Osteoarthritis (OA) is one of the most common chronic diseases and a major cause of disability, with an estimated knee OA prevalence between 12-35%. Pharmacologic therapies used for OA include anti-inflammatories, NSAIDs, steroid injections, Platelet Rich Plasma (PRP), viscosupplementation, and surgery/joint replacement. Unfortunately, current treatments are limited by: addiction, temporary relief, potential adverse effects, and limited research on efficacy. Additionally, standard treatments target symptom management rather than the underlying pathophysiology of OA. Mesenchymal stem cells (MSCs) have known potential for developing osteogenic and chondrogenic cell lines. Adipose-derived stem cells (ASCs) are considered the MSC source of choice based on practicality, easy access, and simple harvesting procedure. Adipose tissue samples contain 100-fold more MSCs (ASCs) than identical bone marrow samples. MSCs also release bioactive substances and stimulate growth factor production which provide a rich environment to support and sustain local tissue regeneration. Clinical studies have indicated that MSCs are capable of stimulating chondrocyte proliferation and extracellular matrix (ECM) synthesis. Other studies evaluated the use of concomitant PRP intra-articular injection with MSCs in knee OA which showed promising functional and radiographic improvements. The current research is still relatively new with many of the studies being rated as low quality or having small sample sizes. More studies and data are needed to clarify the efficacy of adipose derived MSC injections regarding improvement in pain, function, and stiffness.

Method
A prospective observational study using questionnaires and WOMAC Scores at 1 month before SCI, 1 month after SCI, and in the recent month. 52 patients were treated with fat derived SCI, with/without a 1-2 week post Ip-PRP injection. We used a Within-Subject Repeated Analysis of Variance (ANOVA) where time (Pre-SCI, Post-SCI, Recent) was the within-subject factor and WOMAC scores for Pain, Stiffness, and Function were the outcomes of interest. Alpha was set at (.05). A Greenhouse-Geisser and Bonferroni correction was applied to protect the family wise error rate for multiple comparisons.

Purpose
1. To analyze the impact of fat derived MSC injections (SCI) using a Lipogems technique on pain, stiffness, and function associated with OA.
2. To evaluate trends in pain medication usage, Kellgren-Lawrence (KL) scales, and correlation with leukocyte-poor PRP (lp-PRP) injections.

Results
Results showed statistically significant reduction in scores for Pain, Stiffness, and physical Function between Pre-SCI and Post-SCI. Score reductions continued from Post-SCI to the Recent survey but were significant in Pain and Function. These reductions occurred while patients also reported decreased pain medication usage. The percent change remained consistent from 3 months to 2 years. Benefits appeared to extend to various msk conditions although more data is needed for these groups. Less severe OA (< 4 KL) appeared to have greater improvement in Pain and Function. No significant difference was found in those receiving Post-SCI compared to the Recent survey. The primary areas of potential bias/confounders include historical recall which is more prone to ascertainment, a varied timeline, and varied pain medication usage. Areas of improvement include a larger patient population, a control/comparison group, a longer timeline, and post SCI radiographic comparison.

Conclusion / Significance
The vast majority of patients reported overall improvement in pain, stiffness, and function after receiving SCIIs while at the same time reporting decreased pain medication usage. Fat derived SCI appears to be a promising treatment for musculoskeletal pathologies, particularly knee OA. Patients that are without relief from standard therapy, poor candidates for surgery, or requiring frequent pain medication could benefit significantly. With these promising results, additional research is certainly warranted to add to the current data, compare to alternative therapies, and increase the timeline measured.