Each spring the College of Allied Health Professions sponsors a forum. This interprofessional event is intended as an opportunity for students 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.

Due to social distancing in response to COVID-19, the 2020 forum is presented virtually in this booklet.

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**Annual College of Allied Health Professions Awards**

Each spring, in conjunction with the Evidence-Based Healthcare Forum, we honor faculty award recipients. This year, these individuals will be honored at the Annual CAHP Employee Recognition event held in August.

![Excellence in Teaching](Kim Michael, MA, RT(R), RDMS, RVT, FSDMS)

![Significance in Research](Junior Faculty Elizabeth Wellsandt, PT, DPT, PhD, OCS)

![Excellence in Clinical Teaching](Alisha D. Wright, BSRT(R))

![Outstanding Service](Glenda Woscyana, MS, RD, LMNT)
**ABSTRACT #1**

**Oxygen Delivery Assessment in a Prescriptive Perfusion Profile: Continuous vs Intermittent Monitoring**

Scott O’Neal, Nicholas Anderson, David Holt. Clinical Perfusion Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

**Background:** Acute kidney injury (AKI) occurs in roughly one out of ten open heart surgery patients in the United States and costs the healthcare industry over a billion dollars per year. There have been numerous links between AKI and oxygen delivery (DO2) including the relationship between nadir DO2 and increased incidence of post-operative AKI. It is imperative to understand the differences between various methods of DO2 monitoring in order to ensure metabolic demands are being met and kidney function is preserved throughout the procedure. Variation in DO2 monitoring has been identified in equipment and circuit design, but the relationship between intermittent and continuous monitoring has not been discussed. The purpose of this study was to compare and evaluate the level of agreement between continuous DO2 monitoring, intermittent DO2 monitoring using CDI values, and intermittent monitoring using Epoc values to assess potential clinical advantages and disadvantages between the strategies.

**Methods:** 12 trials were conducted during in-vivo labs while students practiced initiation, maintenance, and termination of cardiopulmonary bypass. The time from initiation to termination was considered a trial. Students were asked to conduct bypass as they normally would. DO2 was monitored concurrently in each trial by three strategies: Continuous CDI data collected every 6 seconds, Intermittent CDI data collected every 7 minutes, and Intermittent Epoc data collected every 7 minutes. Descriptive statistics were used to summarize the data and repeated measure ANOVA used to evaluate the agreement between the monitoring strategies.

**Results:** Repeated measure ANOVA identified no significant difference in the mean DO2 between the three monitoring strategies (p=0.1226). There was no significant difference identified between the three groups in the mean flow, cardiac index, pO2, and hematocrit. However, there were statistically significant differences found in the mean sO2 and hemoglobin (Hb) between Continuous CDI and Intermittent EPOC, and between Intermittent CDI and Intermittent Epoc.

**Conclusion:** Significant variance in DO2 monitoring does not exist between the three monitoring strategies. Although significant differences were identified in the sO2 and Hb variables, the variation did not largely alter the calculated DO2. Further studies are necessary to identify variation in the clinical environment.

**ABSTRACT #2**

**Filtration of Shed Blood in Autotransfusion: Does gross filtration of shed blood impact end-product quality?**

Michael Plymell, Jonathan Vidlak, Fang Qui, David Holt. Clinical Perfusion Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Until recently, fine filtration of shed blood has been a standard practice in autotransfusion through modern cell salvage devices. The HEMAsavR blood collection canister has been produced as the first cell salvage reservoir which features a gross 1mm (1000µm) filter rather than conventional 20µm to 120µm filter media. The HEMAsavR’s novel design may yield more red cells recovered with lower potassium and PFHb, with a higher HCT and Hgb. Therefore an equivalency test was performed between three reservoirs featuring different filter pore sizes, analyzing potassium (K+), hematocrit (HCT), hemoglobin (Hgb) and plasma-free hemoglobin (PFHb). Among each group, 20 trials were performed. K+, HCT, Hgb and PFHb samples were collected and analyzed at baseline, pre-wash, post-wash and post-filter after passing through a 40µm transfusion filter. Additionally post-filter samples from each group were analyzed for schistocytes and spur cells. The mean post-filter K+ percentage removal was 72.7% for the 1000µm group, 70% for the 200µm group and 72.1% for the 20µm group. The mean post-filter PFHB percentage removal was -20% for the 1000µm group, 43.6% for the 200µm group and -19.7% for the 20µm group. The mean post-filter Hgb percentage gain was 108.7% for the 1000µm group, 161.3% for the 200µm group, and 138.9% for the 20µm group. The mean post-filter HCT percentage gain was 61.9% for the 1000µm group, 62.2% for the 200µm group, and 65.2% for the 20µm group. Additionally, in all three samples acquired for RBC morphology scans, no schistocytes were noted and all three of the samples contained fewer than 5-10% of spur cells. With a primary outcome of percentage K+ removal, the HEMAsavR and HEMAsavR + In Line Filter interventions were found to be equivalent to the Haemonetics (control group) intervention. Thus, the novel design of a gross 1000µm filter was shown to yield an equivalent end-product quality to that of the more conventional 20-120µm filters used in traditional cell salvage reservoirs.
ABSTRACT #3

Effect of Hemodilution on Sonoclot Parameters
Sarah Pope, Mallory Gillispie, David Holt. Clinical Perfusion Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Background: Clinical perfusionists impact a patient’s hemodynamic status through a variety of mechanisms including hemodilution. Today during open heart surgery there are a variety of microviscometry devices used in order to analyze a patient’s hemodynamic status. These devices are used to help guide the perfusionist in their clinical decisions. The Sienco Sonoclot is an ultra-sensitive viscoelastic instrument used for hematostasis monitoring and basic anticoagulation management in the perioperative setting. Using the Sonoclot, the impact of hemodilution on activating clotting time, clot rate, and platelet function can be analyzed. If the patient’s blood is hemodiluted on cardiopulmonary bypass, then it will increase the ACT and clot formation time.

Methods: 19 subjects donated 6 mL of whole blood which was then allocated to six different hemodilution ratios: normovolemia, 1:0.5, 1:1, 1:2, 1:4, and 1:5 blood:plasmalyte. Each hemodilution ratio was carefully pipetted into the Sonoclot chamber and was run twice. The results were averaged within each subject.

Results: Using a linear fixed model to model the outcome measurements of the varying hemodilution ratios, the following results were obtained. Pairwise comparison was adjusted using the simulation method on all data collected. When looking at ACT, 1:0.5, 1:1, and 1:2 had a statistically significant relationship with 1:5 blood:plasmalyte ratio. When looking at the clot rate, normovolemia and 1:1 had a statistically significant relationship with 1:4 and 1:5 blood: plasmalyte ratio. 1:0.5 has a statistically significant relationship with 1:2, 1:4, and 1:5 blood:plasmalyte ratio. Finally, when looking at platelet function, normovolemia and 1:0.5 had statistically significant relationships with 1:1, 1:2, 1:4, and 1:5 blood:plasmalyte ratios.

Conclusion: With the use of the Sienco Sonoclot, there was an increase in average ACT as hemodilution increased. There was also a decrease in overall clot rate and platelet function as the severity of hemodilution was increased.

ABSTRACT #4

Are Cardiac Infrared Thermal Measurements Reasonable for Deep Tissue Assessment?
Benjamin Powell, Steven Hurst, David Holt. Clinical Perfusion Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Background: The introduction of hypothermia as a cardioprotective tool dates back to the 1950s and has been the cornerstone of myocardial preservation during cardiac surgical intervention. Hypothermic cardioplegia is centered around its ability to decrease the metabolic rate and thus decrease the oxygen demands during periods of protected ischemia. Currently, the standard of assessing the degree of myocardial protection throughout the heart is through the use ECG and myocardial temperature probes. These invasive temperature probes assess the completeness of hypothermic cardioplegic solution delivery throughout different regions of the heart.

Objective: To assess the efficacy of surface infrared (IR) thermal measurements as a means for determining deep tissue temperature in order to ensure adequate myocardial protection.

Methods: Utilizing bovine skeletal muscle with varying thickness to represent a wide range of left ventricular myocardium. A total of 30 room temperature samples were divided into three thickness groups (5mm, 10cm, 15mm) were cooled. Surface and deep temperatures were assessed by IR and a myocardial temperature probe respectively. Experimentation was concluded with two trials per slice for a total of 60 surface and deep temperatures.

Results: At 5mm, the correlation coefficient for the surface with the middle layer was r=0.61, p=0.06; for 10mm, r=0.89, p=0.0005 and for 15mm, r=0.37, p=0.29. The correlation was strongest at the 10mm depth and weakest at the 15mm depth.

Conclusions: The data indicates that there is a strong correlation between the surface IR temperature and the middle myocardial temperature probe reading for the 10mm sample group. The 15mm sample group showed the least statistically significant correlation between surface and middle temperature readings. Thus, indicating the difficulty of assessing myocardial protection with a surface IR reading on thicker myocardium. The 5mm sample group showed close correlation between surface and middle temperature readings but wasn’t statistically significant.

ABSTRACT #5

Treating Hyperkalemia with Zero-Balance Ultrafiltration using 0.9% Sodium Chloride and Pureflow RFP-402 Dialysate Solution: A Retrospective Comparative Analysis
Peyton Price, Lisa Toft, David Holt. Clinical Perfusion Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Background: Perfusionists have adopted a protocol using normal saline as a replacement fluid when treating hyperkalemia with ultrafiltration techniques. However, little research has been conducted on the post-operative effects of ultrafiltration with this solution.

Objective: The purpose of this study is to compare physiological differences when using normal saline or dialysate for the replacement fluid of ZBUF. This study aims...
to decipher the benefits of ultrafiltration during surgery, as well as ensure the same benefits carry into post-operative values.

Methods: A sample size of 109 patients was categorized within three groups; ZBUF with saline, ZBUF with dialysate, and a control group which received no ZBUF. Potassium concentration was documented during preoperative, peroperative, and postoperative time points. Perioperative time points consisted of pre-ZBUF potassium, post-ZBUF potassium, and termination potassium. Five time points were documented during the patient's postoperative stay.

Results: By the third postoperative measurement, all patients but one patient treated with saline were within normal K+ range (3.5-5.3 mEq/L). No significant statistical difference was found between patients treated with ZBUF using either normal saline or dialysate solutions (Lowest p=0.1567 at first postoperative measurement using Fisher’s Exact Test). Similarities in performance of these two solutions may be shown by overlapping 95% confidence intervals (Second postoperative 95% CI: Dialysate 0.73-0.96 and Saline 0.73-0.98)

Conclusion: Although the null hypothesis was unable to be statistically disproven, striking similarities in performance may promote the use of a 0 mEq/L K+ Dialysate solution should there be any shortage of 8.4% Sodium Bicarbonate solution. This retrospective analysis provides introductory information for a prospective study to eliminate variables such as replacement fluid container sizes, metabolic panel blood draw intervals, and clinical ZBUF triggers.

ABSTRACT #6

Assessing Anticoagulation Effects of Heparin: Hemochron ACT versus Sienco Sonoclot
Katherine Sallas, Nikolas Prado, David Holt. Clinical Perfusion Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Background: Prior to patients being placed on cardiopulmonary bypass, it is necessary to ensure that the patients adequately anti-coagulated so blood will not clot in the bypass pump circuit. Heparin in the anticoagulant that is administered to patients prior to being placed on bypass. After heparin administration, an activated clotting time test is run to ensure that patients are adequately anti-coagulated. Activated clotting time (ACT) Remains the primary point of care (POC) test used for monitoring anticoagulation during cardiopulmonary bypass (CPB). The purpose of this study is to compare the Sienco Sonoclots and the Hemochron (coagulation monitoring devices) to provide a comparable alternative, and more complete clinical picture of anticoagulation for patients during open heart surgery.

Methods: A total of 10 subjects were recruited for this research. A 10ml blood sample was drawn from each subject and tested on the Hemochron and Sienco Sonoclot at a baseline condition, low-dose heparin condition and a high-dose heparin condition.

Results: The Sonoclot yields higher ACT values (median = 178.00) than the Hemochron (median = 144.25) in the Low Heparin condition (p= 0.009). The Sonoclot also yields higher ACT values (median = 193.25) than the Hemochron (median = 166.50) in the High Heparin condition (p= 0.10). The clot rate becomes less sensitive to changes in heparin at higher heparin concentrations. From our data we can see that the slopes greatly decrease between the baseline and the Low Heparin condition and show little change between the Low Heparin condition and the High Heparin condition.

Conclusion: With a P value of 0.52 for the baseline condition, we cannot conclude that a significant difference exists between the Hemochron ACT and Sienco Sonoclot ACT. The sample size will only power the no heparin condition. The heparin conditions would require a larger sample size (due to their greater variability) and so those can be considered secondary analyses, which we can acknowledge, are underpowered.

ABSTRACT #7

Aortic Stent Graft Placement due to Aortic Rupture
Radiel Cardentey-Uranga. Cardiovascular Interventional Technology program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

The aorta is the largest artery in the human body and operates under a high-pressure system. Since the aorta receives most of the oxygenated blood that will perfuse most tissues in the body, it is crucial to seek medical help in the event of an emergency involving said structure. Aortic rupture is a condition that typically presents after a motor vehicle accident or other external traumatic stimuli. This tear of the vessel wall will cause the patient to bleed out within minutes if no medical help is available. Each rupture is classified by the severity of the injury. There are treatment options that, after careful considerations, may be employed in order to stop the bleeding. One option would be open surgery, and the other option would be endovascular stent-graft placement. This last one is less risky than open surgery and has faster recovery times. Computed Tomography (CT) is used to check the patency of the newly implanted graft. The purpose of the poster is to create awareness of how a rupture of the aorta can happen and how cardiothoracic surgery and interventional radiology can help fix the problem.
ABSTRACT #8

Treatment of Budd Chiari with DIPS Procedure
Kiley Gosker, Bailey Schnitzler. Diagnostic Medical Sonography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Budd Chiari is a rare disease characterized by thrombus of the hepatic veins. This thrombus impedes the normal venous flow out of the liver which results in portal hypertension. A direct intrahepatic portocaval shunt (DIPS) is a form of treatment for those that have been diagnosed with Budd Chiari syndrome. Ultrasound imaging is used to diagnose Budd Chiari by checking the patency of the hepatic vasculature and to monitor the patency of a DIPS. The objective of this poster is to provide relevant information on the etiology and diagnosis of Budd Chiari, the use of a DIPS as treatment for Budd Chiari, and the use of ultrasound to monitor the shunt’s durability and patency. Additionally, a case study of Budd Chiari treated with a DIPS will be discussed in detail.

ABSTRACT #9

Echocardiography: An Approach to Right Atrial Myxomas
Brooke Zentz, Victoria Seaman. Diagnostic Medical Sonography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Right atrial myxomas are a rare finding, accounting for 15-20% of all intracardiac masses. Prior to use of echocardiography patients were often misdiagnosed preoperatively. With the application of transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) accuracy in proper diagnosis is now 90% effective. This case study emphasizes the importance of an echocardiographic approach in the diagnosis of nonprimary right atrial myxomas. Compared to other imaging modalities echocardiography is superior in real time assessment of mass dynamics, as well as physiological compromises it may impose.

ABSTRACT #10

Role of MRI in the Assessment of Valvular Heart Disease
Danielle Thelen. Magnetic Resonance Imaging program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

This literature review discusses using cardiac magnetic resonance imaging (MRI) as a tool in diagnosing and creating care plans for patients with heart conditions. Pathologies best visualized using cardiac MRI are mitral and tricuspid regurgitation and myocardial fibrosis. Cardiac MRI can image the heart in three different imaging planes, which can provide a complete picture of the heart that may not be achieved with other imaging modalities.

ABSTRACT #11

Balanced vs. Unbalanced Crystalloid Intravenous Fluids for Resuscitation in Sepsis and Septic Shock
Nicole Linton. Division of Physician Assistant Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Sepsis leads to a number of complications and may progress to septic shock, which has a mortality rate of up to 40% (1,4). A mainstay of treatment in sepsis is appropriate fluid resuscitation. The Surviving Sepsis Guidelines were most recently updated in 2016 and recommended the use of crystalloid fluids for fluid resuscitation (4). The two most common crystalloid fluids utilized are normal saline (unbalanced) and Lactated Ringer’s (balanced). Balanced crystalloids are developed to more closely mimic the composition of plasma compared to unbalanced crystalloids. However, there is little evidence supporting the use of a particular fluid in sepsis. The goal of this literature review was to analyze the available research for outcome-based recommendations of the use of balanced or unbalanced crystalloid fluid for fluid resuscitation in sepsis and septic shock. A PubMed search was completed, and three systematic reviews, two analytical reviews, and one randomized trial were analyzed. There was little definitive research, but multiple articles reviewed acknowledged the increased risk of hypernatremia, hyperchloremic metabolic acidosis, and acute kidney injury with the use of normal saline (1). A recent randomized trial found a significant decrease in mortality with the use of Lactated Ringer’s compared to normal saline in patients with sepsis (7). As a result, balanced crystalloids are recommended for fluid resuscitation in patients with sepsis and septic shock. It is important to understand the high incidence of sepsis and the numerous factors regarding patient outcome. Further research is needed to provide stronger evidence regarding use of balanced crystalloid fluids in sepsis.
ABSTRACT #12

Effect of Physical Therapy on Hospital Readmission for Older Adults with Acute Exacerbation of COPD: A Critical Review
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Introduction: Chronic obstructive pulmonary disease (COPD) is a common health disease that burdens the healthcare system. Cardiorespiratory exercise has been found (across a multitude of health conditions) to contribute to improved health status and functional ability. Recent studies have reviewed the effect on hospital readmission rates to reflect hospital resource utilization with the combination of exercise therapy in conjunction with standard care. Studies were reviewed to identify if physical therapy combined with usual care for acute exacerbations (AECOPD) would improve patient health status and reduce recurrent hospital care.

Methods: A search of Medline via PubMed was completed using key terms such as physical therapy, COPD, and hospital readmissions. Several peer-reviewed articles were identified and narrowed to three randomized controlled trials for appraisal. Outcome measures for these studies included hospital readmissions, analysis of health care utilization, exercise performance measures, and mortality.

Results: The RCTs compared “usual” medical care to groups receiving early rehabilitation, a self-managed intervention group, or a pulmonary rehabilitation program. The first study found no differences in hospital readmissions between usual care and early rehabilitation groups after twelve months of treatment. The second study discovered self-managed intervention groups reported fewer hospital readmissions compared to usual care over twelve months. The third study observed patients in the pulmonary rehabilitation groups had improved health status and decreased hospital admissions after three and six months compared to usual care. Although, these results were not sustained after twelve months.

Conclusion: The evidence indicates that patients who received physical therapy interventions had fewer hospital readmissions at twelve months than patients who did not receive physical therapy. When comparing standard physical therapy treatments to a more intensive form of physical therapy with aerobic training there were no differences in hospital readmissions at twelve months. This shows the importance of physical therapy with this population, but in order to achieve fewer hospital readmissions, intensive aerobic training after the acute exacerbation of COPD may not be necessary. Rehabilitation interventions for AECOPD patients are still being studied to identify the most effective duration and intensity of physical therapy combined with standard treatment interventions for long-term health benefits.

ABSTRACT #13

Clinical Predictors of Acute Exacerbation of COPD: A Critical Review
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Introduction/Purpose: Acute re-exacerbation of chronic pulmonary obstructive disorder (AECOPD) has been linked to increased healthcare utilization and therefore increased cost to the patient, as well as decreased overall health of the patient. Much research has been completed to determine factors associated with AECOPD, but little has been researched in order to determine a tool or selection of easily collected factors that can predict re-exacerbation risk. This critical review of the research literature attempts to identify developed objective measures for healthcare professionals to use in order to determine risk of AECOPD.

Method: The database used for this critical review included Medline via PubMed with MeSH terms: pulmonary disease, chronic obstructive, predictive value, disease progression, pulmonary disease, and chronic obstructive drug therapy. Inclusion criteria consisted of patients who were 45 years or older, publications dated from 2010-2019 and studies written in English. Randomized controlled trials and cohort studies were considered. After reviewing literature using search criteria specific to the topic of AECOPD and risk factors, three articles were selected. These articles were selected based on their research design, relevance to the clinical scenario, inclusion/exclusion criteria, validity, and reproducibility.

Results and Conclusions: These studies developed three sets of criteria that can be used to predict the risk of AECOPD. Engel et al retrospectively analyzed a pre-existing RCT, finding that factors affecting a re-exacerbation included hospital stay >8 days, forced expiratory volume (FEV1) <30% predicted, hypertension, higher dyspnea scale ratings. Conversely, present cigarette smoking was negatively associated with re-exacerbation. Make et al retrospectively analyzed three clinical trials and developed a clinical prediction tool (SCOPEX). This tool predicts 6-month re-exacerbation risk based on sex, number of COPD maintenance medications, number of exacerbations in the previous year, FEV1/FVC (forced vital capacity) ratio, and reliever use (number of inhalations/day). Bertens et al compared a derivation cohort and validation cohort to develop a prediction model. Decreased values of FEV1, previous exacerbations, pack years of smoking, and vascular disease were independent predictors of exacerbation in two years.
ABSTRACT #14

**Going the Distance. The Impact of Moderate to High Aerobic Training on 6MWT in Patients with Chronic Heart Failure: A Critical Review**

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Introduction/ Purpose: Following diagnosis of Chronic Heart Failure (CHF), it is occasionally still assumed that these patients may not benefit from the role of aerobic exercise, or that if they do, a low-intensity protocol should be used to avoid adverse effects. While the diagnosis of CHF is permanent, the functional performance and overall well-being can be maintained or improved for this population. But the question still remains: Do clinicians exercise their patients at a high enough intensity to see meaningful changes in functional performance? The goal of this critical appraisal was to determine if moderate to high intensity aerobic exercise improves functional performance, measured with the six-minute walk test (6MWT), in patients with chronic heart failure (CHF).

Method: The search for articles was conducted through PubMed (new interface) using the key terms, “chronic heart failure,” “aerobic exercise,” and “walk test.” This yielded 20 potential articles, consisting of randomized controlled trials, clinical trials, and systematic reviews. Articles were appraised based on inclusion of moderate to high exercise intensity, use of the 6MWT as an outcome measure, and if participants were diagnosed with chronic heart failure.

Results: The articles selected assessed performance on the 6MWT and each found that moderate to high intensity exercise resulted in improved performance on the walk test; however, the type of exercise selected for each article was different. High intensity group exercise, interval training, cycling, and low volume resistance training are all appropriate forms of exercise for patients with CHF to improve functional capacity. This is of importance because it allows therapists to individualize treatment plans that best suit their patients’ interest. Two of the three articles included a quality of life (QoL) questionnaire and found that with an increase in distance walked was correlated with an overall improvement in perceived QoL. The limitations of this appraisal include lack of control groups in a few study designs and the inability to generalize findings to all NYHA classes of CHF.

Conclusion: This appraisal strongly supports that moderate to high intensity exercise is a safe and effective means to improve performance on the 6MWT in patients with CHF.

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ABSTRACT #15

**Does Inspiratory Muscle Training Reduce Dyspnea in Patients Diagnosed with Heart Failure? A Critical Review**

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Introduction/ Purpose: Inspiratory muscle weakness and dyspnea are commonly observed in patients with heart failure and can severely impact their quality of life. The aim of this critical review is to examine recent literature on the impact that inspiratory muscle training (IMT) has on reducing dyspnea compared to patients who receive sham training.

Method: A database search of MEDLINE via PubMed was performed to identify randomized controlled trials (RCTs) published from 1999 to the present that included the treatment of dyspnea with IMT in patients with heart failure. Thirty-four articles met these initial parameters and were ultimately narrowed down to three articles for appraisal because the researchers assessed dyspnea before and after treatment and compared outcomes to a control receiving sham treatment.

Results: All three articles agreed that inspiratory muscle training offers significant improvement in the severity of dyspnea symptoms in patients with heart failure compared to control groups who received sham treatments. One of the articles found that specific inspiratory muscle training (SIMT) also improved inspiratory muscle strength and endurance. Another article found that the Modified Medical Research Council (mMRC) Dyspnea scale scores were significantly lower in the training group during functional activity compared to the sham group. The final article found that at 40% maximum inspiratory pressure (MIP) the IMT program had significant improvements in the level of perceived dyspnea when compared to the sham treatment group.

Conclusion: These studies propose that inspiratory muscle training is an effective treatment option for patients with heart failure who experience dyspnea. More research is needed on how to best utilize inspiratory muscle training in conjunction with traditional cardiac rehabilitation to provide optimal results for patients including improvements in overall functional capacity and quality of life.

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ABSTRACT #16

**Medical Imaging’s Effect on Congenital Heart Defects**

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Congenital heart defects are abnormalities seen specifically within the heart that are often discovered.
at birth. Some common defects that may be identified include septal defects, atrial septal defects, complete atrioventricular canal defects, and valve defects. The purpose of this poster was to understand how each imaging technology modality has impacted the ongoing interpretation of these defects. Multiple modalities were examined to get a complete understanding of each one separately and to then further understand how each modality could visualize and help with the interpretation and treatment of the different defects. It was concluded that each modality had a separate role in the interpretation of congenital heart defects, but that the modalities with a large impact included ultrasound, computed tomography, magnetic resonance imaging, and diagnostic imaging.

**ABSTRACT #17**

**The Effect of Combined Cognitive Behavioral and Balance Interventions on Fear of Falling in Community Dwelling Older Adults: A Critical Review**

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Introduction: Fear of falling, in addition to balance-related impairments, can contribute to decreased participation and overall quality of life in community-dwelling older adults. Cognitive behavioral intervention (CBI) alone and balance intervention alone have been proposed to decrease fear of falling, though their combined effects have had minimal research. Purpose: This critical review aims to determine if a combination of CBI and balance intervention, compared to balance intervention alone, will result in a decreased fear of falling.

Method: Medline via PubMed was used to search for articles relating to cognitive behavioral therapy, balance intervention, fear of falling, and community-dwelling older adults. The target population included community-dwelling older adults (65+ years of age) with a fear of falling. Four randomized controlled trials were selected based on the clinical parameters.

Results: Two articles included balance interventions in the form of Tai Chi, one had “usual care”, and one utilized different community programs that included a variety of balance interventions. Various personnel, including nurses, care assistants and cognitive behavioral therapists, delivered the CBIs. Two studies found that combined balance and CBI led to significantly decreased fear of falling compared to balance intervention alone, while one study found no differences between groups. One study found CBI alone was not superior to combined CBI and balance intervention. Only one study reported a significant difference in number of falls in the combined CBI and balance intervention.

Conclusion: The evidence suggests that combined CBI and balance intervention may help decrease fear of falling. It is uncertain how beneficial this is when considering its clinical impact on the number of falls for an older adult. Clinicians willing to include CBI should consider the time and cost it takes to provide. To ensure clinical relevance, future studies need to incorporate physical therapist developed interventions typically seen in a clinical setting. Additional studies are needed to establish the significance of fear; too little could result in performing risky activities, and too much might result in activity avoidance. Longer follow-up periods are also important for future research.

**ABSTRACT #18**

**The use of immersive 360-degree videos to induce different strategies of postural control**

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Purpose/Hypothesis: Visual perception is a decision-making process of the central nervous system based on recognitions of relative distances and velocities between objects. With the input from visual perception, an appropriate postural control is applied to maintain balance. Previous studies on how visual perception affects the postural control were only in one direction. Therefore, this study used immersive 360° videos to identify how visual perception affects the postural control in multiple directions. We hypothesized that video with more turns could induce more ML body sway, and video with higher elevation could induce more AP body sway.

Number of Subjects: Nineteen healthy young adults (20-31 years; 12 females).

Materials/Methods: A Wii Board (Nintendo, Redmond, WA) was used to measure body sway. A smartphone placed in a pair of goggles displayed three 360° videos: 1) a static room (baseline); 2) a roller coaster (MA) at a height of 205 feet with two intense hills, several small hills and one helix; and 3) a roller coaster (PA) at a height of 149 feet with one intense hill, one big loop and one quick corkscrew. Three standing trials on the Wii Board and three sitting trials on the Wii Board placed on a chair were randomly performed. After each trial, subject rated their fear of falling (FOF) by using visual analog scale. Dependent variables were body sway range (distance in AP and ML directions of the center of pressure trajectory) and FOF grading (0-100). Two two-way repeated measures ANOVA were used to examine the interactions between the postural effect (sit/stand) and the visual effect (three videos) on body sway range and FOF.

Results: A significant interaction was found in body sway range in AP (p=0.02) and ML directions (p=0.009). The post-hoc comparisons indicated that body sway range was larger in standing than sitting in both directions (pAP=0.008, pML<0.001). Baseline body sway range in AP direction was smaller than in viewing MA (p=0.016) but...
no difference in viewing PA (p=0.05). However, in ML direction, baseline body sway range was smaller than in viewing both MA (p=0.01) and PA (p=0.002). Both PA and MA induced higher FOF than baseline (p<0.001), and the FOF was higher in viewing PA than MA (p=0.016).

Conclusions: Different 360° videos induced different postural control strategies in AP and ML directions in young adults. The visual perception affected more in ML than AP direction. Based on the active control hypothesis, higher level of imbalance requires higher active control to maintain balance. Increasing FOF indicated that 360° videos could pose an environment with certain postural threat, and rotational roller coaster induced higher FOF than taller roller coaster.

Clinical Relevance: Since ML direction is more sensitive to postural threat, ML balance training for patients with compromised balance should be emphasized to reduce falls risk. The immersive 360° video could be a useful tool in generating challenging environments for clinical use and research.

ABSTRACT #19

The Effect of Plantar Vibrotactile Stimulation on the Locomotive Adaptability of Older Adults when Negotiating Multiple Obstacles
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The ability to adapt to environmental obstacles is crucial to successful locomotion, and for people who are experiencing decreased sensation for medical reasons, or astronauts in environments of partial weightlessness, the lessened ability to sense the position of their body in space may hinder successful locomotion. We hypothesized that vibratory stimulation on the soles of older adults’ feet would result in an altered strategy for negotiating multiple obstacles when compared to the strategy used without vibratory stimulation.

Ten healthy adults (60-70 years old) had ten retro-reflective markers placed on bony landmarks. Participants stepped over two obstacles (10% of participants’ height) placed three steps apart. They completed 5 trials without vibration and 5 trials with vibration at a supra-threshold frequency-amplitude of 250Hz and 17.5db at normal walking speed. Kinematic data of four gait events were recorded: maximum toe elevations (MTE) of the leading leg and trailing leg when clearing an obstacle, and distance of heel strike and toe-off from the obstacle of the leading leg and trailing leg respectively. The MTE was normalized by the height of participant.

A significant difference between no vibration and supra-threshold vibration for MTE the leading leg crossing over the second obstacle (p < 0.01) was recorded. The mean MTE crossing over the first obstacle was 0.115 cm (95% CI: 0.104-0.125) and the second obstacle was 0.118 cm (95% CI: 0.107-0.129). No difference was observed between two obstacles or two vibration conditions with heel strike, toe off, or MTE of the trailing leg.

The change in MTE of the trailing leg indicates an alteration in walking strategy as a result of stimulation. With stimulation, participants lifted their legs up higher when crossing over the second obstacle. This increased room to maneuver between the participant’s foot and the obstacle may indicate more successful negotiation of the obstacle.

ABSTRACT #20

Effects of Dual-Task Training on Fall Risk in Older Adults with Mild Cognitive Impairment, a Critical Review
Rachel Kendall, Chun Li Kok, Natnicha Songthangtham. Division of Physical Therapy Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Introduction and Purpose: Combined cognitive and physical exercise interventions, or dual-task training (DTT), has been found to be effective for decreasing the risk of falling for older adults and people with neurologic conditions. This critical review aimed to investigate the effect of DTT in older adults with mild cognitive impairment to determine if DTT would also decrease the fall risk in this population.

Methods: Medline via PubMed was searched using key terms such as: Alzheimer, dual task, and decrease fall risk. After conducting a thorough search, two randomized controlled trials and one quasi-experimental study were chosen. The three studies compared the effect of DTT to a control group on older adults with mild cognitive impairment. This is defined as the stage between cognitive decline of normal aging and dementia. The articles measured functional outcome related to gait, function, and fall risk using standardized outcomes such as the Timed Up and Go, Falls Efficacy Scale, and gait analysis.

Results: In the first study, DTT was found to increase functional capacity, postural control and balance which all contribute to an improved fall risk. Another study found that both regular and DTT using music as a cognitive distraction reduced fall risk. The last article showed that DTT decreased the dual-task cost of gait performance, which indicates that these individuals have a better ability to multi-task as they are walking.

Conclusion: DTT is effective in improving cognitive and physical parameters that reduce fall risks. DTT should be considered when treating this patient population. Further research should be done to show the long-term effects of this intervention on fall risk.
Introduction: Older adults are at higher risk for falls and decreased levels of function. Many receive physical therapy services for this reason, but little research has examined the ideal setting for improving function outside of these direct physical therapy services. Common indicators of physical function include, but are not limited to, physical activity level, balance, strength, and cognition. To improve these factors, two common exercise interventions include home-based and community-based exercise programs. The purpose of this critical review is to compare the effects of individual versus group exercise on function for older adults discharged from physical therapy.

Methods: The Medline database was searched via PubMed, and results were narrowed to three randomized controlled trials. Primary outcome measures included level of physical activity, using the Community Healthy Activities Model Program for Seniors (CHAMPS); static balance, using the Berg Balance Scale (BBS); fall risk and mobility, using the Timed Up and Go (TUG); and functional mobility, using the Short Physical Performance Battery (SPPB).

Results: Study findings indicated that both community-based and home-based exercise interventions were beneficial for older adults on measures of function; however, two of the three studies indicated that community-based interventions had a greater effect. One study found that moderate to vigorous physical activity levels significantly increased with both interventions but significantly increased to a greater extent with community-based exercise. Another study found that both exercise intervention groups showed a clinically meaningful change in BBS scores, but the change in the community-based group was significantly greater. The last study showed no difference between home- and group-based exercise programs, as both showed clinically meaningful changes in physical performance and cognition.

Conclusion: For various measures of physical function, both home- and group-based exercise programs are beneficial; however, some studies show that for outcome measures such as balance and physical activity level, group exercise programs show a greater degree of improvement.

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**ABSTRACT #21**

**Comparison of Individual vs. Group Exercise on Function for Older Adults Discharged from Physical Therapy: A Critical Review**

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**Introduction/ Purpose:** The number of people with mild cognitive impairment (MCI) or dementia has been rapidly growing due to the aging society, causing substantial burden on health care. MCI is characterized by cognitive decline that is greater than expected in terms of a person's age and educational level and is considered the transitional phase between normal cognitive function and dementia. A recent meta-analysis shows a small-to-medium positive overall effect of physical activity on global cognitive function, indicating that physical exercise interventions can improve cognitive function in patients with dementia. It has been revealed that exercise increases the volume of prefrontal cortex as well as the anterior hippocampus, and it may facilitate neurogenesis and angiogenesis. Several studies have combined physical exercise with cognitive components to enhance the cognitive benefits in a dual-task setting. However, due to the heterogeneity of the study designs, there is no conclusion of its clinical use. The purpose of this critical review is to explore the effect of dual-task training on cognitive performance for individuals with cognitive impairments.

**Method:** MEDLINE via PubMed database was searched using the search terms of (“dementia” OR “cognitive impairment*” OR “Alzheimer”) AND (“exercise” OR “physical activity” OR “aerobic therapy*” OR “resistance training” OR “cognitive therapy” OR “memory training” OR “cognitive stimulation”) AND (“multimodal” OR “combined” OR “cognitive-motor” OR “dua-task*”). Three articles were selected considering the study type (randomized controlled trial), year of publication (within 10 years), language (English), age of study population (45 and over), and species (human).

**Results:** Three randomized controlled trials examining cognitive functions with dual-task training were reviewed from current available evidences. These studies were critiqued on sample population, intervention, outcome measures, data analysis, internal/external validity, and reproducibility. All three studies reveal a positive effect of dual-task training on cognitive performance for patients with cognitive impairments.

**Conclusion:** This study indicated potential use of dual-task training for patients with cognitive impairments. Practitioners should consider severity of cognitive impairments, environment, safety, and other aspects when applying dual-task training.

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**ABSTRACT #22**

**The effect of dual-task training on cognitive performance for individuals with cognitive impairments: a critical review**

Zhuo Wang, Yuhang Zhang. Division of Physical Therapy Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

**Introduction/ Purpose:** The number of people with mild cognitive impairment (MCI) or dementia has been rapidly growing due to the aging society, causing substantial burden on health care. MCI is characterized by cognitive decline that is greater than expected in terms of a person's age and educational level and is considered the transitional phase between normal cognitive function and dementia. A recent meta-analysis shows a small-to-medium positive overall effect of physical activity on global cognitive function, indicating that physical exercise interventions can improve cognitive function in patients with dementia. It has been revealed that exercise increases the volume of prefrontal cortex as well as the anterior hippocampus, and it may facilitate neurogenesis and angiogenesis. Several studies have combined physical exercise with cognitive components to enhance the cognitive benefits in a dual-task setting. However, due to the heterogeneity of the study designs, there is no conclusion of its clinical use. The purpose of this critical review is to explore the effect of dual-task training on cognitive performance for individuals with cognitive impairments.

**Method:** MEDLINE via PubMed database was searched using the search terms of (“dementia” OR “cognitive impairment*” OR “Alzheimer”) AND (“exercise” OR “physical activity” OR “aerobic therapy*” OR “resistance training” OR “cognitive therapy” OR “memory training” OR “cognitive stimulation”) AND (“multimodal” OR “combined” OR “cognitive-motor” OR “dua-task*”). Three articles were selected considering the study type (randomized controlled trial), year of publication (within 10 years), language (English), age of study population (45 and over), and species (human).

**Results:** Three randomized controlled trials examining cognitive functions with dual-task training were reviewed from current available evidences. These studies were critiqued on sample population, intervention, outcome measures, data analysis, internal/external validity, and reproducibility. All three studies reveal a positive effect of dual-task training on cognitive performance for patients with cognitive impairments.

**Conclusion:** This study indicated potential use of dual-task training for patients with cognitive impairments. Practitioners should consider severity of cognitive impairments, environment, safety, and other aspects when applying dual-task training.
ABSTRACT #23

Effect of Blood Flow Restriction on Quadriceps Atrophy Following Anterior Cruciate Ligament Reconstruction in Athletes: A Critical Review

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Introduction: Quadriceps atrophy and weakness is common following anterior cruciate ligament reconstruction (ACLR). Blood flow restriction training (BFR) to decrease muscular atrophy and improve strength following surgeries such as ACLR has been gaining popularity in research and rehabilitation.

Purpose: The purpose of the present study is to evaluate the effects of BFR training compared to traditional strength training on reducing quadriceps atrophy in athletes after ACLR.

Method: Authors searched Medline via PubMed and PubMed Central for articles related to blood flow restriction, ACL reconstruction, and quadriceps atrophy. The primary population targeted through the search included individuals who underwent ACLR surgery and were treated with BFR training post-operatively compared to traditional strength training. Our search yielded 44 results. The following three articles were selected based on the level of evidence and relevance to the clinical case.

Results: Data failed to determine if blood flow restriction is superior to traditional rehabilitation in decreasing quadriceps atrophy following acute ACLR. Two articles found BFR training to be more beneficial than traditional training in reducing quadriceps atrophy, while the third article found no significant differences. Additionally, no adverse effects or risks associated with BFR training were reported.

Conclusion: Further research is needed to compare BFR training to traditional resistance training for muscle atrophy and strength in young, athletic populations following ACLR. There seems to be no uniform protocol or guidelines on BFR training. BFR cuff pressures and exercise protocols varied between studies, making it difficult to implement in clinical care. Additional research on the safety of BFR would also be beneficial. Although controversial, BFR may help reduce atrophy and strength loss in individuals following ACLR when tissue cannot be loaded maximally.

ABSTRACT #24

Does blood flow restriction training increase strength in elderly women with sarcopenia?: A Critical Review

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Introduction: Sarcopenia is the loss of muscle tissue as one ages which affects the ability to perform Activities of Daily Living (ADLs) and contributes to falls in the elderly.

Purpose: This critical review investigates the effectiveness of blood flow restriction (BFR) training to increase muscle size and strength, and physical function in elderly women with sarcopenia to improve their ability to perform ADLs and prevent falls.

Methods: Four articles (three randomized control trials and one case study) found using the MeSH search terms Blood Flow Restriction Training AND Elderly (140 results), then Blood Flow Restriction Training AND Sarcopenia (18 results) on PubMed (via McGoogan Library of Medicine access). Each article analyzed the effects of BFR on either muscle size and strength, or walking outcome measures in elderly, sedentary populations.

Results: All four studies found improvements in muscle size and strength compared to baseline. The first and third studies found BFR/low-load training to be less effective than high-load resistance training, however, high load training may be contraindicated in this population due to comorbidities and musculoskeletal conditions. The first study also found that improvements in muscle size/strength did not directly correlate to improved physical function or quality of life. The second study found, when using BFR while walking, improved functional tasks such as ambulation and transfers. The fourth study found additional improvements in vascular biomarkers in a sarcopenic 91 year old man. None of the studies reported negative outcomes or adverse effects to blood flow restriction training.

Conclusion: The critically reviewed studies showed statistically significant improvements in muscle size/strength and walking when BFR was used during the functional activity. Secondly, BFR might also increase vascular function in the elderly as well, and has not been shown to have negative outcomes when correctly used. This information can help guide the prescription of BFR as an alternative for those who cannot perform high load resistance training. There is limited high quality evidence on correct application of BFR in the elderly and more robust research is needed in the area of BFR in patients with sarcopenia with greater sample sizes.
**What to Choose? Physical Therapy or Arthroscopic Surgery for Active Individuals with Femoroacetabular Impingement: A Critical Review**

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Introduction: Femoroacetabular impingement syndrome, also known as FAI, is a motion-related clinical disorder of the hip diagnosed by symptoms, clinical signs, and imaging. FAI represents symptomatic abnormal contact of the femur and acetabulum. Femoroacetabular impingement syndrome is a relatively new diagnosis, therefore high-quality evidence regarding optimal treatment methods is lacking. Between 2005 and 2013, there has been a 465% increase in arthroscopic hip surgery, but evidence has not yet determined that arthroscopic surgery is the “end-all” treatment. The purpose of this critical review is to compare the outcomes of physical therapy to those of arthroscopic hip surgery for the treatment of FAI in active, young adults.

Methods: A database search of Medline via PubMed we completed. Medical subheading (MeSH) terms used for database search included: femoroacetabular impingement, physical therapy, and arthroscopy. Filters applied to the initial results consisted of: Results by year (2018-2020), Species (Human), Language (English), and Age (Adult: 19+ years). This search yielded 21 articles for potential selection. Three articles were selected based on level of evidence, applicability to the clinical question, and specific interventions.

Results: The first randomized controlled trial (RTC) failed to identify statistically significant differences between groups receiving arthroscopic surgery versus physical therapy on the HOS and iHOT-33. The second RCT determined that both hip arthroscopy and personalized hip therapy improved quality of life as measured by the iHOT-33, but hip arthroscopy led to greater improvement which was clinically significant. In a cohort study the majority of subjects (69.9%) were able to be treated with physical therapy and did not require further surgical intervention.

Conclusion: As the diagnosis of FAI continues to increase in frequency, current research has not yielded substantial evidence to identify the best method of treatment. Overall, arthroscopic surgery and physical therapy have shown clinical benefits, but further investigation is indicated to determine which treatment option should be considered as standard care.

**Comparing Risk of Rupture in Autograft vs Allograft Anterior Cruciate Ligament (ACL) Reconstruction in Adolescent Athletes: A Critical Review**

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Introduction/Purpose: An increasing number of adolescent athletes require repair or reconstruction of the anterior cruciate ligament (ACL) as a result of sport-related injury. Unfortunately, a number of these adolescents later require a revision of the repair due to graft failure. An autograft utilizes the patient’s own tissue for the repair; an allograft is harvested from another organism, typically a cadaver. The purpose of this critical review is to determine whether autograft or allograft results in decreased risk of rupture in the adolescent athlete population.

Methods: A search of Medline via PubMed was conducted using the following search terms: adolescent, teenager, child, youth, athletics, sports, ACL repair, ACL reconstruction, autograft, allograft, graft repair, bone-patellar tendon-bone autograft. A total yield of 59 articles resulted, from which a meta-analysis, a randomized controlled trial, and a case-control study were selected because they included risk of rupture soon after surgery, as well as the survivability of the rupture several years after the repair.

Results: One study found that allografts are associated with a three-fold risk of re-rupture compared an autograft. Another study found that at two years after the initial surgery, the survivorship of an autograft repair was 96%, compared to the 65% survivorship for an allograft repair. The third study found that the risk for allograft failure increased to 28.95% by 24-48 months after surgery, but the risk remained constant at 11.43% for 24-48 months after initial surgery with an autograft.

Conclusion: ACL repair for adolescent athletes is increasingly common, and as a result, a generous amount of research has been done to investigate the risk of graft failure immediately after surgery and for several years post-surgery. The literature overwhelmingly indicates that an autograft repair is the better choice for adolescent athletes.

**Effect of Strengthening Intervention on Hip Pain and Function in Patients with Femoroacetabular Impingement (FAI): A Critical Review**

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Purpose: In the last ten years, new diagnoses of femoroacetabular impingement (FAI) have risen
dramatically, which has led to a concurrent rise in surgery to treat symptoms due to FAI. This critical review evaluates recent literature exploring the use of strengthening interventions in physical therapy as a conservative treatment for patients with FAI.

Method: Medline via Pubmed was searched with key parameters narrowed to randomized controlled trials and meta analyses published between 2010-2020 that examined strengthening interventions in physical therapy for patients with FAI syndrome. From an initial yield of twenty articles, three were selected because they involved targeted strengthening as an intervention and used hip pain and function as outcome measures.

Results: All three studies determined that patients’ hip pain and function improved when strengthening was included in their physical therapy treatment. The first study showed that trunk strengthening decreases overactive hip musculature and increases stability of the pelvis, which reduces pain associated with FAI, shown by improvements in iHOT-12 (International Hip Outcome Tool) and Tegner activity scores. The second study found that patients with FAI surpassed the minimal clinically important difference (MCID) for change in hip outcome measures when trunk and hip strengthening were included in their treatment compared to when they received manual therapy, stretching, and health education alone. The last study’s results showed that patients receiving hip/trunk strengthening, stretching, and manual therapy in combination demonstrated significant improvements in function that exceeded the MCID for change, while the group using self-management techniques and analgesia did not.

Conclusion: Including strengthening in the treatment of FAI syndrome is beneficial, particularly when pairing hip and trunk strengthening together. However, it is unclear what other conservative treatments are best to include in a physical therapy treatment plan for FAI syndrome. Further large scale randomized controlled trials are needed to compare physical therapy interventions and to determine the most effective strengthening programs and protocols for treating these patients.

ABSTRACT #28

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Introduction: Down Syndrome (DS) is a genetic disorder occurring in 1.3 of 1000 births in America. It is a common cause of developmental disability including multi-joint laxity, decreased postural control, delayed motor milestone goals achieved, and hypotonia. Children with DS may continue to have gait and posture problems into adolescence. These developmental problems can lead to delayed onset and abnormality of independent gait at a young age. Conservative interventions may include traditional physical therapy, treadmill training, or a combination of each with the addition of orthoses.

Purpose: The goal of this critical appraisal is to determine if the use of supramalleolar orthoses (SMOs) in children with DS may allow for improvements in postural stability and gait.

Methods: Medline via PubMed was searched. Key terms include: Physical Therapy AND Down Syndrome; Foot orthotics / Ankle orthotics; Children AND down syndrome AND orthotics; Supramalleolar Orthoses; Down Syndrome AND ankle orthotics. Initial search yielded over 35 total articles. The three articles selected for appraisal directly related to children with Down syndrome who were introduced to foot/ankle orthoses, and direct measurements were taken to indicate improvements in posture, balance, and gait, including the Gross Motor Function Measure (GMFM).

Results: Studies revealed that most children exhibited improvements in gait speed, decreased standing ankle eversion and excessive pronation, as well as an immediate improvement in postural stability when provided SMOs. GMFM scores also improved.

Conclusion: Therefore, improved scores in these outcome measures and foot/ankle measurements due to the use of SMOs could lead to improved patient reported outcomes, gross motor skills and potentially improved quality of life for children with Down syndrome.

ABSTRACT #29

Quadriceps Performance is Associated with Knee Mechanics during Squatting 6 Months Post-Anterior Cruciate Ligament Reconstruction: A Preliminary Analysis
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Background: Quadriceps strength and movement deficits are common after anterior cruciate ligament reconstruction (ACLR) and persist up to four years postoperatively. Rate of torque development (RTD) and quadriceps strength has been associated with irregular loading during gait, but the relationship between quadriceps strength and squat mechanics is currently unknown. The purpose of this analysis was to assess the association between quadriceps performance and knee joint mechanics during squatting at 6 months post-ACLR.

Methods: Quadriceps performance was tested at 6 months after ACLR (n=11). Participants completed 3 trials of maximal voluntary isometric contractions (MVIC) into knee extension with the knee positioned in 90° of flexion.
In the same session, participants performed 3 sets of 5 bilateral and unilateral squats at self-selected speed and depth. Analysis of quadriceps performance included peak torque limb symmetry index (LSI) (involved/uninvolved x 100%) and RTD LSI during the first 200 ms of the MVIC. Biomechanical variables of interest in the involved limb included peak external knee flexion moment (PKFM), the ratio of the external hip flexion moment impulse to external knee flexion moment impulse (hip/knee ratio), and peak knee power.

Results: No significant relationships existed between quadriceps performance and bilateral squat biomechanical variables. The following results pertain to unilateral squatting on the involved limb. After controlling for graft type and meniscus repair, RTD LSI (mean: 64.2±26.8%) explained an additional 60.1% of the variance (R2=0.785, p=0.010) in PKFM. Only RTD LSI was a significant predictor (β=0.797, p=0.003). A similar trend was present between peak torque LSI (mean: 65.2±21.7%) and PKFM but was not significant. After controlling for graft type and meniscus repair, peak torque LSI explained an additional 51.4% of the variance in peak knee power (R2=0.875, p=0.002) and was the only significant predictor in the model (β=0.753, p=0.001). Similarly, RTD LSI explained an additional 55.0% of the variance in peak knee power (R2=0.910, p <0.001). Graft type (β=0.384, p=0.024) and RTD (β=0.763, p<0.001) were significant predictors in this model. The results of this preliminary analysis suggest that quadriceps performance is associated with measures of knee joint loading during unilateral squats after ACLR.

**ABSTRACT #30**

**Effect of Preoperative Physical Therapy on Recovery Following ACL Reconstruction: A Critical Review**

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Introduction: Anterior cruciate ligament (ACL) injuries are common in the physically active or sport population. ACL reconstruction (ACLR) with postoperative rehabilitation is considered the gold-standard of treatment. The goal after recovering from an ACL tear is to return individuals to prior level of function. These outcomes are not always met, but researchers are still investigating rehabilitation protocols that may help patients return to their previous level of function. Preoperative physical therapy is found to play a vital role in improving patient outcomes and function following ACLR. Purpose: This critical review analyzes how preoperative physical therapy affects patient outcomes and knee function following ACL reconstruction.

Methods: A database search of Medline via PubMed was conducted using key terms such as ACL reconstruction, preoperative care, and physical therapy modalities. This search yielded 39 articles. Of the 39 articles, 3 cohort studies were chosen based upon their rigor and relevance to the clinical question.

Results: All articles demonstrated significant improvements in functional outcomes when patients received preoperative physical therapy compared to only postoperative therapy after ACLR. One cohort study evaluated the effects of preoperative physical therapy on International Knee Documentation Committee knee form scores (IKDC) and the Knee Injury and Osteoarthritis Outcome Score (KOOS). This study concluded that the preoperative physical therapy group had significantly higher patient-reported function and higher return to sport rates two years after ACLR. Another cohort study found that those who underwent preoperative physical therapy had significantly better KOOS scores in all subscales and clinically relevant differences were found in symptoms, sports, and quality of life. The final cohort study evaluated the effect of preoperative quadriceps strength on IKDC-2000 scores six months after ACLR. This study concluded that preoperative quadriceps strength is a significant predictor for IKDC-2000 after ACLR.

Conclusion: Patients who received physical therapy interventions prior to ACLR have significantly improved patient reported outcome measures and functional outcomes compared to those who only received postoperative physical therapy. Additional research is needed to explore the optimal parameters and protocols for preoperative physical therapy prior to ACLR and establish a pre-operative protocol that improves functional outcomes after ACL reconstruction.

**ABSTRACT #31**

**The Effect of Neuromuscular Injury Prevention Programs on Risk of Knee Injury in Adolescent Female Athletes: A Critical Review**

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Introduction: It is known that female athletes have a 4 to 6-fold higher risk of anterior cruciate ligament injury than their male counterparts who play the same sports at similar levels. Researchers have identified several non-modifiable factors that contribute to knee injury such as anatomical, hormonal, and genetic components. Conversely, modifiable factors such as biomechanical and neuromuscular components have also been linked to knee injury. It is crucial to identify a preventative exercise program based on these principles that will decrease lower extremity injuries in the adolescent female athletic population. The purpose of this critical review is to examine the effectiveness of neuromuscular training programs on knee injury rates in female high school basketball players from available research.

Method: A review research literature from Medline accessed via PubMed included the search terms “anterior cruciate ligament injury prevention in female adolescents”
Results were further filtered to include RCT and Meta-analysis. Three articles were appraised, comparing lower extremity injury rates in adolescent female athletes that completed either a neuromuscular training program or sport specific training (control group).

Results: The studies reviewed give promising evidence that neuromuscular training can be effective in reducing knee injuries in female high school athletes. The first study found that a 6-week plyometric program was effective in reducing rates of knee injury. Subjects in the second study completed an 8-week program which included six components: warmup, stretching, strengthening, plyometrics, and agilities training resulting in improved biomechanics and strength gains in the athletes. The final study showed decreased lower extremity injury rates in athletes who completed an 8-week neuromuscular training program consisting of strengthening, balance, plyometric, and agility exercises.

Conclusion: From our studies we can conclude that warm-up programs focused on neuromuscular training have a preventive effect when it comes to lower extremity injury rates in adolescent female athletes. Getting this knowledge into the hand of high school coaches is crucial for the health of young athletes. Implementing a neuromuscular training program as a warm-up prior to practice and competitive games can significantly decrease injury rates, keeping players in the game and off the sideline.

ABSTRACT #32

Effect of Sports Specialization on Injury Rate among Youth Athletes
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Introduction/ Purpose: Sports specialization is a growing trend among many youth athletes. While most adolescents engage in a wide variety of sports and physical activities, an increased number of youth are specializing in single sports year-round, and youth acute and overuse injuries are on the rise. Several studies have been conducted to investigate what aspects of sports specialization, such as volume of activity, training structure, and intensity, can potentially contribute to the increasing risk of injury. The purpose of this review is to explore whether there is a significant variance between single-sport and multi-sport athletes in their rate of injury and to further explain what factors contribute to injury rates among youth athletes.

Method: Electronic searches were conducted using the search terms, “youth athlete”, “youth sports”, “adolescent”, “sports”, “multi-sport”, “single-sport”, “sports specialization” and “injury” in the MEDLINE and CINAHL databases. The initial yield was 52 results, and after further clarifying searches, results were condensed to three articles consisting of a systematic review, a meta-analysis, and a prospective cohort study.

Results: Sport-specialized athletes can develop compromised neuromuscular control adaptations during maturation which leads to an increase in acute and chronic injuries when compared to multi-sport athletes who benefit from a diversity of movements with different activities. Early sports specialization and higher degrees of specialization can result in higher rates of the development and onset of overuse injuries that lead to withdrawal from play.

Conclusions: Based on the articles, we concluded that early sports specialization is related to an increased risk of injury; however, availability of research in this field is limited by retrospective studies, research methods, age group, and inconsistent definitions for sports specialization. Maturation status can play a role in an athlete’s injury risk profile, but there are currently no set recommendations on age, volume, or intensity of training with sports specialization or multi-sport activities. Further research is needed to shed more light on this growing trend, but a middle ground between training structure design and sports specialization can have beneficial effects for adolescent athletes.

ABSTRACT #33

Medical Imaging in Surgery
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The purpose for this poster is to inform readers about the quality of medical imaging and the benefits with surgery. The literature review includes a comparison of how the different medical imaging systems work and the way they are used either prior to or during surgery. Medical imaging helps diagnose patient conditions and, in some ways, treat the patient. The review will discuss main points about radiation protection between the technologist, nurses, surgeons, and all other health care professionals who are in surgical rooms being exposed to the radiation. The tools offered by the medical imaging field is what surgeons use to help guide their way during tough cases. Medical imaging is changing today’s appearance of how trustworthy medical imaging can be and how it can benefit more than harm in the process.
Ependymomas are neoplasms of the central nervous system which arise from the ependymal cells that line the ventricular pathways of cerebrospinal fluid flow. Magnetic resonance imaging (MRI) is an essential imaging modality that can help identify and diagnose this pathology. Through the use of multiple tissue weighting variations, MRI can display anatomy in multiple views allowing radiologists to pinpoint ependymomas better. On a T1-weighted image, fluid will appear dark while fat will be bright. On a T2-weighted image, these are the opposite, so fluid appears bright while fat is dark. Ependymomas often present isointense on both T1 and T2-weighted images to their surrounding structures. However, on T2-weighted images, ependymomas can be surrounded by inflammation (fluid), causing them to be more distinguishable by a radiologist. It is these specialized imaging features of various tissue weightings that enable MRI to be versatile and efficient in diagnosing ependymomas.

Rest or Not to Rest? Graded Aerobic Exercise Program Compared to Rest on Time to Return to Sport in Post-Concussion Athletes: A Critical Review

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Introduction/Purpose: Sport-related concussions (SRC) are common in the adolescent population, and the paradigm for treatment is shifting. It was previously believed that the best intervention for this injury was cognitive and physical rest until symptoms resolved; however, emerging evidence indicates otherwise. New evidence demonstrates that subsymptom level aerobic exercise is safe for acute SRC; additionally, exercise is correlated with earlier symptom relief and earlier return-to-sport. Purpose: The purpose of this critical review is to evaluate the emerging evidence on the effectiveness of early subsymptom aerobic exercise in comparison with rest in adolescents following acute SRC.

Method: MEDLINE via PubMed was searched for studies that included exercise and SRC. Inclusion criteria involved studies with males and females between the ages of 15-25 years. Two retrospective cohorts and one systematic review were selected for appraisal.

Result: All studies indicated that graded aerobic exercise is safe and more effective for treatment of SRC than rest. One cohort study showed that sub-symptomatic threshold aerobic exercise resulted in earlier return to sport (13 days), as opposed to relative rest (16 days) or the placebo-like stretching group (17 days). Another cohort found that change in heart rate and symptom-limited exercise intolerance were correlated with longer duration of recovery with rest and a placebo group, but not found in an aerobic exercise group. The systematic review proved that an earlier initiation of physical activity was correlated with lower risk for developing persistent post-concussion syndrome.

Conclusion: While rest has been the recommended treatment for SRC, current evidence suggests that aerobic exercise is more effective for recovery. These studies support the finding that aerobic exercise results in earlier return to sport and decreased risk of persistent symptoms as opposed to relative rest and placebo-like stretching. The most effective parameters for a graded aerobic exercise program have not been determined. Two of the studies used Buffalo Concussion Treadmill Test, a safe and prognostic method used to initiate/monitor a graded aerobic exercise program. The systematic review further outlines the intensity, duration, and time of initiation of previous aerobic exercise programs that have been found to be effective.

Effects of Vestibular Rehabilitation in Adolescent Concussion Management: A Critical Review

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Background and Purpose: As the prevalence of concussions continues to rise in youth sports, treatment of concussions in adolescents continues to evolve. With better identification of patient symptoms, treatment can be more specific and tailored to the individual. In patients with persistent dizziness, headaches, and cervical pain, vestibular rehabilitation may provide a viable option to relieve these post-concussion symptoms. This critical review explores the effect of vestibular rehabilitation in treating sport-related concussion symptoms in an effort to decrease time to medical clearance to return to sport.

Methods: The literature databases Medline via PubMed, EBSCO, and Google Scholar were searched for studies that investigated vestibular rehabilitation in treating concussions. Articles that did not include key terms such as vestibular rehabilitation, concussion, and an adolescent population were excluded. From an initial yield of 119 articles, a systematic review, randomized controlled trial, and retrospective cohort study were selected for appraisal after a review of titles and abstracts was conducted for the inclusion of vestibular rehabilitation in treating post-concussion symptoms in an adolescent population.

Results: All of the selected studies supported
vestibular rehabilitation as a safe and effective option to treat post-concussion symptoms. Vestibular symptoms may arise from peripheral or central vestibular impairments or the cervical spine; treatment should seek to identify the origin of symptoms and treat as needed. Two of the selected articles examined multimodal treatment including both vestibular rehabilitation and manual therapy to treat post-concussion symptoms. One of the articles emphasized individualized vestibular rehabilitation.

Conclusion: Vestibular rehabilitation in conjunction with other treatments (such as manual therapy) is an effective treatment for adolescents with post-concussion symptoms and may reduce time to medical clearance to return to sport. Treatment should be individualized to address each patient’s symptoms.

**ABSTRACT #37**

**Effect of Body-Weight Supported Treadmill Training vs Overground Gait Training on Walking Endurance in Adults Post-Stroke: A Critical Review**

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**Background:** One of the most common goals for adults post-stroke is the recovery of independent ambulation. Over the past three decades, body-weight supported treadmill training has become a frequently used method for gait training in neurorehabilitation.

**Purpose:** To determine how body-weight supported treadmill training (BWSTT) compares to overground gait training in improving walking endurance.

**Methods:** The authors searched Medline (via Pubmed) for articles related stroke, treadmill training, body-weight support, overground walking, walking endurance, cerebral vascular accident, locomotor training. Subject characteristics were patients older than the age of 18 years, <1 year from stroke, and previous functional independence before the onset of stroke. Three randomized controlled trials were selected for inclusion to the review due to use of body-weight support treadmill training and overground gait training.

**Results:** Two articles found no difference between BWSTT compared to overground gait training in walking endurance. One article found that BWSTT showed a significant increase in walking endurance when compared to overground gait training in independent ambulators. Across all studies, walking endurance improved from baseline regardless of intervention strategy.

**Conclusion:** Competing evidence indicates that more research is needed to compare BWSTT vs overground gait training. Due to the lack of conclusive evidence for superiority of one intervention over another, availability of space, resources, cost and patient preference should be primary factors in choosing intervention strategies.

**ABSTRACT #38**

**Functional electrical stimulation is superior to ankle foot orthosis for gait improvement in patients with foot drop after stroke: a critical review**

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**Introduction:** Gait impairments are commonly seen in patients after stroke. Foot drop is one of the impairments contributing to gait deviations. Currently, the functional electrical stimulation (FES) and the ankle foot orthosis (AFO) are used to improve foot drop. Many studies have shown that both FES and AFO can benefit patients with stroke by improving their gait. The purpose of our critical review was to compare the effect of the FES and AFO on gait improvement in patients with foot drop after stroke.

**Methods:** The systematic searches were conducted in the databases Medline (via PUBMED) and Embase. Key terms included: stroke, functional electrical stimulation, ankle foot orthosis, and gait. Thirty articles were yielded, and two randomized controlled trials (RCT) studies and one retrospective cohort study were selected for appraisal. All the selected articles compared the effect of FES and AFO on gait in patients with foot drop after stroke. Results: The two RCT studies compared the effect of surface peroneal FES and articulated or non-articulated AFO on gait speed and other lower extremity functions in stroke patients. Both studies showed no significant difference in gait speed improvement between surface FES and AFO. One study found the surface FES can significantly improve walking endurance and stair climbing speed. The retrospective cohort study investigated the effect of implanted peroneal FES and AFO on gait adaptability and showed that the implanted FES had a higher obstacle avoidance success rate than the AFO in chronic stroke patients (≥ 6 months post-stroke). Conclusions: For patients with foot drop after stroke, the surface FES was non-inferior to the AFO in improving gait speed, while the implanted FES could have a better effect on gait adaptability than the AFO. However, implantable FES is a complicated and costly system that requires surgical procedures and causes more potential complications than AFO.

**ABSTRACT #39**

**Role of Physical Activity Interventions on Endurance in Children with Down Syndrome: A Critical Review**

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**Background:** Down Syndrome (DS) is attributed to a chromosomal abnormality (trisomy 21) and is characterized by several clinical symptoms that include orthopedic and cardiovascular impairments. These impairments among others contribute to limitations in activities and participation
in school-aged children. There is substantial research in studying the effects of strength training in children with DS, but there is limited research in studying interventions to improve endurance in the population. This critical review explores physical activity interventions and their effects on endurance of children with Down syndrome so that they are not limited in their activity and social interactions.

Methods: The literature database MEDLINE was searched using the key terms (Down Syndrome or Intellectual Disability) and Children and Exercise Therapy and Physical Fitness. The initial search yielded 7 results, and articles that investigated the role of physical activity interventions on endurance in children with DS were prioritized. Review of the qualifying articles led to the appraisal of two randomized controlled trials (RCT) and one case study. All three articles selected assessed the effects of physical activity interventions on endurance in children with either DS or intellectual disability.

Results: One RCT found that while aerobic training with a rowing ergometer could be effective in improving pulmonary functions in children with DS, the improvements were small and may not translate to clinically meaningful improvements. The case study concluded that an exercise program combining aerobic and strength training was valuable in achieving cardiovascular benefits. The other RCT found that using a lower extremity endurance exercise for a 20-repetition maximal contraction, followed by 24-25 minutes of cardiorespiratory endurance exercise resulted in increased patients’ maximal oxygen consumption compared with 10-repetition max followed by 26-27 minutes of cardiorespiratory extremity endurance.

Conclusion: In order to improve the endurance and cardiorespiratory fitness of children with Down syndrome, one must implement exercises that focus on improving strength and endurance of lower limb musculature in combination with cardiorespiratory endurance training.

**ABSTRACT #40**

**The Effects of Strength Training on Gait Speed in Children with Spastic Cerebral Palsy**

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Introduction: Cerebral palsy is a permanent, non-progressive movement disorder that is caused by a disturbance to the fetal or infant brain. This disorder affects postural control, balance, coordination, motor planning, and muscle strength, which can cause severe activity limitations. These impairments can lead to difficulty or the inability to walk. As the child grows, he/she will likely receive physical therapy intervention several times to address this activity limitation. Children with cerebral palsy often receive physical therapy to improve gait. There is an increasing interest on the effects of strength training on gait mechanics. Currently, strength training is used to address muscle weaknesses and imbalances, but it is unclear whether the improvements in muscle strength translate to improved gait mechanics. The purpose of this critical review is to determine if strength training improves gait speed in children with spastic cerebral palsy more than traditional physical therapy consisting of passive range of motion, positioning, balance training, functional training, and neurodevelopmental training.

Methods: Medline (via PubMed) was searched to identify articles comparing strength-based exercise programs and traditional physical therapy for children with spastic cerebral palsy when attempting to improve gait speed. Studies were limited to the past 15 years of publication and involved participants under the age of 19 years, primarily with spastic diplegic cerebral palsy. The initial search parameters yielded 61 articles, and 3 randomized control trials were selected.

Results: The studies showed that there was no statistical difference in gait speed, measured by the 10-meter walk test and three-dimensional gait analysis, in children with spastic cerebral palsy who completed a strengthening program compared to a traditional physical therapy program. Two studies showed some increases in muscle strength following the strengthening program, but this did not correlate to increased gait speed.

Conclusion: Strength training did not show greater improvements in gait speed compared to traditional physical therapy. Many studies stated that to improve gait speed one must work on gait training rather than strength training because other impairments likely are playing larger roles in the gait difficulties. This information can be used to help guide intervention strategies used with cerebral palsy.

**ABSTRACT #41**

**Declined Treadmill Walking Eliminates Asymmetric Walking Pattern in Healthy Young Adults**

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Human locomotion is flexible in any environment, and this fact has been proven when walking on different speeds in each leg on the split-belt treadmill. However, during the split-belt walking, participant’s locomotor behaviors are passively adopted by a motor-driven treadmill. Therefore, how humans actively adjust the flexibility of locomotion is still limited by using the split-belt treadmill. Our current study investigated the flexibility of locomotion by using ankle weight on the dominant leg to induce asymmetric walking pattern when walking on a regular treadmill. We hypothesized that the level of active control would increase to adapt the asymmetric walking in all different kinds of inclinations.

Number of Subjects: Twenty healthy young participants (age: 24.7 ± 2.2 years; height: 1.73 ± 0.08 m; mass: 68.92 ± 12.07 kg, 12 females and 8 males) were recruited for this study.
Materials/Methods: Six conditions (walking on the level treadmill, 15% inclined treadmill, 15% declined treadmill with/without wearing 4-lb ankle loading on the dominant leg) were randomly assigned to participants. A motion capture system and reflective markers were used to collect data. The markers were placed on the heel and toe of both legs to measure step length, symmetry index (SLS) and step time symmetry index (STS). SLS = (SL_non_dominant_leg - SL_dominant_leg)/(SL_non_dominant_leg + SL_dominant_leg); STS = (ST_non_dominant_leg - ST_dominant_leg)/(ST_non_dominant_leg + ST_dominant_leg). A two-way repeated measures ANOVA was used to investigate interaction between effect of unilateral limb loading and the effect of different locomotor conditions on SLS and STS. The significant level was set at 0.05.

Results: There was a significant interaction between the effect of ankle loading and the effect of inclinations on SLS and STS (p < 0.0001). The post hoc results indicated that unilateral ankle loading caused the asymmetric walking pattern when walking on the level and inclined treadmill but not on the declined treadmill. This phenomenon could be explained by that participants increased their active control of lower leg during declined treadmill walking to eliminate the effect of unilateral ankle loading by reducing the step length and step time.

Conclusions: Walking on the declined surface could induce a higher level of active control than walking on level and an inclined surface.

Clinical Relevance: To our best knowledge, this is the first study to demonstrate that walking on the declined surface eliminated the asymmetric walking pattern in young adults. It has been shown that training patients with stroke on a split-belt treadmill reduced their asymmetric walking pattern during overground walking. However, this learning effect disappeared after approximately ten strides or less due to different levels of active control. The current result illustrates the possibility of training on the declined treadmill to regain symmetric walking pattern in patients who walk asymmetrically.

ABSTRACT #42

Diagnosing Spina Bifida with Ultrasound
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Spina bifida is one of the most common congenital birth defects concerning the neural tube. There is a 1 in 1,500 chance that a baby will be born with some type of spina bifida. Some parents decide to terminate the pregnancy after the diagnosis, while others opt for intrauterine surgical repair, or in minor cases, surgery on the infant after birth. Intrauterine repair before the 26th week of pregnancy gives the fetus a chance of not being shunt dependent. This exhibit will be look at the etiology, diagnosis, first trimester and second semester findings, sonographic markers, prevention, and treatment, and the advantages that have been found using ultrasound to diagnose spina bifida. Ultrasound has improved over the years, however, there are other tests that can also help diagnose a fetus with spina bifida. Two of the main signs to look for during the first and second trimesters using ultrasound is the “lemon” and “banana” sign of the frontal bones and cerebellum, respectively. As with many other medical complications, there are also ways to prevent this from happening, such as consuming a certain daily amount of folic acid prior to and during pregnancy.

ONCOLOGY

ABSTRACT #43

Effectiveness of Afirma Gene Expression Classifier in diagnosing Follicular Lesions of Undetermined Significance in Thyroid Fine Needle Aspiration
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Introduction: The incidence of palpable thyroid nodules have become increasingly common in clinical practice, and so has screening for risk of malignancy. The screening of these nodules consists of ultrasonography along with fine needle aspiration (FNA), which leads the clinician to decide if surgical excision of the nodule is necessary. However, the one diagnosis that is continued to be problematic among health professionals is the follicular lesion (or atypia) of undetermined significance (FLUS/AUS). In order to provide a more specific result than this diagnosis, an additional sample can be saved from the FNA procedure and be sent out for genetic testing, such as Afirma Genomic Classifier. The Afirma test result will result in benign (negative) or suspicious, where the latter signifies a higher malignant potential of the nodule. The purpose of this research is to observe the relation between FLUS/AUS diagnoses and Afirma results, while recording if a suspicious Afirma result will lead to a repeat of the case or a surgical excision of the nodule.

Methods: The data was collected using a search with the words “atypical,” “thyroid,” and “Afirma” through the pathology reports of Morton Plant Hospital in Tampa Bay, Florida from January 2014 to February 2020. Surgical reports were recorded for each FLUS/AUS diagnosis, if any. The numbers of total thyroid cases done each year were recorded for statistical analysis. The relations between FLUS/AUS diagnoses and Afirma results, while recording if a suspicious Afirma result will lead to a repeat of the case or a surgical excision of the nodule.

Expected Results and Conclusion: It is expected that a majority of the suspicious Afirma results will have an equal chance of being followed by a repeat of the FNA or a surgical excision of the nodule. Additionally, it is
expected that 90% of the FLUS/AUS diagnoses will lead to suspicious Afirma results.

**ABSTRACT #44**

Discrepancies Between Rapid On-Site and Final Cytologic Interpretations: Experience from a Large Academic Center to Highlight Diagnostic Challenges

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Introduction: Rapid On-Site Evaluations (ROSE) is a service provided by cytotechnologists during minor procedures and radiologic imaging to provide the clinician with a preliminary diagnosis and determination of adequate lesion sampling. Since the origination of the Fine Needle Aspiration procedure there have been new advancements in the technique to ensure adequate sampling of the lesion. In this study, ROSE were assessed for five consecutive years beginning January 2014 and ending in December 2018. Interpretations for several different body sites were assessed to determine possible discrepancies between the ROSE and final diagnosis.

Methods: The study included a total of 6,145 cases and utilized the following categories to determine if the case was discrepant: rapid overcall, under call, insufficient cells for accurate diagnosis or mismatch due to wrong malignancy.

Results: The site with the highest rate of discrepancy was lung and in 2014 was at 2.4% and tended to decrease to a rate of 2.02% in 2018. Lymph node received the second highest rate of discrepancy with an unsteady decrease from 1.2% to 0.4% over the five years. Of all the cases and body sites, rapid under call was the most commonly found discrepancy.

Conclusions: Immunologic stains and ancillary testing procedures are often performed on the remaining slides of each FNA procedure. Additional tests help to make a case for the final diagnosis given, and are not available to pathologists and cytotechnologists while on a ROSE. For this reason, it can be determined that although ROSE are helpful in determining whether the lesion was accurately sampled and can often unveil viable preliminary diagnoses, the final diagnosis is still the most accurate and true representation of the case.

**ABSTRACT #45**

Brachytherapy and Its Use in Treating Uveal Melanomas

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Brachytherapy is an up and coming method used in treating an assortment of cancers. It places radiation directly on the tumor, which allows higher doses of radiation to be delivered to more-specific areas of the body. Brachytherapy has been shown to be very effective with its accurate targeting. Since the radioactive material is placed directly near the damaged tissues, brachytherapy has resulted in fewer side effects and shortened treatment duration. Several different types of cancers that have been treated in this way include, but not limited to brain, breast, eye, prostate, and vaginal cancers. Uveal melanoma is one of the most common types of eye cancer that can be treated using the brachytherapy technique. The plaque is attached to the wall of the eye, covering the base of the intraocular tumor. Once in place, the radiation source is placed inside the plaque. The main goal when treating uveal melanoma is to maintain the patient’s visual acuity. Like most other forms of treatment, the primary goal is to always eradicate the tumor and provide the best life prognosis for the patient.

**ABSTRACT #46**

Small Cell Lung Cancer

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Small cell lung cancer (SCLC) is an uncommon form of lung cancer and makes up only 10-15% of the diagnoses. It is primarily caused by smoking but could be caused by other factors as well. Medical imaging is used to detect, help diagnose, and stage this form of lung cancer. In most cases, the cancer metastasizes, or spreads, to other parts of the body. This makes it difficult to cure even with multiple techniques of treatment like surgery or chemotherapy. Radiation therapy is used as a form of treatment and can be either curative or palliative care. New studies are being done to make SCLC an easier cancer to detect and treat. This literature review will explain the causes, signs and symptoms, methods of detection, staging, and treatment. It will also show the way medical imaging influences detection, staging and treatment of SCLC.

**ABSTRACT #47**

What is Osteosarcoma?

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This poster reviews the background, staging process, different imaging modalities associated with diagnosis, treatment, and prognosis of osteosarcoma. It reviews the origins, symptoms, and causes seen in those
diagnosed with osteosarcoma. Staging of osteosarcoma is explained using the Enneking surgical staging system. This categorizes tumors based on if they are high or low grade, where they are located in relation to the affected bone, and if it has metastasized or not. Diagnostic imaging is then used in the diagnosis of osteosarcoma. The most commonly used modalities include traditional radiographs (X-rays), magnetic resonance imaging (MRI), and computed tomography (CT). Treatment options of osteosarcoma include surgery paired with chemotherapy and/or radiation therapy. Amputation or limb-salvaging are the common surgical procedures, with the latter leading to a more favorable prognosis. Survival rates seen amongst those diagnosed with osteosarcoma depends on the staging of cancer, gender, and age, as well as many other factors.

**ABSTRACT #48**

**Lung Toxicities in Patients Undergoing Total Body Irradiation**

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Total body irradiation (TBI) is a form of radiotherapy that is often used as part of the preparative regimen for hematopoietic stem cell transplantation. TBI involves irradiation of the entire body, and in doing so it suppresses the immune system, irradiates residual cancer cells, and increases the chances of a successful transplant. With the advantages of total body irradiation there also comes several disadvantages. For patients, irradiation to the whole body raises concerns. Of these concerns, lung toxicities are one of the most major and life threatening. Radiation causes lung toxicities due to the free radicals it creates and destroys normal tissue. According to an article by Chris R Kelsey, sever pulmonary toxicities from today body irradiation include interstitial pneumonities, infectious pneumonia, diffuse alveolar hemorrhage, and respiratory failure requiring ventilatory support. About 25-80% of patient undergoing today body irration will be diagnosed with a lung toxicity after treatment. With there being so many different protocols for total body irradiation, studies are being done to find which is most superior.

**ABSTRACT #49**

**The Effects of Brachytherapy on Overall Survival While Maintaining an Acceptable Toxicity Profile**

Alexis Farris, McKenna Butler. Radiation Therapy program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

The overall purpose of the study was to determine if brachytherapy was a viable option in comparison to external beam radiation for the treatment of prostate and cervical cancer. Both studies utilized a randomized-patient clinical trial, in which the toxicity profiles of the patients were documented post-treatment. To decide which treatment option would be best suitable for patients, a focus was placed on quantitatively assigning values of various toxicities to determine which radiation had significantly improved biochemical free survival. For prostate cancer, the patients who underwent both external beam radiation and a brachytherapy boost had a significant improvement in biochemical free survival. However, patients who underwent brachytherapy alone had no significant increase in survival. In the vaginal study, toxicity profiles were deemed acceptable for brachytherapy. It was concluded that there is not enough data to prove the toxicity profiles and overall survival rates are increased with brachytherapy versus external beam radiation therapy alone. Both trials could use longer follow-up time, a larger number of patients in each study, and more research to improve the data.

**ABSTRACT #50**

**Management and Treatment Options for Advanced Stage Lung Cancer**

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Lung cancer is the most common malignancy worldwide and is the most common cause of oncologic death. Within the United States, it is the second most common cancer to prostate cancer in men and breast cancer in women. The 5-year relative survival for regional and distant disease is 33% and 6% respectively. Due to the severity and prevalence of the disease, treatment methods are continuously scrutinized and heavily researched to improve survival rates and reduce treatment-related toxicities. Stereotactic body radiation therapy (SBRT) use has increased because high doses are reached in only 1-5 treatments with great dose conformation. Respiratory gating and advanced immobilization such as abdominal compression devices have also shown promise in reducing both inter- and intrafraction motion. Treatment methods continue to advance and improve lung cancer survival.
ABSTRACT #51

The Advantage of MRI-based Planning for Proton Therapy Treatment
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Magnetic resonance imaging (MRI) has recently been implemented into the standard treatment practice of x-ray beam therapy (MRXT). The concept of MRI-based planning for cancer treatment is not a new method in radiation oncology. Recent studies have shown the benefits of using MRI planning for proton beam therapy, which together can become superior cancer treatment. These two exceptional modalities have been collectively called MRI-guided proton beam therapy (MRPT) (1). This is beneficial because it will guide cancer treatment into a bright and healthy future.

Benefits of MRI-based planning includes superior soft tissue contrast and improved delineation of anatomical structures (2). This improved visualization is vital for precise radiation treatment. The role of MRI in radiation oncology is a promising development for the future of cancer patients.

Proton therapy is becoming the superior radiation treatment for certain cancers. This modality gives optimal delivery of high doses to the tumor area with high normal tissue sparing compared to conventional radiation therapy (3). This has interested oncologists and clinical studies continue to grow.

While research is still being done to integrate MRI into the realm of proton therapy practice, and the future for MRI-based planning is bright.

ABSTRACT #52

A Retrospective Analysis of Pap Smears of Transgender Men
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Introduction: A current diagnostic problem in cytology is how to adequately screen Pap Smears from transgender men. Many transgender men take androgen replacement hormones, causing a lack of cell proliferation. The cells appear immature on a smear and are referred to as atrophic. As these cells are harder to diagnose, these patients have higher rates of smears that are called unsatisfactory or as a high-grade intraepithelial lesion (HSIL). The objective of this study was to gather information on the findings observed in the cytology samples of Pap Smears of transgender men.

Methods: This study retrospectively examined Pap smears from transgender male patients from Nebraska Medicine. There were twelve cases from the past three years that were analyzed for this study. The diagnoses and prior history were attained using the CoPath laboratory computer system and recorded in a spreadsheet. It was determined that the majority of cases were diagnosed as negative or negative with atrophy (83%), some with a mention of scant cellularity (16%); only one case was called as unsatisfactory and one as reactive. The slides were examined under a microscope and the observations entered into the spreadsheet.

Results: It was determined that normal atrophic cells presented singly or in sheets or groups. Many of the smears diagnosed as atrophic had a few mature cells admixed with the atrophic cells. These cells were larger than the atrophic cells and some stained eosinophilic (pink). The reactive cells had higher nuclear-to-cytoplasmic (N/C) ratios, relatively smooth nuclear borders, darker chromatin, and were more cohesive. These reactive groups were occasionally observed in slides that were not diagnosed as reactive. Conclusions: While the lower rates of unsatisfactory and HSIL calls were not consistent with current research, the types of cells observed in the smear were similar to those reported in current studies. The lack of atypical cases may be due to the small sample size of this study; however, some cases had a few reactive groups and were not diagnosed as reactive.

ABSTRACT #53

Accident Prevention in the MRI Suite
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Technology is rapidly advancing, especially over the past few decades. Magnetic resonance imaging (MRI) is no exception. During this time, MRI scanners have increased capabilities, more efficient, and ultimately safer for our patients, yet more injuries and accidents that have occurred in MRI than ever before. Why is it that this is happening? Research has shown that it is not MRI itself that is becoming less safe, but it is a combination of issues that when put together create this problem. The doctors ordering these exams, technologists that perform these scans, the education technologists are receiving before being allowed to scan on their own, the increased number of clinics where patients can have a scan done, and the extreme increase in workload that MRI has seen in recent years are all contributing factors. All of these issues can be fixed given the right training, better communication, being more attentive to the patient, and slowing down to make sure they are doing our job to the best of their capabilities.
ABSTRACT #54

The Consequences of Fluoroquinolones in the Treatment of Uncomplicated UTIs
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Acute, uncomplicated urinary tract infections (UTIs) are one of the most common bacterial infections encountered in clinical practice. Recommendations from clinical guidelines and experts indicate Fluoroquinolones as antimicrobial agents to avoid for the management of uncomplicated UTIs. However, Fluoroquinolones are commonly prescribed as first-line therapy when other, more narrow spectrum antibiotics should be utilized. It is important to determine why specific antimicrobials are indicated over others for the empiric treatment of uncomplicated UTIs. The goal of this literature review is to determine if Fluoroquinolones should be used to treat uncomplicated UTIs. A systematic review, systematic review with meta-analysis, and two cohort studies were evaluated. Each study specified systemic Fluoroquinolones should be avoided due to serious adverse side effects that are potentially life-threatening or debilitating long-term. Additionally, limiting the empiric use of Fluoroquinolones minimizes patient morbidity and mortality associated with resistant UTI infections. Future directions should focus on the development of uncomplicated UTI therapy guidelines recognized by all major medical associations to help ensure providers are prescribing other appropriate empiric antimicrobial therapies before resorting to Fluoroquinolones.

ABSTRACT #55

The Use and Effectiveness of Screening Methods and Imaging Modalities to Identify Those at Risk for Stress Fractures
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Stress fractures are the result of overuse and repetitive activity. One unique population at risk for stress fractures are female athletes, especially those competing in gymnastics, lacrosse, cross country, swimming, or diving. To look a certain way, women often eat inappropriately, which can lead to amenorrhea, and potentially osteoporosis. The combination of those three previously mentioned medical conditions is known as the female athlete triad. Results from a study by Beals and Hill of Division II college athletes found that 25% had disordered eating, 26% reported menstrual dysfunction, 10% had low bone mineral density, and 2.6% had all three components of the triad. The goal of this literature is to evaluate the screening methods available to identify those at risk for the female athlete triad and the use of imaging modalities to successfully identify a stress fracture when there is high clinical suspicion.

ABSTRACT #56

The Effectiveness of Physical Activity as an Adjunctive Therapy in PTSD
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Post-traumatic Stress Disorder (PTSD) is a psychological disorder that leads to severe symptoms of hyperarousal, avoidance, re-experiencing, and common comorbid conditions like depression and anxiety. This review of studies compared several existing research articles on the effectiveness of physical activity as an adjunctive treatment to standard PTSD therapy regimens. A search was conducted across multiple platforms for systematic reviews, meta-analyses, and randomized controlled trials on the selected topic. Fourteen articles were reviewed, and five were included in this presentation. All studies showed a significant reduction in symptom severity and onset for patients participating in physical activity versus those who did not. More studies with more fleshed out implementation and measurement methods are needed, and specific applications of prescribed physical activity in PTSD treatment still need to be reviewed. The data pool is relatively small, but the evidence all points towards prescribed physical activity as a cost-effective and successful adjunctive therapy in PTSD patients, especially those with comorbid depression or anxiety.

ABSTRACT #57

Use of External Female Catheter as an Alternative to Indwelling Catheters to Reduce Risk of Catheter-Associated Urinary Tract Infection
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The external female catheter is thought to have potential as a replacement for the indwelling catheter that will reduce catheter-associated urinary tract infections (CAUTI) and incontinence-associated dermatitis (IAD). The goals of this literature review are to collect existing evidence regarding the external female catheter and compare it to existing data regarding the best means for reduction of CAUTI and the prevalence of incontinence and IAD in the inpatient setting. It is clear in the wealth of evidence that the best means for CAUTI reduction is removal of the indwelling catheter early and therefore we may infer that the use of the external catheter may be used to reduce utilization of the indwelling catheter. Although the evidence shows a prevalence of incontinence and IAD,
there is a significant lack of evidence testing the role of the indwelling catheter in relation to this outcome. Although it shows promise, more prospective randomized control trials are needed to look at the external catheter’s direct effects on these factors.

**ABSTRACT #58**

**Sports Participation Improves Quality of Life in Children with Disabilities**
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Introduction: Sports participation has been shown to improve quality of life (QoL) ratings for typically developing children in physical, social, and psychological domains. However, few studies have addressed the impact of sports participation on children with disabilities, in particular cerebral palsy (CP). The goal of this critical appraisal was to determine if sports participation improves quality of life in children with cerebral palsy. Method: For the critical appraisal, searches were conducted on the NCBI PubMed, Springer Protocols, and Google Scholar databases. The search terms included: Quality of Life/Social, Cognitive/Cognition, Disability/Cerebral Palsy, Physical Activity/Sports, Children/Adolescents. Inclusion criteria were studies with adolescents under 18years with CP. Exclusion criteria were studies published before 2010 and not available in English. The search yielded five results. One study was excluded due to the absence of CP as a diagnosis, and another because it analyzed cognition rather than QoL.

Results: The articles assessed QoL through self-reported measures, and each found a strong association between sports participation and high ratings of QoL in physical, social, and psychological domains. These measures were the IARRP, PAQ-A, PedsQL, Likert Scale, SEES. One article reported improved motor skills and attention as a result of sports participation in children with CP. Another article reported a positive association between physical activity and higher QoL in children with CP. In addition to confirming these findings, the final article also highlighted a discrepancy between caregiver’s perception of the child’s reported QoL, with children reporting higher perceptions of their QoL.

Conclusion: Overall, sports participation for children with CP can improve their psychosocial profile, increase the children’s physical function ratings, and enhance QoL. Furthermore, due to the difference in perception of QoL, caregivers may need education about the benefits of physical activity for their children with disabilities, especially when selecting recreational programs. The limitations of this critical appraisal include (i) the absence of randomized controlled trials on this topic and (ii) the lack of studies available focused solely on CP. In summary, the findings of this appraisal strongly support sports as a potential medium to improve quality of life for children with cerebral palsy.

**ABSTRACT #59**

**The effect of inclination on lower extremity inter-joint coordination during treadmill walking**
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Background: Inclined walking is a challenging daily task in comparison with level walking. It requires specific control from central nervous system and exhibits increases in muscle activities and alternations of joint kinematics in lower extremities. However, the knowledge of the inclination effect on interjoint coordination is limited. Previous studies have shown the benefits of investigating inter-joint coordination in patients with Parkinson's disease, low back pain, and hemiplegic gait. This study aimed to evaluate such coordination in healthy young adults during inclined walking.

Methods: Nineteen healthy young adults were recruited. Subjects walked at their comfortable speeds for 2 minutes in four inclined treadmill walking conditions (0%, 5%, 10%, and 15% grade). Three-dimensional kinematics data were captured at 100 Hz by an eight-camera Qualisys motion capture system. To calculate the inter-joint coordination, the phase portraits were created by plotting the specific segment’s angular position versus its angular velocity. The trajectories of these phase portraits were converted from Cartesian coordination to polar coordination to get phase angles. These phase angles were used to calculate the continuous relative phase (CRP) dynamics during a gait cycle between two segments which contained the same joint center. A mean absolute value of the ensemble CRP curve values (MARP) was calculated by averaging the absolute values of all points of the entire ensemble curve. Low MARP indicated that two segments approached to in-phase and vice versa. A two-way repeated ANOVA with Bonferroni correction was used to determine the effect of inclination and the effect of segmental combinations (shank-thigh and foot-shank) on MARP.

Results: There was a significant interaction between the effect of inclination and the effect of segmental combinations on MARP. The MARP of foot-shank combination was lower than that of shank-thigh combination when walking on 0% grade and on 5% grade. However, the MARP of foot-shank combination was higher than that of shank-thigh combination when walking on 10% and on 15%.

Conclusion: When the grade increased to a certain level, the interjoint coordination changed to a different pattern during treadmill walking.
ABSTRACT #60

ABSTRACT #61

Contrast-Induced Acute Kidney Injury
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Coronary and vascular intervention examinations depend on iodinated contrast media in order to perform the exam. Eventually the contrast used in these examinations will find their way into the kidneys. For a certain group of people this will cause contrast-induced acute kidney injury. Contrast-induced acute kidney injury is an unfortunate complication from these exams that can cause permanent injury to the kidneys or death. This review aims to explore the pathophysiology, risks, consequences, impact, and preventative measures that have been researched and currently being developed.

ABSTRACT #62

PROFESSIONAL PRACTICE AND EDUCATION

Effects of Oxygenator Change-Out Simulations on Patient Safety
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Background: Oxygenators have been a staple of life saving cardiac surgery procedures since the 1950s. Through the use of simulation, learners are able to practice the relevant critical actions and concepts involved in safe changing of an oxygenator.

Methods: 10 students from the University of Nebraska Medical Center Clinical Perfusion Education program were recruited to participate in this study. When each student arrived, they were given a brief, narrative description of the case, information on the simulated patient’s initial presentation, learning objectives to be covered during the simulation, and a summary of critical actions to be performed by the learner. Each student participated in three timed trials to change out an oxygenator. During the first trial, the student was asked to change-out the oxygenator without the use of a written protocol and without any directions from the facilitators.

Following the first trial, the facilitators discussed areas of improvement and gave the participant a written protocol for changing out the oxygenator. Two more trials followed with another debrief period after each trial.

Results: In the first trial, the average time to change-out an oxygenator was 229.51 seconds with a standard deviation of 64.8 seconds. The minimum time was 160.81 seconds, the maximum time was 346.26 seconds with a median of 218.81 seconds. Trial 2 had an average of 221.29 seconds with a standard deviation of 77 seconds. The maximum time was 415.22 seconds with a minimum time of 146.69 seconds and median of 194.04 seconds. Trial 3 had an average change-out time of 194.82 seconds with a standard deviation of 51.61 seconds. The maximum time was 294.33 seconds. The minimum time was 137.89 seconds with a median of 192.99 seconds. When comparing trials 1 and 2, trial 2 was shorter by an average of 8.22 seconds with a p-value of 0.49. When comparing trials 1 and 3, trial 3 was shorter by an average of 34.69 seconds to give a p-value of 0.19. In addition, the participants stated during the debrief period that they benefited from the simulation and feel more comfortable with a change-out should an oxygenator fail during bypass.

ABSTRACT #64

Vaping Associated Pulmonary Injury: A cytologic review of cases at Nebraska Medicine
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Introduction: With the rise of vaping popularity comes the need for new criteria to cytologically screen for vaping related diseases, currently referred to as Vaping Associated Pulmonary Injury (VAPI). VAPI is a diagnosis of exclusion as it can present with a wide variety of symptoms, but all have lipophages testing positive for Oil Red O, leading some authors to suggest using it as a diagnostic test.

Methods: This study retrospectively examined the cytology specimens of patients diagnosed with lipid pneumonia who had a history of vaping from Nebraska Medicine. Search was conducted using CoPath, parameters were between 2015 and 2020, and were narrowed down by cases that both used vape products and had Oil Red O stain done, resulting in two cases. Case 1 was a bronchoalveolar lavage (BAL) specimen from a 55-year-old male. An Oil Red O stain was categorized as 1, with 10-25% of the macrophages staining positive. Case 2 was a BAL specimen from a 48-year-old female. An Oil Red O stain was categorized as a 4, with greater than 50% of the macrophages staining positive. The slides were examined under a microscope and the observations entered into the spreadsheet.

Results: For case 1, the histiocytes were very large with more delicate cytoplasm than normal histiocytes,
and large hypochromatic nuclei. Some lipophages could be mistaken for dust cells, with the oil staining a brownish-green, but others have the oil distributed in multiple deposits instead of spread evenly throughout the cytoplasm like dust cells. For case 2, lipophages were not as large or foamy as Case 1 but are still distinctive with Papanicolaou stain, as the lipid is more prominent in the histiocytes and stained green. Chronic inflammation was also present, and a few stripped histiocyte nuclei.

Conclusion: Both cases were consistent with existing literature. Because some patients did not have complete history or were not explicitly listed as using vape products, further research ought to be conducted.

ABSTRACT #65

The Use of Phantoms in Sonography Education
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Imaging phantoms are specially designed educational tools which simulate normal anatomy and pathologies. Phantoms have been utilized in sonography education for many years. There are many benefits to using phantoms in ultrasound education. Phantoms provide sonography students with hands-on opportunities to practice exams in a controlled lab setting and without risk to patient safety. Students can learn to scan and recognize both normal anatomy and pathology with different types of phantoms. Sensitive exams, like endovaginal and scrotal ultrasound exams, can be difficult for both patients and students. Phantoms provide the opportunity for students to practice scanning techniques and review exam protocols for these sensitive exams. Students may also use phantoms to practice invasive procedures, like needle biopsy guidance, without risk to patient safety. The use of phantoms in sonography education can lead to increased student confidence and patient satisfaction in the clinical setting. Ultrasound phantoms created by commercial vendors are costly expenses for sonography education programs. Homemade phantoms, created with household items, offer a cost-effective alternative to manufactured phantoms. The objective of this poster is to demonstrate how homemade phantoms can be integrated into the curriculum of the Diagnostic Medical Sonography program at the University of Nebraska Medical Center. Two examples of homemade phantoms are described.

ABSTRACT #66

Imaging Prostate Cancer
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Prostate health is something every man should keep in mind when they are approaching their fifties, as prostate cancer is one of the more common forms of cancer found in men. Early detection is key to survival. Prostate screening usually begins in a man’s early to mid-fifties. Initial screening often includes a prostate-specific antigen (PSA) blood test and a digital rectal exam. Ultrasound or magnetic resonance imaging (MRI) may be ordered to help aid in diagnosis. MRI will be the focus of this poster. The methods used to obtain prostate images may vary between facilities or radiologists’ preferences. Body coils, endorectal coils, and endorectal coils with biopsy capabilities are discussed, including the positives and negatives to each method. MRIs may be ordered with varying methods of obtaining prostate imaging, and these methods vary in patient comfort level and image quality.

ABSTRACT #67

Improving Utilization of Telemedicine in Nebraska
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Telemedicine is a promising solution to the healthcare shortage across Nebraska. There is little research investigating specific attitudes and problems statewide that hinder its usage. This research survey aims to identify current attitudes towards telemedicine and evaluate different avenues in which telemedicine can be better utilized by healthcare professionals in Nebraska. To explore current views on telemedicine, researchers targeted healthcare professionals in Nebraska as the focus of this study. Methods of our study included both quantitative and qualitative data. A twenty-question anonymous survey was sent out to 857 health care professionals within the UNMC Physician Assistant preceptor list. With 76 responses collected, the 8.9% response rate is a clinically significant sample size to show meaningful relationships and data regarding telemedicine in Nebraska. Overall, the survey provided information on general attitudes towards telemedicine as well as the barriers that prevent healthcare professionals from using it in their practice.

Telemedicine use in Nebraska has been sparse with only 40% of participants currently using it in their practice. However, 80% of responders indicated that they would like to increase the utilization of telemedicine in their organization. Collectively, responders agreed that
telemedicine is a strong adjunct to practice, improves access to new patients, improves efficiency and continuity of care, and that telemedicine fills an essential provider gap. Yet, over 80% of the participants are not aware of any programs which support telemedicine application and education. The most significant barrier, which was determined by a score ranking system, was lack of leadership, training, and technical assistance. The second most significant barrier was lack of awareness. Our findings indicate that more outreach efforts and resources on telemedicine education need to be implemented to increase provider comfort with utilization and application in practice, and awareness of these programs need to be placed as a priority.

ABSTRACT #68

Nursing and rehabilitation therapy perceptions of training on safe patient mobilization
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Background/Significance: Nurses often report lack of training and reduced confidence as barriers for patient mobilization. Given their expertise, rehabilitation therapy staff may be well suited to train nursing staff in this area. Limited evidence describes perceptions about the impact of interprofessional training on safe patient mobilization.

Purpose: To describe perceptions of 1) nursing staff who received training on safe patient mobilization; and 2) rehabilitation therapy staff who served as instructors.

Methods: Over 700 nursing and rehabilitation therapy staff in 18 rural hospitals received an online survey to measure perceptions of staff collaboration to reduce patient fall and fall injury risk. The survey included questions about staff training on safe patient mobilization. Responses of two groups were analyzed with frequency distributions: 1) nursing staff identified as learners; and 2) rehabilitation therapy staff identified as instructors.

Results: Three hundred twenty respondents (243 nursing and 76 rehabilitation therapy staff) completed the survey. Mean response rates across hospitals for nursing and rehabilitation therapy staff were 44% and 61%, respectively. One hundred twenty-six nurses identified as learners indicated whether nursing staff, rehabilitation therapy staff, or both, were instructors for the training. Regardless of instructor profession, nursing staff indicated that because of training, they were more likely to 1) feel their skills improved, 2) encourage patient mobility, 3) utilize equipment for patient mobilization, 4) seek help from the profession(s) who provided instruction, and 5) feel the training helped both professions have similar goals for patient mobilization. Comparatively, 85% of nursing staff taught by rehabilitation therapy staff believed training was important, compared to 67% taught by nursing staff alone. Nearly 100% of 22 rehabilitation therapy staff identified as instructors believed the training was important and helped both professions have similar goals for safe patient mobilization.

Conclusions: Perceptions of training on safe patient mobilization were largely positive in a sample of nursing and rehabilitation therapy staff in rural hospitals. Nursing staff may place higher importance on training and have increased confidence when rehabilitation therapy staff provide instruction.

ABSTRACT #69

Misdiagnosing of Soft Tissue Sarcomas
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The lack of information on soft tissue sarcomas is a reason that a misdiagnoses may occur. Soft tissue sarcomas may occur in any of the soft tissue of the body and present as a lump. Often this lump is misdiagnosed as a cyst or a lipoma, leaving a malignant cancer to further advance in the body. Imaging and pathology is important to fully understand what the neoplasm may be so that proper treatment for the patient may occur. Once the cancer is accurately diagnosed, treatment can start. The most common form of treatment is surgery to remove the cancer cells, but radiation therapy and chemotherapy may be used as well. This paper will discuss what soft tissue sarcomas are, the causes, and the role of imaging in diagnosing these.

ABSTRACT #70

Ultrasound-Guided Needle-Based Procedures
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The use of ultrasound across the medical field is one that is becoming increasingly diversified, especially in equivalence with needle-based procedures. As a result, the procedures offered with ultrasound continually evolves, from diagnostic to therapeutic and several facets in between. Specific needle-based procedures involving ultrasound currently include: needle biopsies, aspirations, sports medicine and orthopedics, and various endoscopic and interventional exams. With ultrasound frequently utilized, more and more individuals receive training on how to properly and effectively use the equipment, learn the fundamentals of ultrasound, and understand precisely what is being evaluated.
ABSTRACT #71

Anxiety Associated with Medical Imaging and Coping Mechanisms
Gabriella Marco. Radiography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Anxiety associated with medical imaging is a huge issue that can be solved with effective coping mechanisms. The purpose of this poster is to explore what anxiety is and how it can have a negative impact on medical imaging procedures. There are many factors that contribute to medical anxiety, and research shows that a vast majority of patients experience anxiety for many different reasons. Some of those reasons include parent-child separation, unknown diagnosis, claustrophobia, and symptoms. In response to anxiety associated with medical imaging, there are a variety of coping mechanism to help provide the radiologists with quality images. Some of the coping mechanisms include medications, proper communication about the exam, and virtual reality to help minimize anxiety.

ABSTRACT #72

Application of Contrast-Enhanced Ultrasound in Modern Diagnostic Imaging
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This poster will examine various aspects of contrast-enhanced ultrasound and its clinical application in modern diagnostic imaging. Contrast-enhanced ultrasound is a relatively new diagnostic imaging method, which functions by means of a unique microbubble composition. This review will focus on a handful of the most relevant contrast-enhanced ultrasound protocols and the implementation of these protocols into routine clinical practice. Contrast-enhanced ultrasound may be used alone or in conjunction with other contrast-enhanced imaging modalities like computed tomography and magnetic resonance imaging. As contrast-enhanced ultrasound continues to gain acceptance nationwide, clinical analysis will assist in the understanding of its overall efficacy.

ABSTRACT #73

Evolving with New Information to Improve Medical Imaging
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Shielding has been a part of radiology for a long time, but as time goes on new information is put out there and adaptations must be put into place. The objective of this exhibit is to demonstrate the new information put out there by the American Association of Physicists in Medicine and how this information effects radiology. As stated by the AAPM shielding provides little to no benefit to the patient and in some circumstances increases the absorbed dose of the patient. Adapting to this new information policies and procedures must be changed in order to provide the best quality care. It’s going to be tough for most technologists who have been working in this field for quite some time, because this concept will seem foreign to most. Overcoming these growing pains to maintain a dose as low as reasonably achievable is what is needed to grow as professionals.

Although it may seem counterproductive due to old procedures and policies that are still in place the more this information is spread to the general public the more likely it is to put into place. Although patient shielding should not be continued, individuals who work around radiation should still practice using lead aprons and thyroid shields to keep their occupational dose at a minimum. My methodology for most of my information came from the AAPM statements on shielding and how it should change for the better. All other sources and images came from google scholar to have more credible information for this information exhibit. Research supporting these claims came directly for the AAPM. In conclusion patient shielding should not be continued in order for radiology to grow as a profession. Personnel should still practice shielding to remain an adequate dose. Overcoming these old ways of practice is going to be hard, but the end result is for the better.

ABSTRACT #74

Rapid Prototyping from Image Acquisition to Three-Dimensional Model
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Historically, surgeons have relied on cross-sectional imaging modalities such as computed tomography (CT) and magnetic resonance imaging (MRI) to plan surgical case procedures. In select cases, these images tend to render insufficient visualization of the whole tumor and its margins. Rapid prototyping is a process utilizing emerging
technology to generate a physical three-dimensional model of a tumor including its margins. The rapid prototyping process includes three steps: image acquisition, image post-processing, and three-dimensional printing. The prototypes are produced from CT and MRI imaging data—the foundation of this technology. The potential applications of rapid prototyping are surgical training, surgical simulations, and patient education. While this technology has not yet been widely established within the surgical community, it is suggested to be advantageous for several clinical applications.

ABSTRACT #75

Effectiveness of Gonadal Shielding
Cierra Wynn. Radiography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

The purpose of this poster is to examine gonadal shielding effectiveness, and whether researchers think this practice should be discontinued or improved. Gonadal shielding was introduced to reduce patient exposure and decrease hereditary risks. Recent studies found that gonadal shields are often increasing dosages or not being used at all. In addition, no hereditary effects of x-ray radiation have been found in humans since the introduction of using gonadal shields. Based on this information, the American Association of Physics in Medicine (AAPM) and many others have decided that no-shielding practices should be put in place. Some researchers believe gonadal shielding can be improved with education or by making modifications to the traditional practice. Regardless of the way it is done, the amount of patient overexposure due to gonadal shielding needs to be reduced.

ABSTRACT #76

10-Year Retrospective Correlation of the SurePathTM and the ThinPrep Smears at University of California Davis Medical Center
Irina Atkins, Sara J Kwong, Stanley Seko, Don York, Rosa Lopez, Alaa Afify. Cytotechnology program, College of Allied Health Professions, University of Nebraska Medical Center, Satellite Site: University of California Davis Health System, Sacramento, CA

Introduction: The SurePath and ThinPrep methods of preparing cytological sample for evaluation have replaced traditional conventional smears. The SP and TP use automated technology to accelerate the process and improve the quality of the samples. Both methods are approved by the FDA and help in diagnosis of gynecological and non-gynecological lesions. Both methods reduce the number of artifacts, blood and microorganism elements. Methods: A retrospective study was done in, University of California Davis Medical Center, in which we retrieved the results of ten consequent years of Pap test utilizing two different methods - SP and TP. The Pap results were classified according to the Bethesda System. Results: A total of 104305 Pap cases were analyzed for a 10-year period. The cases were split into 2 five-year periods. In the first 5 years, there were 61192 SP tests, and in the following five years, our lab started implementing TP and there were 43113 tests performed. There were 236 unsatisfactory cases for SP compared to 640 unsatisfactory cases for TP, which was a 3.8 fold difference. The processing time per slide was also compared for SP and TP, and it showed that SP required 108 compared to 255 sec for TP. In addition, the surface area of the SP slide is smaller than that of TP and the unit cost of SP is cheaper than that of TP. However, the TP Smears showed an overall lower rate for atypia of undetermined significance (ASCUS) category. Conclusions: The retrospective study of comparing methods of Pap test processing demonstrates that SP had advantages in processing time, cost, screening time, and low unsatisfactory rate compared to TP though the TP showed an overall lower rate of ASCUS category.

WOMEN’S HEALTH

ABSTRACT #77

Low Grade Intraepithelial Lesion, cannot exclude High Grade Intraepithelial Lesion in a Pap Test — What’s Next?
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Introduction: Bethesda uses two distinct categories for low grade intraepithelial lesion (LSIL) and high grade intraepithelial lesion (HSIL) in a pap test. This study discusses using a third category not implemented by Bethesda termed “LSIL, cannot exclude HSIL (LSIL-H)” when apparent LSIL cells are present, but showing some features of HSIL as well; just not enough to push up the diagnosis. We correlated pap test cases diagnosed as LSILH with biopsies to determine the follow up plan and the final diagnosis. Methods: LSIL pap tests reports signed out between January 2017 and December 2018 were checked to see if “cannot exclude high grade” was commented along with the final diagnosis. If “cannot exclude high grade” was commented, further investigation was done on the case to see if a biopsy was performed within six months and if so, what the diagnosis of the biopsy was. The information was entered into a spreadsheet where it was separated into LSIL, HSIL, No Follow Up, Negative for Intraepithelial Lesion and Malignancy (NILM), and Inconclusive categories. Carle Foundation Hospital’s LIS system, Soft Path, was used to search for the needed
Results: 921 total LSIL pap test reports were checked for LSIL-H diagnosis. Out of the 921, 96 (10%) were diagnosed as LSIL-H. When those LSIL-H cases were further checked to see if follow up occurred with a biopsy within six months, 34 (35%) came back as LSIL, 24 (25%) came back as HSIL, 26 (27%) of them had no follow up, 9 (9%) showed NILM, and 1 (1%) was diagnosed inconclusive.

Conclusions: In conclusion, the majority of the LSIL-H cases (35%) were diagnosed as LSIL determined by biopsy results, however, HSIL was still used more than we expected (25%). There were also a fair number of cases with no follow up. These results indicate that utilizing the LSIL-H diagnosis may be confusing for clinicians to determine the appropriate follow up procedure. Given this, we suggest trying to classify lesions into either LSIL or HSIL categories and refrain from using LSIL-H.

**ABSTRACT #78**

**Investigating correlations between HPV cytology results and surgical pathology results in cervical biopsies**

Cassidy Jones, Christi Lincoln. Cytotechnology program, College of Allied Health Professions, University of Nebraska Medical Center, Satellite Site: ProPath, Dallas, TX

Introduction: With the introduction of HPV testing as an adjunctive test for precancer and cancer of the uterine cervix it is necessary to study its accuracy along with Pap screening. While much research has been performed on the accuracy of these tests, the efficiency of these tests is not known for the specific population of those served by ProPath laboratory. The purpose of this study is to determine the efficiency of HPV testing and Pap screening.

Methods: A search was conducted on the ProPath database to find cervical cases with a Pap, HPV testing and a biopsy from 9/27/19 to 12/27/19. The exclusion criteria were any case with a biopsy that was not a cervical biopsy (such as endometrial cases, skin biopsies and colon biopsies). After excluding irrelevant cases the population size was 1114. Cases were then categorized by positive and negatives in each of the three categories and further divided into specific diagnosis. Atypical squamous cells of undetermined significance (ASCUS) or higher was considered as a positive pap result.

Results: The accuracy of HPV testing and Pap screening were analyzed by comparing the results to the biopsy results. Pap screening had a higher detection rate (44.9%) than HPV testing (38.5%). However, Pap screening had a higher missed detection rate (13.4%) than HPV testing (10.9%). When both HPV and Pap test were positive the detection rate rose to 46.6%. When both were negative the missed detection rate dropped to 4.2%. Conclusion: A positive Pap result is more indicative of true HPV changes than a positive HPV test while a negative HPV test is a better predictor of a negative biopsy than a negative Pap. Using both tests in conjunction yields the best results with both the highest detection rate and lowest missed detection rate. Therefore, it is recommended to continue to use both tests at ProPath.

**ABSTRACT #79**

**A Retrospective Study on the Significance of High-Risk HPV in Detecting High-Grade Cervical Lesions on Smears Reported with Atypical Glandular Cells During Pap Screening**

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Introduction: Successful High-Risk HPV (HR-HPV) triaging strategies have been implemented for the management of squamous epithelial lesions reported as atypical cells of undetermined significance (ASCUS), but its utilization in the management of Atypical Glandular Cells (AGC) is still unclear and could prove valuable. The interpretation of AGC on a Pap screening may actually be diagnosed as alternative diagnoses, such as a squamous lesion, on biopsy. The purpose of the study was to determine the significance of HR-HPV testing when performed with Pap smears reported as AGC on screening to detect underlying/co-existing high-grade squamous intraepithelial neoplasia or worse. Malignancies of endometrial glandular origin were considered as an outcome in this study. Methods: This was a three-year (2017-2019) retrospective study of AGC cases with HPV testing conducted at ProPath Laboratory in Dallas, Texas. The cases were reviewed and analyzed for correlation with the surgical biopsies for high-grade squamous intraepithelial lesions (HSIL), Squamous cell carcinoma (SCC), Adenocarcinoma in situ (AIS), and Adenocarcinoma (ADCA) of the cervix and endometrium. Results: HR-HPV was found in 33% of the total 344 AGC cases with subsequent histopathological follow-up. The mean age of these women was 30 years (range 24-77 years). HR-HPV was found among cervical high-grade lesions with 96% sensitivity and 46% positive predictive value (PPV) for Cervical Intraepithelial Neoplasm (CIN2) or worse. The highest concentration was HSIL, accounting for 57% of the high-grade lesions. The risk of being HR-HPV positive increased with age, with the highest incidence among women aged >50. The corresponding figures for the HPV-negative AGC group was forty-five Endometrial ADCA and two Cervical ADCA, yielding a PPV of 29% for endometrial cancer. Conclusion: This study confirms that HR-HPV co-testing of AGC-reported pap smears will greatly increase the predictive ability for identifying cervical high-grade lesions.
ABSTRACT #80
EP + IUD = What Now?
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When an individual chooses a method of contraception, pregnancy is an undesired outcome. However, unintended pregnancies still occur in certain circumstances. There are multiple methods of contraception available today. The use of intrauterine contraceptive devices (IUCDs) is becoming increasingly common with its effectiveness being one of the highest of long-acting, reversible contraceptive methods. Nearly 100 million women worldwide use IUCDs and approximately 7% of reproductive-age women choose IUCDs as their contraceptive of choice. Several types of IUCDs are available including the hormone-releasing IUCD and non-hormone releasing Copper T IUCD. A complication of IUCD usage includes the risk of ectopic pregnancy or the implantation of a fertilized egg in an extrauterine location. Ultrasound can be utilized to confirm proper (or improper) placement of an IUCD or to determine the location of an ectopic pregnancy. The objective of this poster is to provide relevant information on types, complications, and ultrasound-assisted placement of IUCDs, as well as to evaluate the prevalence, symptoms, and treatment of ectopic pregnancies in the presence of an IUCD. A case study of an ectopic pregnancy in the presence of an IUCD will be discussed in detail as well.

ABSTRACT #81
The Role of Magnetic Resonance Imaging in the Detection of Breast Abnormalities
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Magnetic resonance imagining (MRI) can play an essential role in the detection of breast lesions. Early detection of breast lesions can lower the chances of breast cancer from becoming deadly. While MRI should not be the only form of screening used, it is often used to evaluate further any lesions or abnormalities seen on ultrasound or mammography. The images produced to aid in the determination of if a lesion in the breast is malignant or benign. MRI-guided breast biopsies are another way that MRI aids in the screening and diagnosis of breast lesions.

ABSTRACT #82
Effects of Amount of Provider Knowledge of Modern Natural Family Planning Methods (NFP) and Corresponding Recommendation Rates to Patients
Kiley Reecy. College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Modern Natural Family Planning (NFP) methods have been utilized for decades both as a means of pregnancy prevention and child spacing. Until recently, the efficacy of such methods has been largely underestimated by the medical and scientific communities. This general underestimation has resulted in the minimal education of these methods for all types of health care providers both in practice and during professional training. This, in turn, has led to less provider confidence when discussing accurate knowledge about NFP. Most do not even present it during patient encounters as a recommendation for family planning. The goal of this research was to investigate if an increase in provider education, and a corresponding increase in knowledge, would lead to an increase in recommendation rates to patients. Research available currently suggests that when educational avenues were provided, providers felt more confident and competent in the material, both of which ultimately led to more recommendations during patient encounters overall. This general conclusion indicates that continued research investigating this correlation is needed. It also showcases the essential need to create educational guidelines for NFP and to implement them throughout all avenues of health care education.

ABSTRACT #83
The Effect of Exercise or Bisphosphonate Use on Bone Density and Microarchitecture among Postmenopausal Women with Low Bone Mass Experiencing Modest Weight Loss
Kristen Beavers, Nancy Waltman, Kevin Kupzyk, Joan M. Lappe, Laura Flores, Lauren Fasth, Laura Bilek. Division of Physical Therapy Education, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Purpose: Current clinical guidelines state that osteopenia can be treated either with lifestyle (i.e., exercise and nutrition) or pharmacotherapy, however, this recommendation is based on low-quality evidence. Data informing treatment modality choice is particularly needed for older women with low bone mass who are also losing weight, as weight loss exaggerates age-related bone loss. The purpose of this analysis is to begin to explore the effect of a bone loading exercise program or bisphosphonate use on bone mineral density (BMD) and bone microarchitecture among postmenopausal women with low bone mass who are also losing weight.
Methods: Data are preliminary results from postmenopausal women who completed a clinical trial and were randomized to 12 months of: 1) control (supplementary calcium and vitamin D only [CaD]), 2) 150 mg monthly oral Risedronate+CaD, or 3) bone-loading (high-impact weight bearing and resistance training) exercise+CaD. BMD of the total hip and lumbar spine and trabecular bone score (TBS) of the lumbar spine were assessed at baseline and 12 months using dual energy x-ray absorptiometry (DXA). One-way ANOVA models were used to determine differential treatment effects for the three outcome measures. Women who lost weight during the 12 month period, regardless of adherence to the assigned intervention, were included in the analysis.

Results: In total, sixty of 141 women who completed the study lost any amount of weight during the 12 month trial (n=18-23/group). Average age was 55±3 years with 82% Caucasian and average BMI at baseline 26±4 kg/m2 with those in each treatment group losing a similar, modest amount of weight (mean change: -1.6±1.3 kg; -2.4±2.0%). For those who lost weight, treatment effects were not observed for total hip BMD or TBS for any group; however, by 12 months, lumbar spine BMD increased in the Risedronate group (0.032±0.042 g/cm2) in comparison to both bone-loading exercise (-0.004±0.042 g/cm2) and control (-0.001±0.025 g/cm2) groups (p<0.01).

Conclusion: Risedronate treatment over 12 months increases lumbar spine BMD among those experiencing similar, modest weight loss. Neither exercise or supplementation alone (CaD) was effective at increasing spine BMD, and no intervention affected total hip BMD or bone microarchitecture, as measured by TBS, in this study sample.

ABSTRACT #84

The Use of Ultrasound Technology for Reproductive Health
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The purpose was to review literature pertaining to the use of ultrasound technology in the specialty of male and female reproductive health. Peer-reviewed journals and articles were used as the basis of knowledge, as well as a few textbooks relating to the topic. The majority of sources were published within the last 10 years. Ultrasound has use everywhere from diagnosing cancer to treating a miscarriage. These benefits are not available to everyone, and that is why there have been efforts to expand into rural and low-income areas and countries. Because of the noninvasive nature of ultrasound technology, it is the most preferred imaging modality to diagnose and treat many anomalies of the human body. It is also inexpensive and safe, so it is being prioritized to introduce into rural and low-income areas.

ABSTRACT #85

Breast Tissue and Affects with Different Imaging Modalities
Ileana Gonzalez. Radiography program, Department of Medical Imaging and Therapeutic Sciences, College of Allied Health Professions, University of Nebraska Medical Center, Omaha, NE

Breast density is one of a key factor leading to false-positives findings in mammography. With multiple imaging modalities being improved and developed, there is a greater chance to lowering false positives for all genders. In this poster, there is an explanation of how dense breasts are developed, how dense breast can lead to false positives, and how each modality have advantages to viewing the breast more in depth. An overview will be provided regarding the development of dense tissue and what types of factors can contribute to such development. Additionally, there will be an overview on how grading system works for placing the breast in what are called BI-RADS to figure the extent of density in the breast. Finally, there will be a brief explanation on how different imaging techniques can either improve results of imaging the breast or have a similarity to the use of mammography. This poster is to give knowledge that each imaging modality can either help radiologist figure out breast composition and to detect cancerous tissue sooner than later, as well as giving the public a general idea of how.

ABSTRACT #86

Imaging the Pregnant Patient
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There are many misconceptions about the effects of ionizing radiation on a fetus but most of those claims have proven to be unfounded. While there are risks that accompany each imaging modality, those risks tend to be outweighed by the benefits of performing the exam. Existing literature was reviewed and used to develop this exhibit. This research exhibit will discuss the potential risks for the mother and fetus and which imaging modalities provide the least amount of risk.
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