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IN REVIEW

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ACTIVE SHOULDER MOTION MEASUREMENT USING AN INFRARED DETECTION SYSTEM

Restoration of active motion of the shoulder is a major treatment goal for patients with shoulder conditions. Variability in clinical measurement of the shoulder motion can make it difficult to evaluate a patients' progress. This study investigated the utility of a widely available infrared system for measuring shoulder motion.

This study used the Microsoft Kinect system, which employs infrared laser light and depth sensing cameras to determine positions of the arm and shoulder. Measurements were made for 10, normal, adult volunteers using the Kinect system, with those results compared with measurements made using standardized, anterioposterior and lateral photographs, taken concurrently. Measurements were made in five different positions of abduction, flexion, rotation and cross body adduction. The relationship between the two measurement methods was determined using linear regression. The results of the ROM measurements as determined by the Kinect system was compared with the ability to perform the Simple Shoulder Test (SST).

For the 10 control subjects, the Pearson correlation coefficients for the different positions were 0.997, 0.992, 0.982 and 0.995. The average time to document the five motions in both shoulders was 4.8 minutes. The Kinect measures of active motion correlated with the patients' self-assessments of their ability to perform the SST, with Pearson correlation coefficients of 0.79 for abduction, 0.67 for flexion, 0.56 for external rotation, 0.5 for internal rotation and 0.33 for cross-body adduction.

Conclusion: This study found that an infrared system without attached markers can provide a quick and accurate measurement of range of motion in the upper limb.

Matsen, F., et al. Measurement of Active Shoulder Motion Using the Kinect, a Commercially Available Infrared Position Detection System. **J Shoulder Elbow Surg.** 2016, February; 25(2): 216-223.

BARIATRIC SURGERY AND HEALTH IN ADOLESCENCE

Severe obesity affects 4.4 million children and adolescents in the United States. This study explored the effect of these procedures on weight loss, weight related quality of life, micro-nutritional levels and coexisting conditions among adolescents.

This prospective, multicentered study included consecutive adolescents undergoing bariatric procedures between March of 2007 and February of 2012. Included were 242 obese adolescents with a mean body mass index of 53 kg/m^2, all of whom underwent gastric bypass or sleeve gastrectomy procedures. Change in body weight, coexisting conditions, cardiometabolic risk factors and postoperative complications were evaluated during the three years post-procedure.

At three years, mean body weight had decreased by 27%. Remission of type II diabetes occurred in 95% of the patients, and remission of prediabetes occurred in 76%. Abnormal kidney function remission occurred in 86%, with remission of hypertension in 74%. Dyslipidemia improved in 66% and weight-related quality of life as measured by the Impact of Weight on Quality of Life–Kids improved from 63/100 to 83/100. However, most participants suffered from micronutrient deficiencies and 13% had undergone further intra- abdominal procedures during the follow up period.

Conclusion: This study of adolescents undergoing bariatric surgery found that weight, cardiometabolic health and weight-related quality of life improved in the three years after surgery, although this surgery was associated with micronutrient deficiencies and additional intra-abdominal procedures.

Inge, T., et al. Weight Loss and Health Status Three Years After Bariatric Surgery in Adolescence. **N Engl J Med.** 2016, January 14; 3742): 113-123.

BLIND CORTICOSTEROID INJECTIONS FOR ADHESIVE CAPSULITIS

While adhesive capsulitis has been described as a self-limiting condition, long-term studies suggest that residual pain may occur in up to 50% of patients. As intra-articular steroid injections have been shown to provide significant short-term benefits for pain relief and increased range of motion, this study assessed the effect of a single intra-articular corticosteroid injection, performed without image guidance, when applied before physical therapy.

This blinded, randomized, controlled trial was performed at a single Argentinian center between June of 2012 and June of 2013. Subjects were adult patients with stage II adhesive capsulitis according to the classification of Hannafin and Chiaia. Eighty-seven consecutive patients with frozen shoulder were randomized to receive either a single corticosteroid injection into the glenohumeral joint or oral diclofenac, 75 mg twice a day. All subjects then engaged in a progressive rehabilitation protocol. Clinical and functional parameters

were determined at baseline and at two, four, eight and 12 weeks.

The corticosteroid group had faster pain relief and shoulder function improvement during the first eight weeks ($p<0.001$). At 12 weeks, no significant difference was seen between the groups. Forward flexion, abduction and internal rotation were significantly improved in the steroid group as compared to the control group at all time points ($p<0.001$).

Conclusion: This study of adults with adhesive capsulitis found that pain and functional improvement, through physical therapy, could be better accelerated with a blind intraarticular steroid, than with oral NSAIDs.

Ranalletta, M., et al. Corticosteroid Injections Accelerate Pain Relief and Recovery of Function Compared with Oral Nonsteroidal Anti-Inflammatory Drugs in Patients with Adhesive Capsulitis: A Randomized, Controlled Trial. **Am J Sports Med**. 2016, Feb; 44 (2): 474-481.

CENTERS FOR DISEASE CONTROL OPIOID GUIDELINES

Opioid prescription per capita in the United States increased 7.3% from 2007 to 2012. The Centers for Disease Control and Prevention (CDC), noting potential problems with opioid prescriptions, met to create guidelines for primary care providers.

The process of creating the guidelines involved using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework, with a systematic review of the scientific evidence. The focus of these guidelines was for primary care physicians treating adult patients with pain lasting more than three months in outpatient settings. The literature was reviewed for opioid efficacy and risk, followed by a solicitation of expert opinion, stakeholders, the public, peer reviewers, and a federally chartered advisory committee.

Twelve recommendations were made. Summarized, these include considering opioid therapy only if expected benefits for pain and function outweighed the risks, with opioid therapy continued only if there is clinically meaningful improvement in pain and function. These should be combined with nonpharmacologic and non-opioid therapy. Treatment goals should be established initially, with risks discussed. When initiating, immediate release should be prescribed at the lowest effective dose, carefully reassessing at 50 morphine milligram equivalents (MME), and should be avoided at 90 MME or higher.

For acute pain, three days or less of opioid therapy should be sufficient. Harms and benefits should be evaluated one to four weeks after starting opioids for chronic pain. Before starting, and periodically during opioid therapy, the risks should be evaluated and plans to mediate these risks should be made, including offering naloxone. Clinicians should review the patient's history of controlled substance prescriptions using state prescription drug monitoring programs (PDMP). Urine drug testing before and at least annually should be used to assess the use of prescribed and other medications. Combining opioids and benzodiazepines concurrently should be avoided. Clinicians should offer or arrange evidence-based treatment for patients with opioid disorders.

Conclusion: This guideline, published by the Centers for Disease Control and Prevention provides succinct recommendations for primary care physicians who wish to prescribe opioid medications for noncancer pain.

Dowell D, Haegerich TM, Chou R. CDC Guideline for Prescribing Opioids for Chronic Pain — United States, 2016. **MMWR Recomm Rep** 2016;65 (No. RR-1):1–49.

EXTENDED RELEASE NALTREXONE TO PREVENT OPIOID RELAPSE

Opioid–use disorder is a chronic condition with serious public health consequences. Extended release naltrexone, the monthly injectable formulation, was approved by the FDA in 2010 for the prevention of relapse to opioid dependence. This study examines the effectiveness of extended release naltrexone among community dwelling criminal justice offenders at high risk for opioid relapse.

This open label, randomized controlled trial included community dwelling adult volunteers who had been incarcerated with a history of opioid dependence. Subjects were randomized to a treatment group to receive extended release naltrexone, or a usual care group. Those in the treatment group received extended release naltrexone at a dose of 380 mg administered by intramuscular injection once every 4 weeks. Those in the usual care group received counseling focused on adverse events, the prevention of relapse and overdose and support for community treatment from the same trial personnel. Subjects were followed every 2 weeks for 24 weeks during the treatment phase, with assessments including urine toxicologic screening and self-report of opioid, cocaine, alcohol and IV drug use. The primary outcome was the time in weeks to opioid relapse during the 24 week treatment phase.

From 5 sites, 308 subjects underwent randomization with a mean age of 44 years. During the treatment phase, time to relapse was longer in the treatment groups than in the usual care group (10.5 weeks versus 5 weeks; $p<0.001$). All recorded overdose events occurred among participants in the usual care group. Self-reported use of cocaine, alcohol and IV drug use, unsafe sex and re-incarceration did not differ between the 2 groups.

Conclusion: This study of criminal justice offenders found that the use of extended release naltrexone could result in a lower rate of opioid relapse than occurs in usual treatment.

Lee, J et al Extended Release Naltrexone to Prevent Opioid Relapse in Criminal Justice Offenders. **N Eng J** Med 2016, March 31; 374(13):1232–1242.

INCIDENCE OF SPINAL FRACTURE IN ANKYLOSING SPONDYLITIS

Ankylosing spondylitis (AS) is a seronegative spondyloarthropathy that increases the risk of spinal fractures and spinal cord injury. Previous reports have shown that the lower cervical spine is the most common site for fractures among those with AS. This study was designed to better understand the incidence and type of spinal fractures in the AS population.

Data were obtained from a national inpatient sample of patients with AS and spinal fractures from 2005 to 2011. This retrospective, cohort study characterized spinal fractures by region and spinal cord injury based on ICD-9 codes. Spinal fractures were further classified by treatment group and by incidence of adverse events.

Of the 939 patients hospitalized with a fracture, 498 were cervical, 393 were thoracic, 171 were lumbar, 14 were sacral and 123 were multiple in region. Of these, 6.6% died during hospitalization. A spinal cord injury occurred in 198 of the 939 patients, with two thirds occurring as a result of cervical, and one third as the result of thoracic, fractures. Among the 276 patients experiencing adverse events during hospitalization, urinary tract infection was the most common, and intubation the second most common.

Conclusion: This study of patients with ankylosing spondylitis found that those hospitalized with a vertebral fracture are at high risk for inpatient complications and mortality.

Lukasiewicz, A., et al. Spinal Fracture in Patients with Ankylosing Spondylitis. Cohort Definition, Distribution of Injuries, and Hospital Outcomes. **Spine.** 2016, February; 41(3): 191-196.

JOINT INFLAMMATION AND PAIN SENSITIZATION IN OSTEOARTHRITIS

Although osteoarthritis (OA) is traditionally considered a systematically noninflammatory arthritis, studies have demonstrated local inflammation, as evidenced by cellulitis and effusion. Bone marrow lesions are the predominant micro-traumatic lesions related to excessive mechanical load or remodeling related to tissue injury. This study examined whether inflammation or bone marrow lesions are associated with pain sensitization in knee OA.

This study, the multicenter osteoarthritis study (MOST), is a National Institute of Health funded longitudinal cohort of older adults with or at risk for knee OA. All subjects were assessed at baseline, and at 30, 60, and 84 months using MRI imaging, standardized questionnaires and objective measurements of relevance to knee OA. Data were evaluated for the relationship between MRI findings and mechanical temporal summation, (an augmented response to repetitive mechanical stimulation) and pressure pain threshold (PPT).

Data were analyzed for 716 patients with a mean age of 66.9 years and a mean body mass index of 29.7 kg/m2. Of these, 38% had radiographic knee OA at baseline and 21% reported frequent knee pain at baseline. Those with synovitis at baseline had significantly lower PPT at baseline and a significant decrease in PPT at the patella 24 months later, indicating that they had become more sensitized. Baseline effusion and bone marrow lesions were not associated with baseline PPT, baseline temporal summation or change in PPT at the patella over 24 months. Effusion was also associated with a decrease in PPT at the wrist and with the risk of incident temporal summation at the patella. Bone marrow lesions were not associated with sensory testing measures.

Conclusion: This study found that MRI findings of synovitis or effusion are associated with pain sensitization among patients with knee OA, with effects noted distant from the knee, suggesting central sensitization.

Neogi, T., et al. Association of Joint Inflammation with Pain Sensitization in Knee Osteoarthritis. **Arthritis Rheum**. 2016, March; 68(3): 654-661.

MESENCHYMAL STEM CELLS IN FACET JOINTS AND INTERSPINOUS LIGAMENTS

In degenerative diseases of the spine, the posterior longitudinal ligament and the ligamentum flavum ligament and associated joints can become hypertrophied and ossified. While the etiology of these conditions remains largely unknown, mesenchymal stem cells (MSCs) are believed to play an important role. This study was designed to detect the presence of MSCs in the facet joints and interspinous ligaments of patients with degenerative joint disease of the spine.

Subjects were ten patients scheduled for posterior lumbar decompression surgery. At surgery, facet joints and interspinous ligaments were harvested, with mesenchymal stem cells extracted and cell surface markers analyzed using flow cytometry. The cells were then analyzed *in vitro* after exposure to differentiating agents while in cell culture.

The stem cells derived from the facet joint and interspinous ligaments were found to have a tri-lineage potential to be differentiated into osteogenic, adipogenic and chondrogenic cells, depending upon the induction environment to which they were exposed.

Conclusion: This study of tissue harvested from patients undergoing spine surgery for spinal stenosis isolated stem cells which showed high proliferation rates which could differentiate into osteoblasts, adipocytes, and chondrocytes, depending upon the microenvironment.

Kristjansson, B., et al. Isolation and Characterization of Human Mesenchymal Stem Cells from Facet Joints and Interspinous Ligaments. **Spine.** 2016, January; 41(1): E1-E7.

PATIENTS WITH TOTAL KNEE REPLACEMENT

Among patients with osteoarthritis (OA) of the knee, pain is the most common presenting symptom. While the mechanism of knee pain is not fully understood, some have suggested demographic, structural, genetic and central factors as contributors. This study was designed to determine whether individuals with at least one parent undergoing a total knee replacement (TKR) for severe, primary knee osteoarthritis would have an increased risk of knee pain, as compared to those with no family history of knee OA.

Subjects included 219 patients, ages 26 to 61 years (115 offspring and 104 controls). At two and 10 years into the study, knee pain was assessed using the Western Ontario and McMaster University's osteoarthritis index (WOMAC), comparing the offspring of those who did, with the offspring of those who did not undergo a TKR.

After adjusting for confounders and structural factors such as knee cartilage defects, bone marrow lesions, effusions, meniscal extrusion and tears, the offspring of those with TKR were found to be at an increased risk of worsening total knee pain (odds ratio 2.16), and at increased risk for the pain according to each subscale of the WOMAC except for knee pain on a flat surface and standing (all comparisons $p<0.05$) as compared to the offspring of those without TKR.

Conclusion: This study found that offspring of people with a history of total knee replacement are at an increased risk of worsening knee pain over eight years, suggesting a genetic etiology, independent of structural factors.

Pan, F., et al. The Offspring of People with a Total Knee Replacement for Severe Primary Knee Osteoarthritis Have a Higher Risk of Worsening Knee Pain over Eight Years. **Ann Rheum Dis.** 2016, February; 75(2):368-373.

OUTCOMES AFTER CHOPART AMPUTATION

The Chopart amputation is often required in diabetic patients with tissue destruction in the midfoot due to gangrene or infection. While this procedure is considered to be an extreme limb salvage technique, the outcome of these patients is not well understood. This study reviewed the outcomes of 83 patients undergoing Chopart amputation.

Subjects were a consecutive series of diabetic patients undergoing Chopart amputation from 2009 to 2011, with 45.8% with gangrene, 37.4% with abscess and 16.9% with osteomyelitis. Urgent surgery was performed for 67.5% of the patients. The primary outcome measure was limb salvage after amputation. All subjects were followed weekly until the ulcer had healed, and monthly thereafter in the absence of recurrence. The average follow-up period was 2.8 years.

Of the 83 patients, 34 had been referred after failure of a minor foot amputation, with 63 undergoing emergency surgery. At follow-up, 56.6% healed completely at a mean interval of 164.7 days, 13 patients died without having obtained a complete cure and 27.7% underwent major amputation at a mean of 96 days, with an incidence rate of 12.9%. The mean interval to ulcer recurrence in 15 of the patients was 86.3 days. Of the 83 patients, 38 died, with a rate of 45.8% and an incidence rate of 25.8% per year.

Conclusion: This study of 83 consecutive patients undergoing Chopart amputation found that 47% healed at an average of 164.7 days, with major amputation necessary at an annual incidence of 12.9%, and annual incidence of death of 25.8%.

Faglia, E., et al. Outcomes of Chopart Amputation in a Tertiary Referral Diabetic Foot Clinic: Data from a Consecutive Series of 83 Hospitalized Patients. **J Foot Ankle Surg. 2016, March-April; 55(2): 230-234.**

PREDICTING ANKLE SPRAIN IN AMERICAN FOOTBALL PLAYERS

Lateral ankle sprains (LASs) are the most common acute and recurrent injuries among athletes, representing 23% of all high school athletic injuries. This study assessed whether clinical tests, focusing on potentially modifiable factors might be useful for predicting LAS.

This prospective cohort study investigated 606 American football players, including 365 high school and 241 NCAA Division I athletes. For all participants, body mass index (BMI) was recorded, with preseason testing with the Star Excursion Balance Test and a modified functional movement screen completed by a certified athletic trainer. The players were followed through the following season to identify those experiencing an LAS.

A significant association was found between BMI and the risk of a LAS ($p<0.001$), with an odds ratio of 1.4 for those with a BMI of greater than 26.69 kg/m². Of the subsets of the Star Excursion Balance Test, only performance on the anterior subsegment was significantly associated with the risk for LAS ($p=0.001$), with scores of less than 67% demonstrating a 1.62 odds ratio for LAS as compared to those with scores of greater than 67%.

Conclusion: This prospective study of high school and college football players found that body mass index and the Star Excursion Balance Test-Anterior Performance Subscale were significantly associated with the risk of lateral ankle sprain.

Gribble, P., et al. Prediction of Lateral Ankle Sprains in Football Players Based on Clinical Tests and Body Mass Index. **Am J Sports Med.** 2016, February; 44(2): 460-467.

TESTOSTERONE TREATMENT IN OLDER MEN

In 2003, the Institute of Medicine concluded that there was insufficient evidence that testosterone treatment is beneficial in older men. This study further investigated whether testosterone benefits older men with age-related low testosterone.

Eligible subjects were 65 years or older with testosterone levels averaging less than 275 ng/dL. Each individual participated in one of three trials, including a sexual function trial, a physical function trial and a vitality trial. The subjects were randomly signed to receive AndroGel, with the dose adjusted to keep the concentration within the normal range for young men. Serum testosterone was measured at months one, two, three, six and nine.

Efficacy outcomes were assessed at baseline and after three, six, nine and 12 months of treatment. The primary outcome of the sexual function trial was the change in sexual activity on the Psychosexual Daly Questionnaire. The primary outcome of the physical function trial was the percent of men who increased the distance walked in the six-minute walk test by at least 50 m. The primary outcome of the vitality trial was a percentage of men whose scores increased on the FACIT- Fatigue Scale by at least four points.

Of the 705 men who completed the study, serum testosterone levels were raised in the treatment group to the mid-normal range in 91%. Testosterone treatment was associated with increased sexual activity, increased sexual desire and increased erectile function. Among all testosterone trials, treatment improved the six-minute walk distance and physical

function. Among those in the Vitality trial, there was no significant difference between groups in the primary outcome measure, although significant differences were seen between groups in vitality, affect and depression scores. Adverse events were equivalent between the placebo and treatment groups.

Conclusion: This study of elderly men with low testosterone levels found that supplementation could improve sexual function and performance in six-minute walk test distances and improve affect and vitality, but did not substantially decrease fatigue.

Snyder, P., at al. Effects of Testosterone Treatment in Older Men. **N Eng J Med.** 2016, February 18; 374(7): 611-624.

PHARMACOTHERAPIES FOR FRACTURE PREVENTION AFTER GLUCOCORTICOID USE

Oral glucocorticoids are crucial for the management of chronic inflammatory and autoimmune diseases. However, the use of oral glucocorticoids is a common cause of iatrogenic osteoporotic fractures. This study assessed the efficacy of different interventions for the prevention of osteoporosis among glucocorticoid users.

Data were reviewed from published data through March of 2015. Eligible studies were double-blinded, randomized, controlled trials including patients with continuous oral glucocorticoid use during the study timeframe, with a follow-up of at least six months.

The studies selected for analysis included a total of 3,286 patients with 12 agents examined, including placebo, calcium, calcium plus vitamin D, alendronate, etidronate, ibandronate, risedronate, zoledronic acid, calcitonin, raloxifene, denosumab, and teriparatide. The mean glucocorticoid dose ranged from five to 25 mg per day, with a duration ranging from six to 102 months.

Those treated with etidronate, risedronate and teriparatide had reduced vertebral fractures, although no studies were found to have significant effects for the treatment of non-vertebral fractures. Teriparatide was ranked as the best for preventing vertebral and nonvertebral fractures.

Conclusion: This meta-analysis of studies reviewing the efficacy of pharmacotherapies for preventing fractures among glucocorticosteroid effective in preventing osteoporotic fractures.

Amiche, M., et al. Efficacy of Osteoporosis Pharmacotherapies in Preventing Fracture among Oral Glucocorticoid Users: A Network Meta-Analysis. **Osteoporosis Intern.**DOI 10.1007/s00198-015-3476-4

PRECUT KINESIOLOGY TAPE FOR SUBACROMIAL IMPINGEMENT

Subacromial impingement is among the most frequently diagnosed shoulder disorders in adults, with its lifetime prevalence estimated to be as high as 36%. While the initial management is most often with physical/exercise therapy, some studies have suggested that kinesiology tape may be effective. This prospective study examined the effectiveness of precut kinesiology tape as compared with that of nonsteroidal anti-inflammatory drugs for reducing shoulder pain among patients with subacromial impingement.

This prospective, parallel group, randomized, controlled trial included patients with a primary complaint of shoulder pain, further diagnosed with subacromial impingement syndrome. The subjects were randomized to receive precut kinesiology tape and exercise (K), Naprosyn 500 mg twice daily and exercise (N), or exercise alone(E) for a total of four sessions over two weeks. The primary outcome measure was the numeric pain rating scale (NPRS), with secondary measures including the Simple Shoulder Test (SST) and the Constant Score.

Of the 100 individuals who completed the study, all three groups had a significant decrease in pain by all measures. Between group differences on all outcome measures were not statistically significant or clinically meaningful.

Conclusion: This study of patients with subacromial impingement who underwent exercise therapy found no clinically meaningful difference in outcomes between patients who received additional treatment with Naprosyn or precut kinesioolgy tape.

Devereaux, M., et al. Short-Term Effectiveness of Precut Kinesiology Tape Versus an NSAID as Adjuvant Treatment to Exercise for Subacromial Impingement: A Randomized, Controlled Trial. **Clin J Sports Med.** 2016, January; 26(1): 24-32.

PRESEASON HIP STRENGTH ASSOCIATED WITH ANTERIOR CRUCIATE LIGAMENT INJURIES

The anterior cruciate ligament (ACL) is most commonly ruptured knee ligament in competitive athletics, with 70% of these injuries deemed noncontact in nature. This study assessed whether isometric hip strength is associated with noncontact ACL injuries.

Subjects were 501 athletes enrolled in a prospective case control study. Preseason hip strength was assessed bilaterally with a hand-held dynamometer, measuring hip abductors and external rotators. All athletes were followed for ACL injuries during the season, which were further classified as contact or noncontact.

Among the athletes, 15 noncontact ACL injuries were identified during the following season. Baseline hip external rotation and hip abduction strength were associated with increased risk of noncontact ACL injury (p=0.001 for both comparisons). Strength cutoffs for high risk were determined. For hip external rotator strength, a cutoff of <20.3% of body weight corresponded with a 93% sensitivity and a 59% specificity, as well as a positive likelihood ratio of 2.3, and a negative likelihood ratio 0.11, for injury. For hip abductor strength, a clinical cutoff of <35.4% of body weight corresponded with a sensitivity of 87% and a specificity of 65%, with a positive likelihood ratio of 2.5 and a negative likelihood ratio of 0.21 for injury.

Conclusion: This prospective study found that both hip external rotation strength and hip abduction strength tests (measured preseason) distinguished between athletes who later sustained an ACL injury.

Khayambashi, K., et al. Hip Muscle Strength Predicts Noncontact Anterior Cruciate Ligament Injury in Male and Female Athletes: A Prospective Study. **Am J Sports Med**. 2016, February; 44(2): 355-361.

PREVALENCE OF SPORTS-RELATED SPINAL CORD INJURY

Spinal cord injury (SCI) most commonly occurs as a result of motor vehicle accidents and falls. These injuries can also occur as a result of participation in sports. This systematic review of the literature was completed to determine the proportion of SCIs resulting from sports, and to compare sports-related SCIs across countries and sports.

A literature search was completed for articles between 1980 and 2015 concerning sports-related SCI. Studies were included that reported on the proportion of sports-related SCI relative to all cause traumatic SCI and the proportion of SCI for specific sports relative to all sport-related SCI.

Of the 1,001 articles initially identified, 54 papers were chosen for inclusion. From these, it was determined that the six countries with the highest proportion of SCIs caused by sport were Russia, with 32.9% followed by Fiji (32%), New Zealand (20%), Iceland (18.8%), France (15.8%) and Canada (13.1%). The six countries with the lowest proportion of SCIs caused by sport were Turkey (3%), Jordan (2.6%), Nepal (2%), Malaysia (2%), China (1.8%), and Nigeria (1.7%). The sports which caused the greatest number of SCIs worldwide were diving, rugby, horseback riding and skiing.

Conclusion: This study found that the individual sports with the highest risk for spinal cord injury were diving, skiing, rugby and horseback riding. In Russia, 32.9% of spinal cord injuries were sport-related, while in Nigeria, only 1.7% of such injuries were related to sport.

Chan, C., et al. Epidemiology of Sport-Related Spinal Cord Injuries: A Systematic Review. **J Spinal Cord Med.** 016.10.1080/10790268.2016.1138601

TREATMENT FOR OLECRANON BURSITIS

Olecranon bursitis is characterized by fluid accumulation in the bursa, occurring with and without inflammation. Treatment options for nonseptic olecranon bursitis include compression bandaging with nonsteroidal anti-inflammatory drugs, aspiration with or without steroid injections or surgical management. This study was designed to determine whether compression bandaging with nonsteroidal anti-inflammatory drugs, aspiration or aspiration with steroid injection is most effective for the treatment of this disorder.

This prospective study included 90 patients, randomized to one of three treatment groups, compression bandaging with nonsteroidal anti- inflammatory drugs (C), aspiration (A) or aspiration with steroid injection (S). The mean symptom duration was four weeks prior to intervention, and the mean follow-up was 12 weeks. Those in the NSAID group received aceclofenac, 100 mg twice per day, while those in the injection group received one mL of 40 mg per mL triamcinolone acetonide.

The participants were followed weekly for four weeks. Group S had the earliest resolution (2.3 weeks) when compared with Group A (3.1 weeks) and Group C (3.2 weeks), p = 0.015. However, no significant differences were noted between groups at four weeks (p=0.073). No complications of treatment were noted for any of the groups.

Conclusion: This study of patients with nonseptic olecranon bursitis found that symptom resolution occurred most rapidly in the group treated with aspiration and steroid injection, though no significant difference in outcomes was noted between groups at four week follow- up.

Kim, J., et al. A Randomized Trial among Compression Plus Nonsteroidal Anti-Inflammatory Drugs, Aspiration, and Aspiration with Steroid Injection for Nonseptic Olecranon Bursitis. **Clin Ortho Rel Res.** 2016, March; 474 (3): 776-783.

TREATMENT OF PAINFUL DIABETIC NEUROPATHY

Of the 26 million individuals in the United States with diabetes mellitus, approximately half suffer with painful diabetic neuropathy (PDN). Symptomatic PDN is typically treated with medications including desipramine (DES), pregabalin (PRE), duloxetine (DUL) or gabapentin (GABA). Guidelines differ concerning which should be the first line therapy. This study reviewed the efficacy and long-term cost- effectiveness of starting patients for treatment of PDN with one of these medications.

A health state transition model was developed to compare the cost effectiveness of beginning treatment for PDN with PRE, DUL, GABA or DES. Microsimulation was used to estimate outcomes. Model outcomes were quality-adjusted life years (QALYs) and direct medical costs. Model inputs for clinical effectiveness, adherence and utilities were derived from estimates in the published literature.

The model wherein the treatment was started with DES resulted in the lowest average cost per patient, followed by treatment beginning with GABA, DUL and PRE. The highest average quality of life gained per patient was found in the group that began treatment with DUL, followed by PRE, GABA and DES.

Conclusion: This study evaluated the cost effectiveness of initiating different medications for painful diabetic neuropathy, finding that the most cost effective initial medication was DES, and the most effective treatment medication was DUL.

Bellows, B., et al. Long-Term Cost Effectiveness of Initiating Treatment for Painful Diabetic Neuropathy with Pregabalin, Duloxetine, Gabapentin or Desipramine. **Pain**. 2016, January; 157(1): 203-213.

ULTRASOUND GUIDANCE FOR SUBACROMIAL INJECTIONS

Subacromial impingement is one of the most common causes of shoulder pain in adults, with corticosteroid injections one of the most common management tools for this condition. Ultrasound (US) guidance has been recommended for these injections due to the increased accuracy provided by its

use. This study compared the clinical effectiveness of US-guided subacromial injections with that of blind subacromial injections.

This prospective, double-blind, randomized, controlled trial included 51 patients with a diagnosis of subacromial impingement with 28 shoulders undergoing US-guided injections and 28 receiving a landmark guided injection. Examiners held blind to group assignment performed clinical evaluations before and after the procedures.

Both groups realized significant improvement at week six in visual analog scale scores for pain with overhead activities, decreasing from 59 to 33 in the US group ($p<0.001$), and from 63 to 39 in the landmark guided group ($p<0.001$). American Shoulder and Elbow Surgeons (ASES) scores improved from 57 to 68 at week six in the US group ($p<0.01$) and from 54 to 65 in the landmark guided group ($p<0.01$). No significant difference was seen between groups in either measurement.

Conclusion: This study found no significant difference in clinical outcomes for ultrasound guided versus landmark guided subacromial injections for the treatment of subacromial impingement syndrome.

Cole, B., et al. Ultrasound-Guided versus Blind Subacromial Corticosteroid Injections for Subacromial Impingement Syndrome. Randomized, Double-Blind, Clinical Trial. **Am J Sports Med**. 2016, March; 44(3): 702-707.

ISOLATED SYNDROME

Previous studies have demonstrated that levels of 25-hydroxyvitamin D are associated with inflammatory activity among patients with multiple sclerosis (MS). As the loss of gray matter volume predicts long-term disability among patients with MS, this study was designed to determine any association between 25–hydroxyvitamin D levels among patients with clinically isolated syndrome (CIS) and imaging measures of neurodegeneration.

Data were obtained from subjects in the STAyCIS trial, a randomized study of atorvastatin in patients with recent CIS, used to assess the association of 25-hydroxyvitamin D levels with imaging measures thought to reflect neurodegeneration. All subjects were evaluated clinically and by brain MRI at baseline and at months three, six, nine, and 12. The primary endpoint was the development of at least one MS relapse or at least three new T2 lesions on brain MRI at month 12. The data were reviewed for the relationship between 25-hydroxy vitamin D levels and clinical and MRI measures of inflammatory activity.

Of the 65 patients included in this study, 55% met the composite inflammatory endpoint, while 29% had a second attack during the follow-up period. Every 25 nmol/l higher 25-hydroxyvitamin D level was associated with a 7.8 mL higher gray matter volume ($p=0.025$). A trend was noted for an inverse association between vitamin D levels and the composite endpoint of at least three new brain T2 lesions or at least one relapse within the first 12 months.

Conclusion: This study of patients with early CIS found that increased levels of 25-hydroxyvitamin D are associated with preserved gray matter volume.

Mowry, E., et al. Vitamin D in Clinically Isolated Syndrome: Evidence for Possible Neuroprotection. **Euro J of Neurol.** 2016, Feb; 23(2): 327-332.

LEVODOPA–CARBIDOPA INTESTINAL GEL FOR ADVANCED PARKINSON'S DISEASE

Among patients with Parkinson's disease (PD), long-term, oral levodopa therapy is often associated with motor fluctuations, resulting from alterations in the plasma concentration of levadopa. To overcome these fluctuations, various therapeutic modalities have been developed. With the exception of deep brain stimulation, these therapies have failed to demonstrate significant long-term safety and efficacy profiles among patients with advanced PD. This Middle Eastern study assessed the effect of levodopa-carbidopa intestinal gel (LCIG) monotherapy on patients with PD.

Subjects were 20 to 80 years of age, presenting with advanced PD with motor fluctuations and non-motor symptoms. All patients were hospitalized and underwent a nasoduodenal tube insertion with levodopa–carbidopa intestinal gel infusions. These infusions were divided into a morning bolus and a continuous hourly dose, with these based on the equivalent oral medications previously used. The on-time, off-time and LCIG doses were recorded. Outcome measures included the unified PD scale(UPDRS III), non-motor symptoms scale (NMSS) and PD questionnaire–8 (PDQ-8). During follow-up, the mean off- time, UPDRS-III, NMSS and PDQ-8 score improvements were significantly better after the gel infusion therapy than before.

Conclusion: This study of should only claim credit commensurate patients with PD found that levodopa- carbidopa intestinal gel infusion improve time-off, reduce levodopa–induced dyskinesia and improve nonmotor symptoms and quality of life among patients who are inadequately responding to traditional oral therapy.

Bohlega, S., et al. Levodopa Carbidopa Intestinal Gel Infusion Therapy in Advanced Parkinson's Disease: Single, Middle Eastern Center Experience. **Euro Neurol**. 2015, December 1; 74(5-6): 227-236.

CENTERS FOR DISEASE CONTROL OPIOID GUIDELINES

Opioid prescription per capita in the United States increased 7.3% from 2007 to 2012. The Centers for Disease Control and Prevention (CDC), noting potential problems with opioid prescriptions, met to create guidelines for primary care providers.

The process of creating the guidelines involved using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework, with a systematic review of the scientific evidence. The focus of these guidelines was for primary care physicians treating adult patients with pain lasting more than three months in outpatient settings. The literature was reviewed for opioid efficacy and risk, followed by

a solicitation of expert opinion, stakeholders, the public, peer reviewers, and a federally chartered advisory committee.

Twelve recommendations were made. Summarized, these include considering opioid therapy only if expected benefits for pain and function outweighed the risks, with opioid therapy continued only if there is clinically meaningful improvement in pain and function. These should be combined with nonpharmacologic and non-opioid therapy. Treatment goals should be established initially, with risks discussed. When initiating, immediate release should be prescribed at the lowest effective dose, carefully reassessing at 50 morphine milligram equivalents (MME), and should be avoided at 90 MME or higher.

For acute pain, three days or less of opioid therapy should be sufficient. Harms and benefits should be evaluated one to four weeks after starting opioids for chronic pain. Before starting, and periodically during opioid therapy, the risks should be evaluated and plans to mediate these risks should be made, including offering naloxone. Clinicians should review the patient's history of controlled substance prescriptions using state prescription drug monitoring programs (PDMP). Urine drug testing before and at least annually should be used to assess the use of prescribed and other medications. Combining opioids and benzodiazepines concurrently should be avoided. Clinicians should offer or arrange evidence-based treatment for patients with opioid disorders.

Conclusion: This guideline, published by the Centers for Disease Control and Prevention provides succinct recommendations for primary care physicians who wish to prescribe opioid medications for noncancer pain.

Dowell D, Haegerich TM, Chou R. CDC Guideline for Prescribing Opioids for Chronic Pain — United States, 2016. **MMWR Recomm Rep** 2016;65(No. RR-1):1–49.

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