing function change among middle-age group can be compensated by modifying the viscosity of the liquids.

ABSTRACT #70

The Impact of Physical Activity on Attention Allocation in Normal and Narrow-Based Treadmill Walking
Meng Liu. Division of Physical Therapy Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Purpose/Hypothesis: Doing regular physical activities has been suggested to induce positive effects on cognitive function including executive function. However, lack of direct evidences about how regular physical activity affect attention allocation. This study attempted to identify a direct evidence that doing regular activities indeed enhances ability to allocate attention by using a novel approach — Modified Attention Allocation Index (mAAI). We hypothesized that young adults who have regular physical activities were easier to execute their attention allocations with respect to the different experimental instructions than young adults who do not have regular activities;

Number of Subjects: 20 (6 males and 14 females, average age: 24.5±3.8 years old).

Materials/Methods: Six conditions are randomly assigned to subjects (2 types of walking-based x 3 types of attention allocation conditions). Walking-based conditions were normal-based (50 x 155 cm) and narrow-based (15 x 155 cm) treadmill walking. Three attention allocation conditions were 100% focus on walking within the width of treadmill while performing the secondary task simultaneously, 50% focus on both walking and secondary task, and walking with 100% focus on the secondary task. The secondary task was to perform a 3-letter back recognition test. Spatial-temporal gait parameters (stride length, stride time and step width) were recorded using motion capture system (Qualysis). We are particularly interested in examining with-task trade-offs in response to instructions in order to understand the capability of execution function. Thus, a scatter plot between mAAI of spatial-temporal gait parameters and mAAI of numbers of errors made in the secondary task was made. Higher correlation and higher slope rate of the scatter plot indicated better attention allocation capability.

Results: Our results indicate that there is higher correlation and higher slope in scatter plot of young adults who were physically active than that of young adults who are not physically active in both normal and narrow-based walking.

Conclusions: Doing regular physical activities clearly enhances the capability of execution function. In addition, young adults who do regular physical activities tend to be more able to shift attention allocation in different challenging conditions flexibly.

ABSTRACT #71

The Effect of Continuous Sloped Treadmill Walking on Dynamics of Gait Parameters in Young Adults
Jiani Lu, Jung Hung Chien, Li Zhang, Ka-Chun Siu. Division of Physical Therapy Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Walking on a sloped surface is a fundamental daily activity. The impairment of this function deteriorates the quality of life in the older adults. Therefore, to understand the gait characteristics while walking on the sloped surface is crucial for developing rehabilitation tools for older adults. Previous studies have suggested that walking on the sloped surface requires specific modification of the neural control strategy in comparison with level walking by increasing the stride length and stride time. However, these abovementioned findings only focus on a discrete but not a continuous motion. The limited number of trials used might sometimes hinder the “true” locomotor mechanism behind the fact of walking on the sloped surface. In addition, the limited number of trials cannot be used to measure the change of the amount of variability and temporal structure of variability, which are widely used to identify the potential risks of falls or other neurological disorders. This study would fill in the knowledge gaps for two-folds: 1) to understand the change of the amount of variability during different slopes of treadmill walking and 2) to understand the stride-to-stride fluctuations during slope walking and
potentially provide the rationale for training protocol in people with the impaired locomotor system. 10 healthy young adults were asked to walk on the treadmill for 2 min under each inclination condition (0%, 3%, 6% and 9% of grade). The sequence of the four conditions was randomized. The effects of inclined walking on stride interval and stride time were analyzed by mean, coefficient of variance (amount of gait variability) and long-range correlation (temporal structure of gait variability). The detrended fluctuation analysis was used to determine whether the long-range correlation is statistically persistent or statistically anti-persistence. The means and CVs of stride interval and stride length were not affected by the inclined walking surface. As the grade of inclination increased, the stride interval became more statistically persistent whereas the stride length became less statistically persistent. Our results showed that the central nervous system might allow more adaptability in stride length by restricting variability of stride interval to adapt inclination walking.

**ABSTRACT #72**

A Detailed Overview of Nephrolithiasis
Richard Heekendorn. Radiography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Nephrolithiasis, or more commonly known as kidney stones, is a condition where multiple minerals and elements crystalize and form a stone in the kidney. There are many ways these stones can form, both non-spontaneous and spontaneously. How a stone is formed can vary, but the most common compound is composed of calcium, uric acid and cystic crystals. A kidney stone has very distinguishable signs and symptoms, although some cases do not present the normal signs. To properly diagnose a stone a physician will most likely order a computed tomography scan, but other modalities can be used if necessary. One of the most common ways to treat a stone is to have it pass naturally with the aid of pain medication if the size permits, for larger stones a couple of invasive procedures that include extracorporeal shock wave lithotripsy (ESWL) and percutaneous nephrolithotomy (PCNL).

**ABSTRACT #73**

Saving Children from Radiation
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The purpose of this paper is to discuss the usage of radiology when it comes to pediatric patients. X-rays and other radiologic modalities, such as Computed Tomography, are highly used as a child grows, and with that comes increase in radiation exposure. To help decrease this risk of exposure, organizations have come together to set standards for radiation of pediatric patients. After so many exposures, a child can no longer keep up with the harmful effects of increased radiation and fatal diseases may be the resulting aspect.

With this as a future predicament, it is up to everyone who comes into contact with any pediatric patient to help reduce the increase in radiation exposure by keeping in mind the Image Gently pledge, following all child safe technical methods of radiology, making certain there is a genuine reason for every pediatric exam, and understanding the effects of too much radiation.

**ABSTRACT #74**

Cytological Processing Techniques and Their Effect on the Cytotechnologist
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Introduction: Cytology laboratory techniques allow for a variety of different methods for processing specimens for evaluation. The diagnostic outcomes of these different processes are largely consistent, but they are not commonly studied. Also, the effect of different processing methods on the cytotechnologist’s screening of each slide has not been researched regularly. The importance of studying these outcomes is vital for maximizing accuracy in diagnosis and for efficiency in slide screening.

Methods: Slides were processed via three different cytologic techniques: Cytospins, ThinPrep and SurePath. Eight body cavity fluid specimens were selected and processed through all three techniques. The slides were then screened by two board certified cytotechnologists. Screening time and diagnosis were recorded for each individual slide. Outcome variables
were measured by assigning a point system to levels of diagnoses and comparing these results to actual diagnosis from a pathologist on each specimen’s originally created slide.

Results: All three processing techniques yielded different diagnoses than the originally created slides’ diagnoses. ThinPrep slides were the most accurate of all three processes, followed by Cytospin slides and SurePath slides. Screening time varied for each processing method. On average, Cytospin slides had the shortest screening time, followed by SurePath and ThinPrep. These numbers varied from each cytotechnologist, which is to be expected as cytotechnologist’s preferences vary.

Conclusion: The results showed diagnostic differences in all three techniques. While ThinPrep processed specimens were the most accurate, there were incorrect diagnoses for all three processes. These may have resulted from the integrity of the samples chosen. Screening time is an important statistic to consider, but accuracy is more important when it comes to diagnosing patients. Therefore when contemplating which technique to use in cytological processing, screening time should come secondary to accuracy in diagnosis. In conclusion, despite having the longest screening time, the ThinPrep processing technique was the most efficient of the cytological processing techniques tested in this experiment.

ABSTRACT #75

Chronic Pancreatitis and Puestow Procedure: A Case Study
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Chronic pancreatitis is an uncommon disease; however, it is increasing in incidence. There are multiple treatments available, but there is no cure. Medical therapies are attempted first, but if they fail, a patient may be considered for surgical intervention. One of the common procedures performed is a Puestow Procedure. It is a procedure that may be successful in relieving the patient’s symptoms. Ultrasound plays an important role in performing a Puestow Procedure. This project reviews a case of a male in his early forties who underwent a Puestow Procedure to help treat his chronic pancreatitis.

ABSTRACT #76

A Comparison of Preclinical Learning Environments: PA Student Perceptions of Clinical Competency
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Hippocrates’ Oath addresses the importance of interprofessional cooperation, the necessity of unceasing pursuit of knowledge and skill, and incorporates humanistic principles into the practice of medicine1. A recent study suggests that in the demanding world of modern medicine, students are inadequately prepared to uphold this oath.2 This outcome has led some to question if today’s students are sufficiently prepared for the weighty responsibilities of their chosen profession. Traditionally, the preclinical medical curriculum is focused heavily on didactic instruction, with little emphasis placed on patient encounters until late in the curriculum3. Efforts to engage students in experiential learning early in their educational tenure have recently become more common, resulting in a shift in medical curricula4. The benefits of exposing preclinical students to direct patient care are numerous; early patient contact serves to augment the development of professionalism, clinical reasoning, and humanism5. Importantly, incorporation of early clinical experience also familiarizes future practitioners with the increasingly complicated and ever-evolving world of modern medicine6. In the United States, this evolution can be seen in the number of medical schools encouraging preclinical patient encounters, both through participation in student-run free clinics and clinical preceptorships. Currently, there is limited data to suggest which preclinical experience is superior, especially as pertains to physician assistant (PA) education7. This study seeks to provide insight into the efficacy of and differences between each preclinical setting in producing qualified student clinicians and in students’ perceptions of clinical competency, specifically as pertains to the University of Nebraska Medical Center’s PA curriculum. The domains considered representative of an adequate medical education are interprofessionalism, the application and furthering of medical knowledge, and cura personalis - the art of medicine.

Methods (descriptive study): A self-administered survey was developed to provide insight into the efficacy and differences between each preclinical setting; survey designed to measure students’ perceptions of clinical competency in the areas of interprofessionalism, medical knowledge, and care for the whole person (cura personalis).
ABSTRACT #77

Faculty Scholar Score: What is the Value of Different Scholarly Activities?
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Background: A critical aspect driving the educational development, evidence-based practice, and patient-centered care of the physical therapy (PT) profession is scholarly activity. However, only 21% of PT education faculty describe themselves as being actively involved with research. To our knowledge, a measure to thoroughly and accurately quantify the value of scholarly activity for PT educators does not yet exist. The first aim of this study was to ascertain if a difference in value of various scholarly activities existed between different Carnegie Classification institutions. The second aim was to establish a measure which accounts for the relative values of each scholarly activity to help guide PT educators in their scholarly agenda and career planning.

Methods: Utilizing Dillman’s Survey Protocol, we sent an online survey to 226 PT Program Directors at CAPTE accredited institutions (93 Doctoral, 93 Masters, 36 Special Focus, 4 Baccalaureate). 4 of the 226 e-mails bounced, bringing the potential respondent pool to 222. The survey asked respondents to place a value on 39 individual components of scholarly activity encompassing grants, publications, and presentations. Statistical comparison was performed via 1-way ANOVA with Bonferroni correction using SPSS statistical software.

Results: We received 53 responses from Doctoral (n=24), Masters (n=19), and Special Focus (n=10) institutions for a response rate of 24%. We found a significant main effect between the three groups on 2 of the 39 items: Authorship Order; Last [Masters (27.9±29.5) and Doctoral (54.6±33.6) (p=.028)] and Grant Role: PI/Co-PI [Masters (52.6±30.0) and Doctoral (79.6±34.3) (p=.036)]. However, Last Author and Grant Role did not differ between Special Focus and Doctoral or Special Focus and Masters classified programs. We developed a weighted formula based on these results to quantify a PT educator’s scholarly activity into one numeric value that could be objectively compared across Carnegie Classification institutions.

Conclusion: Scholarly activity plays an integral role in the career advancement of the faculty member while also benefiting PT educational institutions, students, and patients. The development of an objective measure offers the ability to bring uniformity to value of scholarly activity in a manner that can be equally applied across different Carnegie institution classifications.

ABSTRACT #78

The Role of Radiology in Trauma Situations
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Traumatic events occur every day across the world. The individuals involved in those events get severely injured and there needs to be trained personnel to help save them. The trauma team consists of many people such as paramedics, respiratory therapists, pharmacists, care techs, nurses, Emergency Room doctors, Operating Room doctors, and x-ray technologists. As the patient arrives to the hospital, everyone is prepared and knows what role they will have for the duration of the trauma. Clean areas and clear communication between everyone are key to providing the best care to the patient. Radiology personnel are crucial to have during a trauma. X-ray and Computed Tomography (CT) are two modalities of radiology that aid in the internal diagnosis of a patient. Chest and pelvis x-rays are two common exams performed in the trauma bay. Chest x-rays are able to help diagnose several injuries or lung diseases such as shortness of breath, fractured ribs, a pneumothorax, fluid in the lungs, and changes in shape or size of the heart which could lead to heart failure. Pelvis x-rays are taken when the patient has undergone a crush injury to determine if part of the pelvis or proximal femurs are fractured. With many major vessels surrounding the hip and pelvis, the rupture of an artery can be very life threatening. A CT exam can often show more specifically where a fracture may be. It can also show much more than an x-ray for skull and abdominal imaging, such as internal bleeding and hematomas. For imaging a trauma patient, the technologist must be able to work under stressful and fast-paced conditions so that the patient receives the best care and the doctors can continue to treat the patient.
ABSTRACT #79

Radiography in the Forensic Field: A Brief Look into Viritopsy
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Viritopsy refers to the use of the radiography field in forensics, which apples computed tomography (CT), magnetic resonance imaging (MRI), and 3D scanning. With Viritopsy being hands-off, this can aid in many cases where the pathologist and their assistant can be exposed to contagious pathologies, or from an unseen, sharp object. In cases relating to gunshot, known as ballistic trauma, viritopsy can assist in detecting the entrance wounds and exit wounds. The findings made can help determine the cause of death, and maybe solve a criminal case. Some other benefits are the fast and efficient documentation that can be done, as well as the ability to archive images for future references. When comparing viritopsy to autopsy, viritopsy is more culturally competent since the hands-off aspect may not interfere with religious beliefs or personal reasonings that were against an autopsy.

ABSTRACT #80

Elastography in Clinical Use
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Elastography has provided useful information when applied to the diagnosis of both liver fibrosis and breast lesions. It can measure the tissue stiffness, which can be converted into kilopascals for easy comparison. The issue, however, with validating elastography as a diagnostic test is that stiffness values have yet to be determined for both fibrosis staging and for malignant breast lesions. Even so, elastography can characterize already known lesions, as well as provide follow-up information on patients.

Although it is not yet diagnostic, elastography is helpful with tests that are already considered diagnostic, such as biopsies and B-mode ultrasound exams. There is a strong correlation between tissue stiffness and abnormalities, predicting a positive outlook for elastography in the future.

ABSTRACT #81

Quantifying the Follow-up Results after an ASC-H Pap Test Diagnosis and Establishing Pitfalls
Eric Freemon. Cytotechnology program, College of Allied Health Professions, Satellite site: Carle Foundation Hospital, Urbana, IL

Introduction: The Bethesda System category of Abnormal Squamous Cells cannot exclude HSIL (ASC-H) is a common-place diagnosis used to describe abnormal pap tests that contain rare high grade appearing cells. Recent studies have revealed a high false-positive rate associated with the ASC-H diagnosis. In order to delve into this issue, ASC-H cases were studied in an effort to find pitfalls that could be identified, thereby decreasing the false-positive rate. It was decided to eliminate as many independent variables as possible, therefor only cases in which the patient tested positive for HPV were included.

Methods: This is a two year (2016-17) retrospective study in which ASC-H Pap Test cases with accompanying HPV positive status were identified at the Carle Foundation Hospital. After this identification, researchers looked at what the ensuing biopsies were signed out. Cases in which an initial ASC-H diagnosis was made and a follow-up biopsy in which no further dysplasia was identified were added into the Group of Interest (GoI). ASC-H cases that were followed by a biopsy in which further HSIL was identified were placed into the Comparison Group (CG). These two groups were screened by blinded researchers who were given a checklist to record their observations of the slide. Researchers were aware that all cases were called ASC-H. Checklist included “possible streaming,” “hyperchromatic crowded groups,” “Single Cells/Small Groups,” “Prominent Nucleoli,” “Atypical Nuclear Borders,” “Groups with incorporated PMNs,” “Keratoing Dysplasia,” and “Extreme Nuclear Pleomorphism.”

Results: Of the markers provided in the pre-made sheet, researchers found that the Comparison Group recorded higher percentages in all but one category. Substantial differences were seen in categories “Prominent Nucleoli” (GoI: 30.8%, CG: 39.1 %), “Markedly Atypical Nuclear Borders” (GoI: 57.7%, C: 69.9%), and “Extreme Pleomorphism” (GoI: 11.5%, C: 21.7%).

Conclusion: This retrospective study provides helpful morphological tips in how to achieve a lower false positive rate by avoiding pitfalls. This study showed prominent nucleoli, markedly atypical nuclear membranes, and extreme pleomorphism showed to be the markers that a cyto technologist could use to decrease their false positive rate.
**ABSTRACT #82**

Follow-up of HPV Positive Gynecological Smears: A one-year retrospective study  
Joana Palafox. Cytotechnology program, College of Allied Health Professions, Satellite Site: Swedish Covenant Hospital

Introduction: According to the American Cancer Society, there are roughly 13,200 new cases of invasive cervical cancer that will be diagnosed in 2018 and about 4,100 women will die from cervical cancer. However, the death rate for cervical cancer has significantly dropped with increased Pap test screening and the human papillomavirus (HPV) test. Having a HPV test with a Pap test is a way of finding pre-cancerous changes before they turn into invasive cancer. This study aimed to see if sending HPV positive patients with normal, ASC-US (atypical squamous cells of undetermined significance), LSIL (low-grade squamous intraepithelial lesion) and HSIL (high-grade squamous intraepithelial lesion) Pap smears to have a colposcopy is a beneficial standard of practice for detecting and preventing cervical cancer.

Methods: This is a one year (2017) retrospective study of normal and abnormal (ASCUS, LSIL, HSIL) Pap cases with HPV positive testing that were performed at Swedish Covenant Hospital in Chicago. The cases were then checked to see if there was a corresponding LSIL or HSIL surgical biopsy.

Results: A total of 99 normal, ASC-US, LSIL and HSIL Pap smears with HPV positive results were identified along with a correlative surgical biopsy that were recorded from January 2017 to December 2017. The results were as follows: 29 ASC-US HPV positive cases led to a LSIL surgical biopsy, two ASC-US HPV positive cases led to a HSIL or Carcinoma In Situ (CIS) surgical biopsy, 26 LSIL HPV positive cases led to LSIL surgical biopsy, 17 LSIL HPV positive cases led to a HSIL or CIS surgical biopsy, five HSIL HPV positive cases led to a HSIL or CIS surgical biopsy, 14 normal HPV positive cases led to a LSIL surgical biopsy, five normal HPV positive cases led to a HSIL or CIS surgical biopsy, and one HSIL HPV positive case led to a LSIL surgical biopsy.

Conclusion: This retrospective study confirms that the current standard of practice, sending patients with a HPV positive Pap smear to have a colposcopy, is an effective tool for cervical cancer screening.

**ABSTRACT #83**

Ultrasound Importance in Diagnosing Vasa Previa  
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Vasa Previa is a rare pathology that occurs when the blood vessels of the umbilical cord are trapped between the internal os of the cervix and the presenting part of the fetus. It is a high-risk concern as failure to diagnose may lead to blood vessel rupture or compression during birth. Ultrasound is the best method to evaluate for vasa previa. With careful evaluation, a diagnosis can be made in a timely manner, which increases the chance for a good outcome. This poster presents the sonographic findings associated with a vasa previa.

**ABSTRACT #84**

The Benefits of Diagnostic Imaging in Women’s Health  
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While October is National Breast Cancer Awareness Month, women’s health issues, specifically breast health, is a year-round concern. The diagnostic imaging modality mammography plays a significant role in breast cancer screenings. However, mammography is not the only imaging modality that can be utilized. Both magnetic resonance imaging (MRI) and sonography provide high-quality imaging options as well. Each imaging modality has its respective place in the screening, diagnosis, and follow-up.

**ABSTRACT #85**

Limb Body Wall Complex Sonography Case Study  
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Limb body wall complex is a congenital disorder characterized by many physical abnormalities, such as abdominoschisis, scoliosis, facial cleft, thoracic wall defects, ectopia cordis, or limb abnormalities such as
clubfoot, absent limbs, bradydactyly and polydactyly. The congenital abnormalities are most noticeable on fetal ultrasounds and are diagnosed based on Van Allen's findings. In order to diagnose an infant with limb body wall complex they must have two of the three abnormalities: exencephaly or encephalocele with facial clefts, thoraco and or abdominoschisis and limb defects. Van Allen proposed the criteria in 1987 in order to distinguish the congenital disorder form other defects and disorders. Russo later developed two phenotypes in 1993 based on commonalities he noticed among fetuses affected by limb body wall complex, and Sahinoglu revised them in 2007 and came up with three different phenotypes with his findings. The case study presented shows a set of twins affected by limb body wall complex on a fetal ultrasound scan and the abnormalities present on each fetus.

**ABSTRACT #86**

**Tubo-Ovarian Abscess with Pyosalpinx: an Overview and Case Study**

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Tubo-Ovarian Abscess (TOA) and pyosalpinx are two components that occur in 18-34% of pelvic inflammatory diseases. These conditions are presented when TOA causes the fallopian tubes and ovaries to fuse. Pyosalpinx, on the other hand, is characterized by the collection of fluid in the fallopian tubes, which if ruptured, can cause even more inflammation. TOA and pyosalpinx together can affect many aspects of the pelvis causing pain, distorting the anatomy, and impairing the various functions. Both TOA and pyosalpinx utilize sonography as well as computed tomography images that are essential for diagnosis and follow-up treatment.