



# Journal of Osteopathic Physiatry

# JOP

Volume 2, Issue 1 | Spring 2017

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*Functionality Through Osteopathic  
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The Official Journal of the American Osteopathic College of Physical Medicine and Rehabilitation

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of Physical Medicine & Rehabilitation



# JOP

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## Publication Information



*Mission Statement: The Journal of Osteopathic Physiatry (JOP) is the official journal of the American Osteopathic College of Physical Medicine and Rehabilitation (AOCPPMR). It's mission is to provide a platform for advocacy, education and practice for Osteopathic Physiatrists and the members of the interdisciplinary team.*

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When you read this, our latest edition of the Journal of Osteopathic Physiatry, you will notice we've changed. We proudly present an improved, brighter and more organized format to provide you with a more informative and personalized journal. We are less formal (think of your hometown newspaper rather than The Times, Courier or Tribune) and more useful. We feature original research, best evidence-based reviews, clinical notes and pearls, online training videos and professional practice advice and guidelines.

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Best regards,

Michael M. Weinik, DO, FAOCPMR  
President-Elect



## Linking Ultrasound with Nonspecific Electrodiagnostic Results in Upper Extremity Neuropathy: A Case Report

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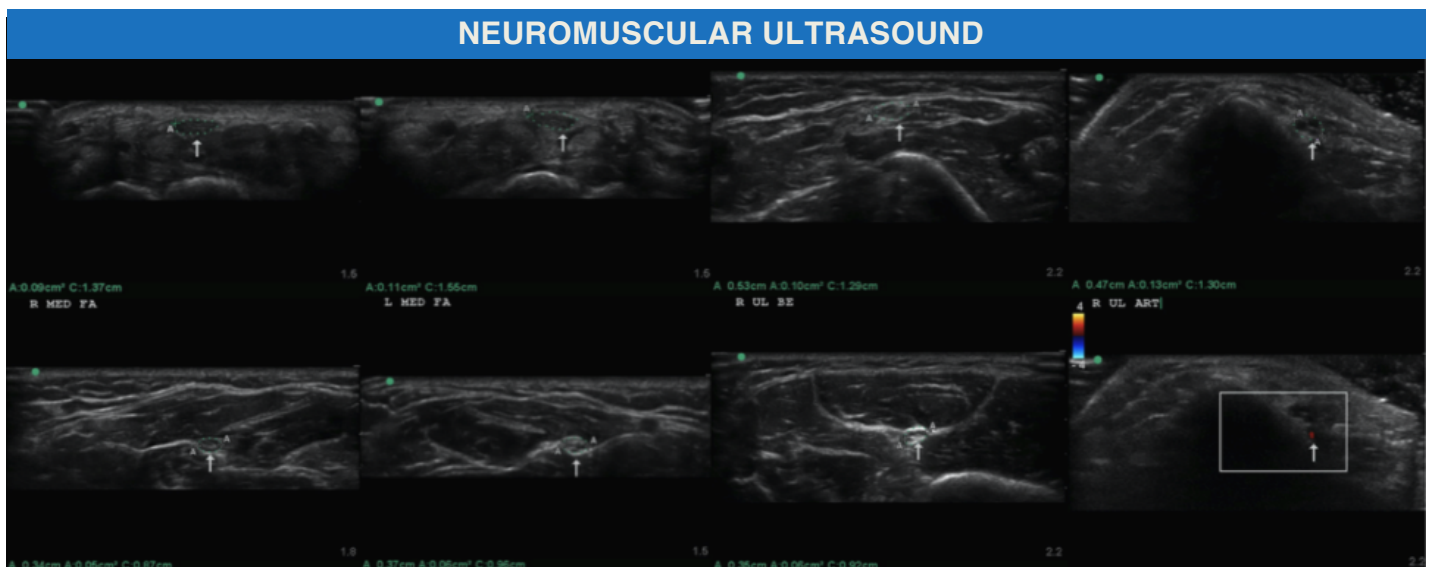
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### CASE DESCRIPTION:

A 67 year-old right-hand-dominant male with hypertension and non-insulin-dependent diabetes mellitus was referred for evaluation of progressive pain and paresthasias in both hands. Patient described worsening intermittent numbness, tingling, 6/10 pressure-like pains in his right hand and infrequently on the left. Physical examination revealed normal reflexes, strength and tone; diminished sensation to light touch and pinprick to the bilateral median and right ulnar distributions. Phalen’s sign, carpal compression and Tinel’s sign at the elbow and wrist were positive on the right upper extremity; Hoffman’s reflexes, Lhermitte’s sign and Spurling’s test are negative. Structural examination identified the area of greatest restriction in the periscapular thoracic segments.

There was electrophysiological evidence for median neuropathy at the wrist (MNW) bilaterally and right ulnar neuropathy at the elbow (UNE). Electromyography of the right upper extremity, via concentric needle electrode, found motor unit action potential morphology to demonstrate chronic, neurogenic changes to the first dorsal interosseous, abductor pollicis brevis and biceps muscles. Results of the diagnostic neuromuscular ultrasound demonstrated characteristics consistent with bilateral MNW and right UNE in the ulnar groove, with focal nerve enlargement, hypomobility and hypoechogenicity. There was also a persistent left ulnar collateral artery in the groove.

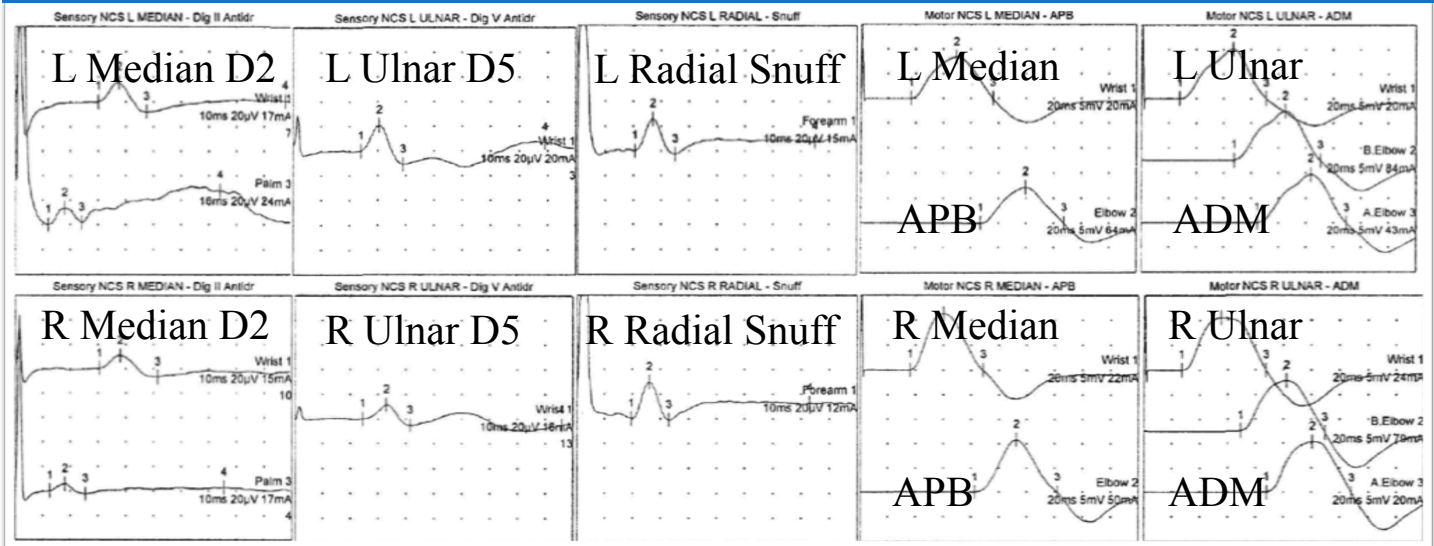


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# Linking Ultrasound with Nonspecific Electrodiagnostic Results in Upper Extremity Neuropathy: A Case Report

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## NERVE CONDUCTION STUDIES / ELECTROMYOGRAPHY IMAGE



### NERVE CONDUCTION STUDIES / ELECTROMYOGRAPHY TABLE:

| SNAPs          | Distance | Latency   | Velocity    | Amplitude   |
|----------------|----------|-----------|-------------|-------------|
| Median Digit 2 | L / R    | L / R     | L / R       | L / R       |
| Wrist          | 12/12    | 3.00/3.05 | 41.7*/39.3* | 15.5*/10.7* |
| Palm           | 6/6      | 1.20/1.25 | 50.0/48.0   | 13.7*/5.8*  |

| Ulnar Digit 5 | Distance | Latency   | Velocity  | Amplitude  |
|---------------|----------|-----------|-----------|------------|
| Wrist         | 12/12    | 2.40/2.45 | 50.0/49.0 | 20.5/11.5* |

| Radial Snuffbox | Distance | Latency   | Velocity  | Amplitude |
|-----------------|----------|-----------|-----------|-----------|
| Forearm         | 10.5/10  | 2.05/1.95 | 51.2/51.3 | 25.8/29.8 |

| CMAPs        | Distance | Latency   | Velocity  | Amplitude |
|--------------|----------|-----------|-----------|-----------|
| Median - APB | L / R    | L / R     | L / R     | L / R     |
| Wrist        | 7/7      | 3.65/3.60 |           | 8.4/11.3  |
| Elbow        | 25/24    | 8.70/8.25 | 49.5/51.6 | 7.2/10.8  |

| Ulnar - ADM | Distance | Latency   | Velocity   | Amplitude |
|-------------|----------|-----------|------------|-----------|
| Wrist       | 7/7      | 2.8/2.70  |            | 10.1/10.6 |
| Below Elbow | 22/21    | 9.9/10.3  | 55.7/50.0  | 9.9/10.3  |
| Above Elbow | 9/7      | 8.45/8.80 | 52.9/36.8* | 9.7/10.3  |

\* Denotes abnormal value.

**EMG** **Right Upper Extremity**  
 Normal EMG findings in the deltoid, triceps & right C5-C6 paraspinals.  
 Abnormal biceps polyphasic MUAP on volition; FDI, APB with increased amplitude, long duration and polyphasic MUAP on volition.

### DISCUSSION:

MNW is the most common focal entrapment neuropathy in the upper extremity followed by UNE. In atypical cases electrodiagnostic studies are recommended to differentiate focal neuropathy, radiculopathy, plexopathy, neurogenic thoracic outlet syndrome, peripheral polyneuropathy, mononeuritis multiplex, myopathy versus other neuromuscular conditions. Evaluation and intervention requires expertise in regional anatomy and the anomalous variations. The ulnar nerve at the elbow receives its main blood supply from three arteries: the superior ulnar collateral artery, posterior ulnar recurrent artery (PURA) and the inferior ulnar collateral artery (IUCA), which is variably present. In this case direct visualization of the IUCA to PURA extraneural anastomosis was seen in the cubital tunnel, without evidence of ulnar

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# Linking Ultrasound with Nonspecific Electrodiagnostic Results in Upper Extremity Neuropathy: A Case Report

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nerve hypervascularity. Vascular anomalies are a known cause of focal neuropathies including vasculitis, aberrant or thick veins, venous plexuses, arteriovenous malformations, venous thrombosis as well as both intraneural and extraneural hemangiomas. In these cases electrodiagnostics and ultrasonography were the most common diagnostic modality. The combination of electrodiagnostic, sonographic and clinical evidence resulted in the diagnosis of bilateral MNW and right UNE.

## CONCLUSIONS:

In cases of nonspecific electrodiagnostic results, select patients with neuropathy can be further evaluated by neuromuscular ultrasound a noninvasive objective measure of neuropathies, identifying variable anatomy and conceivably severity. Further studies are needed to support associations between ultrasound to electrodiagnostic findings in neuropathies.

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**NEUROMUSCULAR ULTRASOUND TABLE:**

| Nerve           | CSA                | Mobility  | Echogenicity | Vascularity |
|-----------------|--------------------|-----------|--------------|-------------|
| <b>R Median</b> |                    |           |              |             |
| DWC             | 9 mm <sup>2</sup>  | Decreased | Decreased    | Normal      |
| Forearm         | 5 mm <sup>2</sup>  | Normal    | Normal       | Normal      |
| <b>L Median</b> |                    |           |              |             |
| DWC             | 11 mm <sup>2</sup> | Decreased | Decreased    | Normal      |
| Forearm         | 6 mm <sup>2</sup>  | Decreased | Decreased    | Normal      |
| <b>R Ulnar</b>  |                    |           |              |             |
| Below Elbow     | 6 mm <sup>2</sup>  | Normal    | Normal       | Normal      |
| UG              | 13 mm <sup>2</sup> | Normal    | Decreased    | UCA         |
| Above Elbow     | 10 mm <sup>2</sup> | Normal    | Normal       | Normal      |

CSA - cross sectional area, DWC - distal wrist crease, UG - ulnar groove, UCA - ulnar collateral artery

## Hip Fracture In Older Adults: Is Calcium And Vitamin D Helpful In Prevention?

Michael K. Christakos, D.O., and Shashank Dave, D.O.

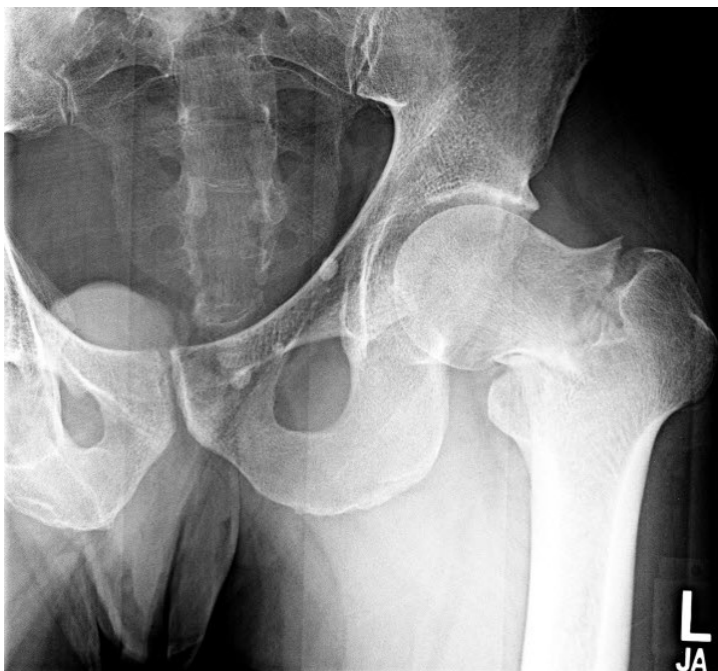
**OBJECTIVE:** To investigate current literature for the efficacy of calcium and vitamin D in preventing hip fractures in non-symptomatic postmenopausal women and older men.

**DESIGN:** PubMed® literature search of articles from 1966-2013 with key words: "osteoporosis," "fracture," "calcium," and "vitamin D." Only meta-analyses of randomized control trials were included.

**SETTING:** Both community and institutionalized settings.

**PARTICIPANTS:** Postmenopausal women and men over age 65.

**INTERVENTIONS:** Calcium alone, vitamin D alone or calcium plus vitamin D [versus placebo or no treatment].



Osteoporotic Hip Fx  
Image courtesy of Dr. Edward Fox MD,  
Penn State Hershey Bone and Joint Institute

**PRIMARY OUTCOME MEASURE:** Risk of hip fracture.

**RESULTS:** 26 studies total were found with over 35,000 participants. There was no statistically significant risk reduction in hip fracture in the community dwelling participants receiving either calcium alone, vitamin D alone, or the combination of the two compared to controls. There was a small but statistically significant reduction in risk of hip fracture in institutionalized participants receiving calcium plus vitamin D supplementation. Additionally, several of these studies showed trends towards adverse outcomes in the groups containing calcium, such as myocardial infarction and stroke.

### CONCLUSION:

There is evidence that the empiric use of calcium and/or vitamin D supplementation does not reduce hip fractures in the postmenopausal and men over 65 community dwelling populations. There is small

but significant evidence that calcium plus vitamin D supplementation reduces the risk of hip fracture in institutionalized populations.

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# Hip Fracture In Older Adults: Is Calcium And Vitamin D Helpful In Prevention?

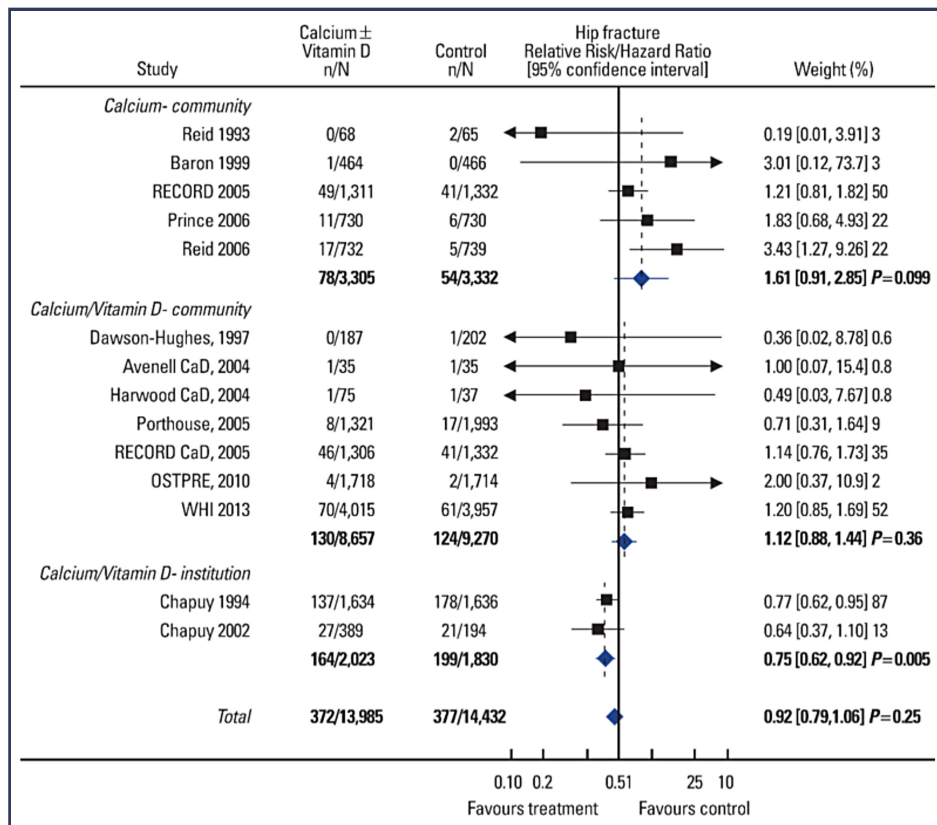
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## BACKGROUND:

There are over 300,000 osteoporotic hip fractures annually in the United States. Per the AHRQ, these fractures cost the healthcare system over fifteen billion dollars per year.

The CDC reports that one fifth of hip fracture sufferers will die within a year of their injury, and one third of survivors, who were living independently prior to their injury, will require nursing home admission for at least one year following their fracture.

Due to their roles in bone metabolism, calcium and vitamin D have been prescribed to prevent osteoporotic fractures for at least a decade, but is there evidence that these are effective treatments? Furthermore, what are the risks associated with calcium and vitamin D supplementation?



## CONCLUSION:

There is statistically significant evidence that supplementation of calcium with or without vitamin D does not reduce hip fractures in the postmenopausal and men over 65 community dwelling populations.

There is limited but statistically significant evidence that calcium plus vitamin D supplementation reduces the risk of hip fracture in institutionalized populations over 65 years of age.

There is statistically significant evidence that chronic calcium supplementation (+/- vitamin D) increases the risk of myocardial infarction. There is a non-statistically significant trend towards increased risk of stroke with the use of these calcium supplementation (+/- vitamin D).

Fig 1. - Calcium and/or Vitamin D Supplementation and Prevention of Hip Fracture "Should We Prescribe Calcium Supplements for Osteoporosis Prevention?" Journal of Bone Metabolism 2014. I. Reid (1)

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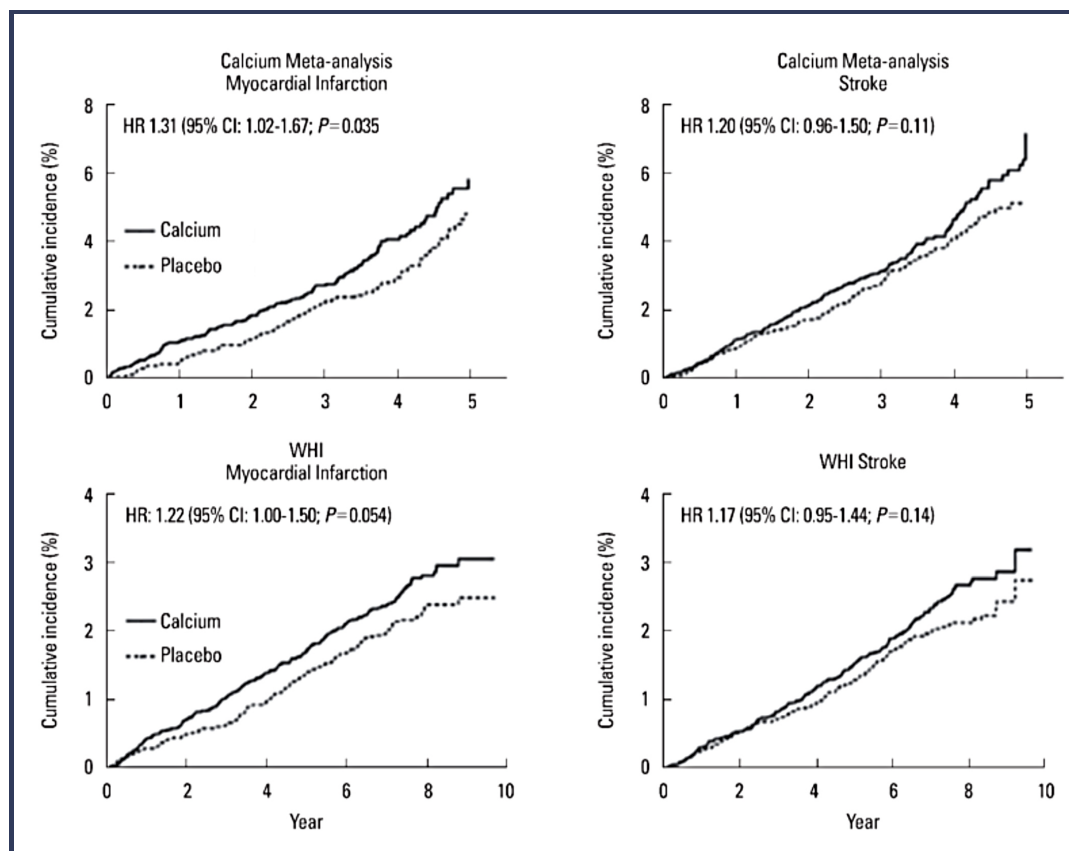




# Hip Fracture In Older Adults: Is Calcium And Vitamin D Helpful In Prevention?

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Even the USPSTF states evidence is insufficient to assess the balance of the benefits and harms of combined vitamin D and calcium supplementation for the primary prevention of fractures in postmenopausal women and men over 65.



Considering this evidence, providers may want to rethink recommending calcium with or without vitamin D supplementation in most population groups. As for the older institutionalized population, providers need to balance the modest benefit of supplementation on hip fracture reduction with the common side effects of calcium supplementation and the more concerning ones of myocardial infarction and stroke.

Fig 2. - Calcium Supplementation and Risk of Myocardial Infarction and Stroke  
 "Should We Prescribe Calcium Supplements for Osteoporosis Prevention?"  
 Journal of Bone Metabolism 2014. I. Reid (1)

**REFERENCES:**

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<sup>1</sup> Ultrasound-guided hip injections: a comparative study w/ fluoroscopy-guided injections. Arthroscopy. 2014. See full article.



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## Underwater Treadmill Training: A New Effective And Safe Gait Restoration Modality For The Spinal Cord Injured Population.

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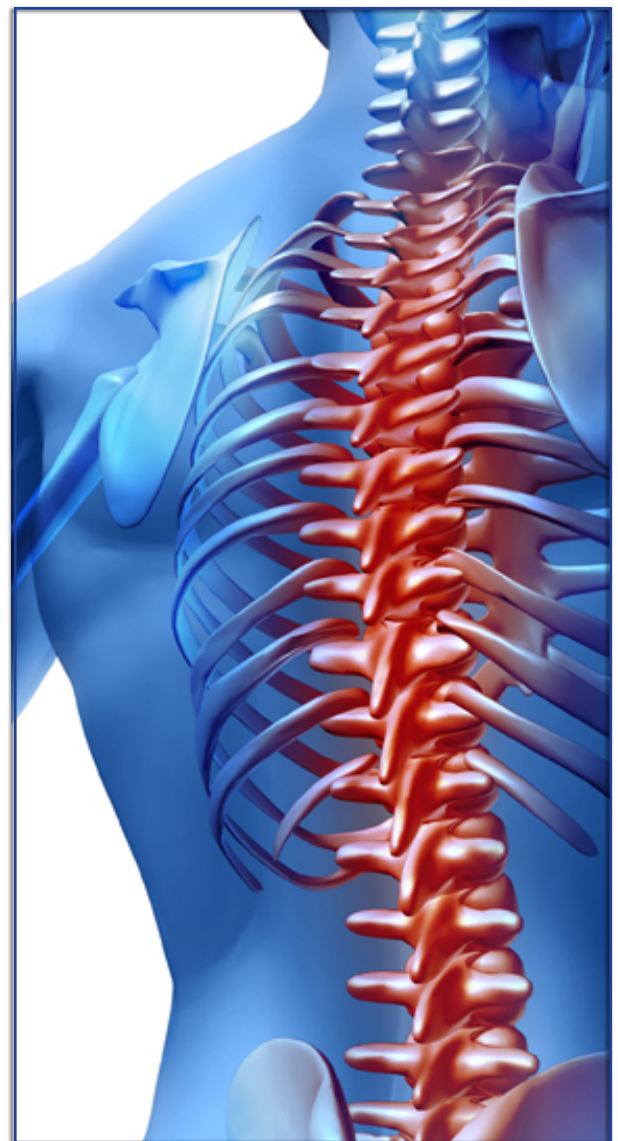
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### BACKGROUND:

With up to 400,000 estimated individuals in the United States living with paralysis due to spinal cord injury, and an additional 12,000 new spinal injuries occurring annually, the need for effective and safe gait restoration therapies is a major concern of physical rehabilitation facilities nation-wide. While modern spinal cord injury rehabilitation centers utilize a wide range of different gait restoration therapies, those methods that function to alleviate the effects of gravity have shown consistently positive results and are becoming more widely used. Of the most recent and promising is underwater treadmill training. This new therapeutic gait restorative modality has proven effective in individuals with neural-paralytic conditions and recent research with spinal cord injured individuals showed improvements in leg strength, balance, walking speed, walking distance, cardiac performance, and quality of life. As the results of previous studies show, the use of an underwater treadmill can produce physiological and functional improvements comparable to or better than some other widely used therapeutic gait restoration techniques.

### PURPOSE:

The following is a comprehensive description of underwater treadmill training, its benefits for paralyzed individuals, and the advantages and disadvantages of its incorporation into a rehabilitation plan of care.



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# Underwater Treadmill Training: A New Effective And Safe Gait Restoration Modality For The Spinal Cord Injured Population.

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## RESULTS:

The use of an underwater treadmill has shown to be a safe and effective technique for the improvement of both gait characteristics and cardiovascular performance for individuals with spinal cord injury (Table 1), however more study is needed in this therapeutic modality before implementation into a rehabilitation plan of care.

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| Table 1   |   |   |
|---|---|---|
| Study/Participants  | Exercise Protocol   | Results (Stat. Sign. In Bold)   |
| Stevens et al. [1]<br><br>n=11, L2-C2 iSCI<br>AISCH scale C-D                 | UTT: 3x/wk, 8wks  | <b>Inc. Leg Strength (57%)</b><br><b>Inc. Balance (39%)</b><br><b>Inc. 6MWT (Endurance)(82%)</b><br><b>Inc. Pref. Walking Speed (34%)</b><br><b>Inc. Rapid Walking Speed (61%)</b><br><b>Inc. Daily Step Average (121%)</b> |
| Stevens et al [2]<br><br>n=11, L2-C2 iSCI<br>AISCH scale C-D                  | UTT: 3x/wk, 8wks  | <b>Dec. Submax. Heart Rate: (17%)</b><br><b>(Despite Inc. in Exercise Volume)</b>   |
| Dolbow et al [3]<br><br>n=1, 12 months<br>post SCI, C4 iSCI,<br>AISCH scale C | UTT: 2x/wk, 12wks<br>(followed by 6 mths<br>non-UTT therapy)<br>Additional 3x/wk,<br>13 wks UTT | <b>Inc. in unaided steps from 0 (no<br/>ably to independently step) at<br/>beginning of study to &gt;1100 unaided<br/>steps underwater per UTT session<br/>by the end of study (25 wks total<br/>UTT training)</b>          |
| Park et al. [4]<br><br>n=11, 6-24 Months<br>Post-Hemiplegic<br>post-stroke    | Gen. Physiotherapy<br>+ UTT (Exp. Group)<br>5x/wk each<br>(10 sessions/wk),<br>4 wks total      | <b>Dec. Mediolateral, Anteroposterior,<br/>and Total Postural Sway</b>  |
| n=11, 6-24 Months<br>Post-stroke  | Gen. Physiotherapy<br>(Control) 5x/wk<br>4 wks total  | <b>Dec. Mediolateral, Anteroposterior,<br/>and total Postural Sway</b>  |
| Lee et al. [5]<br><br>n=16, 7.9 months<br>post-stroke                         | UTT (Exp. Group)<br>3x/wk, 6wks   | <b>Inc. Peak Torque at 60<sup>0</sup>/sec during<br/>knee flexion and extension</b><br><b>*Sign. Greater Improvement than<br/>Control Group</b>   |
| n=16, 8.0 months<br>post-stroke   | Overground<br>Treadmill (Control)<br>3x/wk, 6wks.   | <b>Inc. Peak Torque at 60<sup>0</sup>/sec during<br/>knee flexion and extension</b>   |
| Yoo et al. [6]<br><br>n=10, ? months<br>post-stroke<br>(Crossover design)     | UTT (single 20 min<br>session)<br><br>Overground<br>Treadmill (single 20<br>min session)        | Both Exercise:<br>Inc. Blood Pressure<br>Inc. Heart Rate Pressure Product<br><b>* Lower Ave. Maximum Increases in<br/>Heart Rate, Blood Pressure, and<br/>Rate Pressure Product in UTT<br/>group than Control</b>           |
| Jung et al. [7]<br><br>n=8 (Average 5.6<br>yrs post-stroke)<br>n=8 (Healthy;  | UTT (single 8 min<br>walk)<br><br>Overground<br>Treadmill (single 8<br>min walk)                | Stroke Group:<br>Mean VO <sub>2</sub> dec. (39%)<br>Mean VCO <sub>2</sub> dec. (42%)<br>Mean Energy Expend. dec (40%)<br>Healthy Group:   |

Table 1: Comparison of the use and effectiveness of underwater treadmill training as a rehabilitative modality in patients with spinal cord injury and stroke.



## Psychological Distress is a Predictor of Poor Outcome Following Rotator Cuff Repair

Scott Primack, D.O., Kaitlyn Brunworth, Research Assistant, Andrew Hammes, B.S., B.A., M.S. candidate, David Weitzenkamp, Ph.D.

### ABSTRACT

#### BACKGROUND

Psychosocial factors such as depression, anxiety, distress, and unreasonable expectations have been associated with poor outcomes in a variety of musculoskeletal diagnoses. It has been shown that psychological distress correlates with poor patient self-assessment of shoulder function before rotator cuff repair surgery. However, the effect of psychological distress on rotator cuff repair outcomes after surgery has not yet been thoroughly studied. Our study utilizes the Distress Risk Assessment Method questionnaire for psychological assessment and the Simple Shoulder Test questionnaire for shoulder assessment in order to answer the following questions:

1. Does psychological distress affect baseline (preoperative) scores on the Simple Shoulder Test questionnaire?
2. Is psychological distress a predictor of postoperative function following rotator cuff repair?

#### RESULTS

Preoperatively, psychologically normal patients (as categorized by the Distress Risk Assessment Method) had higher Simple Shoulder Test scores than distressed patients by 3.614 points ( $p < 0.001$ , 95% CI(3.3, 3.9)). Using raw Simple Shoulder Test scores from all preoperative and postoperative visits, psychologically normal patients scored higher than distressed patients by 4.04 points ( $p < 0.001$ ) overall. When accounting for the difference in preoperative score between groups, the psychologically normal patients still scored higher than distressed patients by 1.42 points ( $p < 0.001$ ) in the postoperative visits overall. When all of the three postoperative visits were analyzed separately, there were statistically significant differences between Simple Shoulder Test scores of the psychologically normal and distressed patients ( $p < 0.001$ ) at each visit.

#### CONCLUSIONS

Preoperative psychological distress is associated with poor patient self-assessment of shoulder function both before and after rotator cuff repair surgery, as assessed by the Simple Shoulder Test questionnaire. This indicates that psychological screening should be utilized as part of the preoperative work-up to identify patients who are at risk for poor surgical outcomes. Further research should be conducted to examine the effect of psychological intervention on surgical outcomes for rotator cuff repair.

#### Keywords

Rotator Cuff Repair, Psychological Distress, Outcomes

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## Psychological Distress is a Predictor of Poor Outcome Following Rotator Cuff Repair

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### BACKGROUND

Because rotator cuff tears are such a common cause of upper extremity disability [9] it is essential to investigate methods to improve outcomes of rotator cuff repair. O'Holleran et al. found that following rotator cuff surgery, patient satisfaction is more robustly related to subjective measures of symptoms and functions than objective variables [18]. This indicates that outcomes are heavily reliant on psychosocial factors because these factors are influential determinants of patients' subjective experience of pain and disability [30]. In fact, it has been shown that psychological factors such as depression, anxiety, and unreasonable expectations correlate with poor outcomes in many other musculoskeletal diagnoses including lumbar spine injury [7,25], low back pain [3,28], total knee arthroplasty [26,11,29], and carpal tunnel release [27,5].

In regards to rotator cuff repair surgery, it is known that many variables such as age [6], sex [24], smoking [15], size of tear [20], poor tendon quality, insurance type [17,31,13,10], and preoperative expectations [9,19] affect outcomes. From a preoperative perspective, Cho et al. utilized the Hospital Anxiety and Depression Scale [21] to demonstrate the impact of depression and anxiety on patients' self assessments of pain and disability before surgery [4] and Potter et al. found that psychological distress, as determined by the Distress Risk and Assessment Method [14], negatively affects pre-surgical functional self-assessment in patients with rotator cuff tears [22]. Neither of the above studies investigated the effect of psychological distress on postoperative outcome. They both noted that a longitudinal follow-up study would be beneficial in determining whether there remains a significant difference in outcomes between normal and distressed patients after surgical treatment [4,22].

Our study aims to investigate the influence of psychosocial factors on patient self-assessment of shoulder function both before and after rotator cuff surgery. Our study utilizes the Distress Risk Assessment Method (DRAM) for psychosocial analysis because it has been shown to be a predictor of outcomes in various orthopedic injuries [3,28,14]. In reference to a patient's perception of shoulder function, our study uses the Simple Shoulder Test (SST) questionnaire, as it has been shown to correlate with patient outcomes in various shoulder disorders [8,23]. Our study aimed to answer the following questions:

1. Does psychological distress affect baseline (preoperative) scores on the Simple Shoulder Test questionnaire?
2. Is psychological distress a predictor of postoperative function following rotator cuff repair?

### METHODS

This is a prospective cohort study of patients undergoing rotator cuff repair surgery for full-thickness rotator cuff tears. Data was collected retrospectively from the database of a large single specialty private practice in a clinical setting.

Inclusion criteria identified 442 patients who were 18 years old or older with full-thickness rotator cuff tears choosing to undergo surgical repair due to exhaustion of all conservative measures including physical therapy, time to recover, medication, and injections. Traumatic full-thickness rotator cuff tears were

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diagnosed by magnetic resonance imaging or ultrasound. Patients underwent surgery through independent surgery centers between September 2009 and October 2014. Their postoperative care and rehabilitation procedures followed standard protocols for rotator cuff repair. Data was collected from patient questionnaires preoperatively (baseline), 6 months postoperatively, 12 months postoperatively, and 18-24 months postoperatively. Exclusion criteria was failure to complete all of the necessary questionnaires (DRAM preoperatively and SST preoperatively, 6 months postoperatively, 12 months postoperatively, 18-24 months postoperatively), previous rotator cuff repairs, partial thickness rotator cuff tears, and fractures/dislocations associated with rotator cuff pathology. 125 of the 442 original patients were thus excluded from the study, leaving 317 patients included in analysis. Age and sex were recorded for each patient. There was a statistically significant difference between the normal and distressed groups' ages ( $p=0.04$ ), which necessitated age being used as a confounding variable in the statistical analysis. There was not shown to be a statistically significant difference between males' and females' psychological scores ( $p=1.00$ ).

Each patient answered the DRAM questionnaire preoperatively in order to categorize levels of psychological distress. Patients in our study did not repeat the DRAM at any of the three postoperative appointments, thus each patient retained his or her psychosocial classification for the duration of the study. The Distress Risk Assessment Method was developed as a simple psychological screening procedure enabling initial classification of patients, which may then be used as the basis for prediction and evaluation of outcome in musculoskeletal ailments [3,14,22,28]. The DRAM utilizes a combination of the Modified Zung Depression Index score and the Modified Somatic Perception Questionnaire score to place each patient in one of four categories: "Normal," "At Risk," "Distressed-Depressed," and "Distressed-Somatic." For our study, the non-distressed population scored in the "Normal" category and the distressed population was found in either "At Risk," "Distressed-Depressed," or "Distressed-Somatic." Potter et al [22] implemented this same grouping methodology in a similar study that utilized the DRAM to categorize patient psychological status. The SST questionnaire was given to each patient preoperatively to assess shoulder function before rotator cuff repair. The SST was then repeated at 6, 12, and 18-24 months postoperatively. The Simple Shoulder Test questionnaire is a function-based, 12 item yes/no answer patient questionnaire, scored on a 0-12 scale by the number of "yes" answers out of 12. Each of the 12 questions represents an important activity that can be performed by normal shoulders [16] so higher scores correlate with decreased pain and increased function [8]. The SST has been shown to be a valid instrument in the assessment of shoulder function [8,23] both before treatment and over time [2].

All DRAM and SST questionnaire scores were given, stored, and analyzed utilizing Comprehensive Outcome Management Technologies (COMT), a patient derived outcomes system and database that integrates psychosocial factors (DRAM) with the functional assessment of a specific body part (SST in this case).

A mixed models random intercept approach was used to account for the multiple measurements over time.

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The fixed effects portion of that model was used to compare the overall Simple Shoulder Test questionnaire scores between those who were categorized as psychologically normal by the Distress Risk and Assessment Method against those who were categorized as distressed. Age and gender were both used as confounding variables in the model to assure reliability, since age was not shown to be independent of psychological status.

A linear regression model was used to compare the SST scores at each visit (preoperative, and 6, 12, and 18-24 months postoperative) by each time individually, with age and gender being accounted for as confounding variables.

Statistical analysis was carried out using SAS software, Version 9.4 of the SAS System for Windows, copyright 2002-2010 SAS Institute Inc. SAS and all other product or service names are registered trademarks of SAS Institute Inc., Cary, NC, USA. Data manipulation was carried out in Rx64 version 3.2.2. Of the 317 total patients studied, there were 155 patients (49%) in the normal group and 162 patients (51%) in the distressed group. Of the normal patients there were 79 (51%) males and 76 (49%) females. Of the distressed patients, there were 83 (51%) males and 79 (49%) females. The average age of the normal group was 57 years (range, 35-84 years) and the average age of the distressed group was 53 years (range, 33-77 years), ( $p = 0.04$ ).

| Table 1: Demographics of study participants, percentages by column |             |        |        |          |        |         |
|--|-------------|--------|--------|----------|--------|---------|
| Characteristic   |             | Normal | %      | Abnormal | %      | p-value |
| Age  | < 40 years  | 5      | 3.2 %  | 15       | 9.3 %  | 0.04    |
|  | 40-49 years | 37     | 23.9 % | 50       | 30.9 % |         |
|  | 50-59 years | 58     | 37.4 % | 45       | 27.8 % |         |
|  | 60-69 years | 34     | 21.9 % | 38       | 23.5 % |         |
|  | 70+ years   | 21     | 13.5 % | 14       | 8.6 %  |         |
| Gender   | Female      | 76     | 49 %   | 79       | 48.8 % | 1.00    |
|  | Male        | 79     | 51 %   | 83       | 51.2 % |         |

### RESULTS

Psychological distress affects baseline (preoperative) scores on the Simple Shoulder Test questionnaire. A linear regression model was used to compare SST scores of the psychologically normal and distressed

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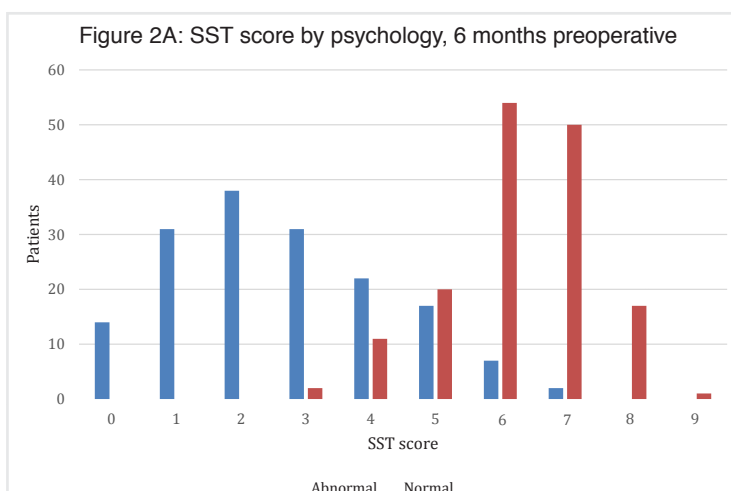
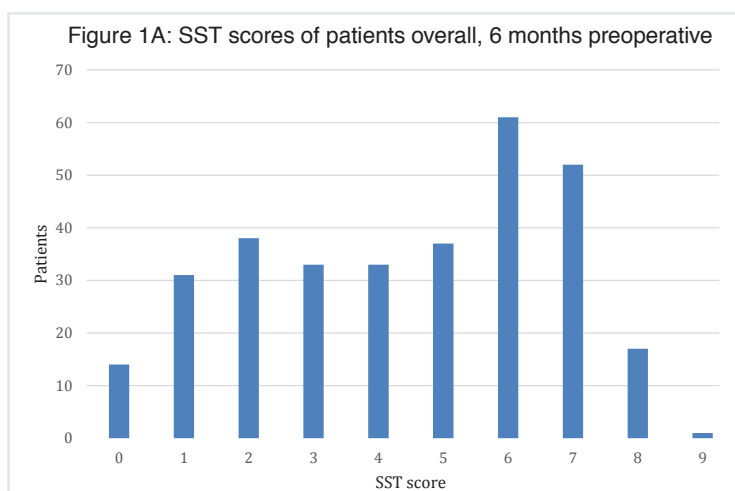




## Psychological Distress is a Predictor of Poor Outcome Following Rotator Cuff Repair

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groups at each visit (Table 2). At the preoperative visit, psychologically normal patients had higher SST scores than distressed patients by 3.614 points ( $p < 0.001$ , 95% CI(3.3, 3.9), Table 3). Figure 1A illustrates the range of SST scores for all patients preoperatively, and Figure 2A splits the two groups to show the distribution of these scores between the psychologically abnormal (distressed) and psychologically normal groups.



Psychological distress continued to predict Simple Shoulder Test questionnaire scores for up to 18-24 months postoperatively. Random intercept mixed models using the raw SST scores from all four visits found that the psychologically normal patients overall had SST scores 4.07 points higher than distressed patients ( $p < 0.001$ ; Table 2). Another random intercept mixed model was used that controlled for the difference between preoperative SST scores, because psychologically normal patients had substantially higher preoperative shoulder scores than distressed patients. It was found that the SST scores of psychologically

normal patients remained higher than the scores of distressed patients by 1.44 points ( $p < 0.001$ ), even when accounting for differences in baseline scores (Table 2).

Table 2: Results of random intercept analysis, difference in SST scores between normal and distressed groups

| Comparison                | Difference | p-value |
|---------------------------|------------|---------|
| Not adjusted for baseline | 4.0730     | < 0.001 |
| Adjusted for baseline     | 1.4440     | < 0.001 |

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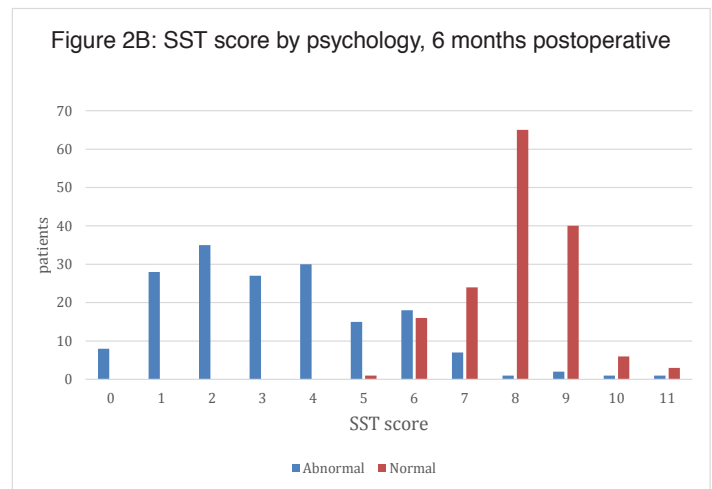
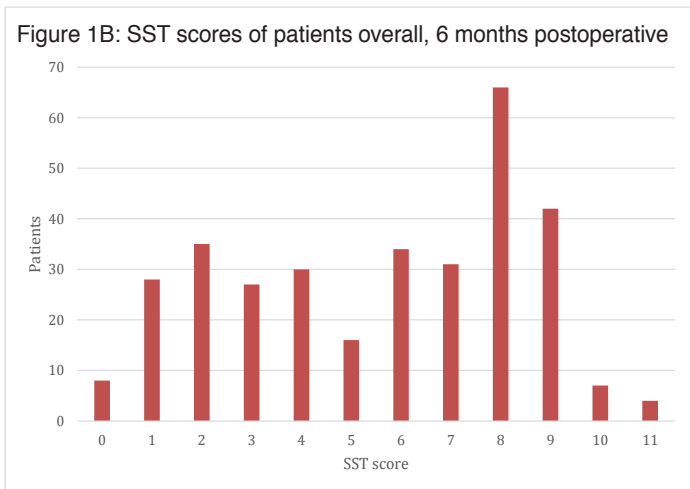
# Psychological Distress is a Predictor of Poor Outcome Following Rotator Cuff Repair

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The scores from each visit were also analyzed separately using linear regression models (Table 3). At 6 months postoperatively, psychologically normal patients had higher SST scores than distressed patients by 4.846 points ( $p < 0.001$ , 95% CI(4.5, 5.2), Table 3). Figure 1B shows the distribution of SST scores for all patients 6 months postoperatively while Figure 2B splits the two groups to show the difference in distribution of SST scores between the psychologically normal and abnormal groups at 6 months postoperatively.

Table 3: Comparisons of SST scores for normal and distressed groups at each visit

| Time               | Difference | p-value | 95% CI     |
|--------------------|------------|---------|------------|
| 6 months pre       | 3.614      | < 0.001 | (3.3, 3.9) |
| 6 months after     | 4.846      | < 0.001 | (4.5, 5.2) |
| 12 months after    | 5.174      | < 0.001 | (4.8, 5.5) |
| 18-24 months after | 5.420      | < 0.001 | (5.1, 5.9) |



At 12 months postoperatively, psychologically normal patients had higher SST scores than distressed patients by 5.174 points ( $p < 0.001$ , 95% CI(4.8, 5.5), Table 3).

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## Psychological Distress is a Predictor of Poor Outcome Following Rotator Cuff Repair

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Figure 1C shows the distribution of SST scores for all patients 12 months postoperatively while Figure 2C splits the two groups to show the difference in distribution of SST scores between the psychologically normal and abnormal groups at 12 months postoperatively. At the final visit 18-24 months postoperatively, psychologically normal patients had higher SST scores than distressed patients by 5.420 points ( $p < 0.001$ , 95% CI(5.1-5.9), Table 3).

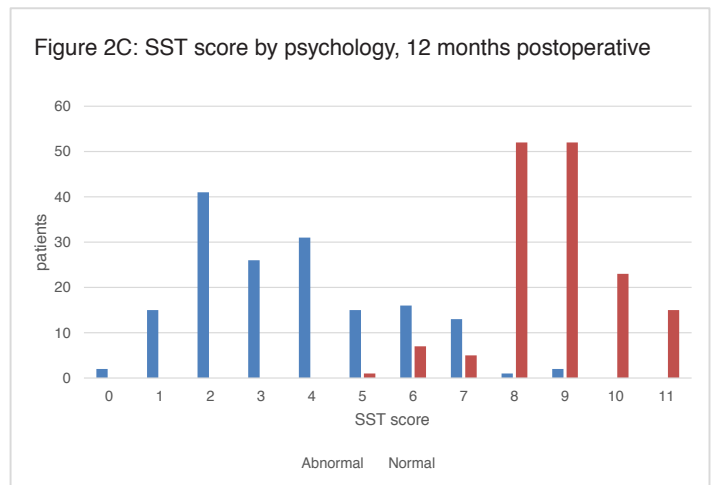
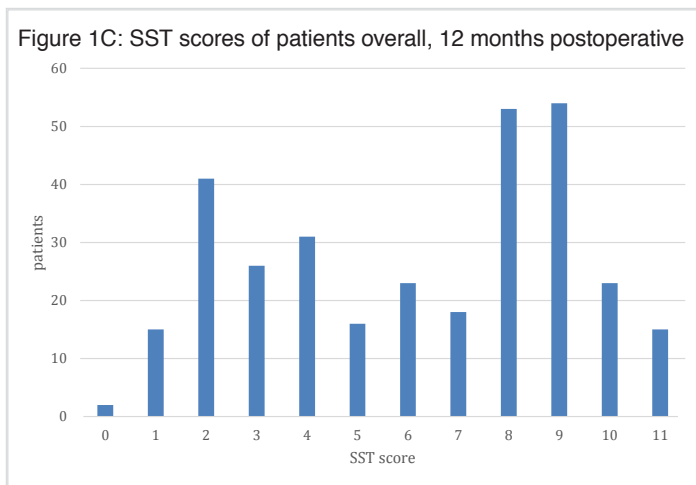
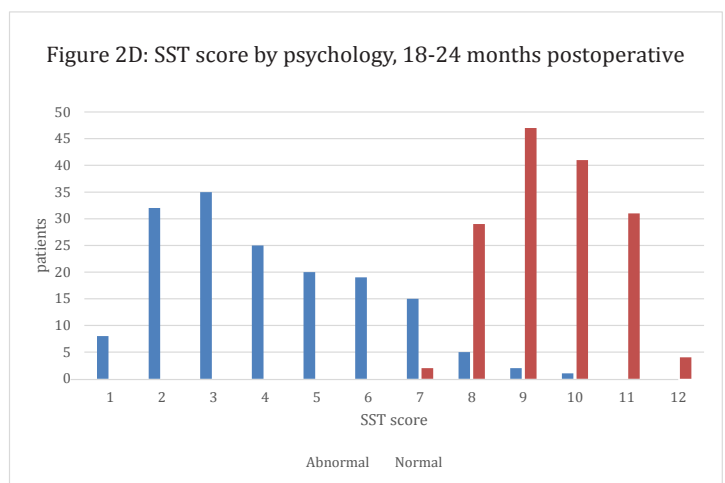
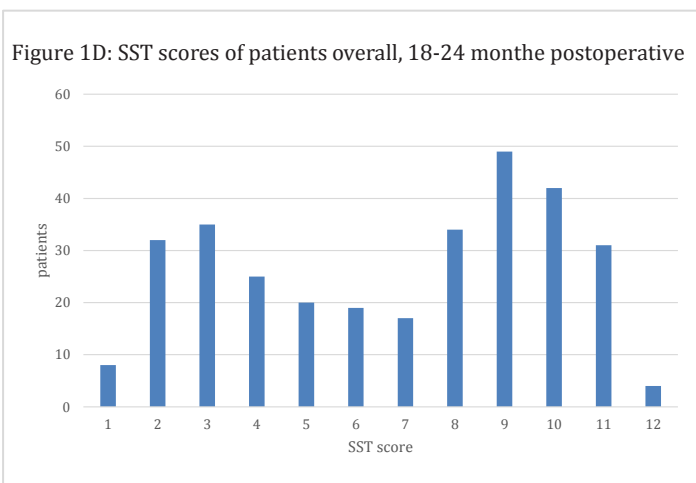


Figure 1D shows the distribution of SST scores for all patients 18-24 months postoperatively while Figure 2D splits the two groups to show the difference in distribution of SST scores between the psychologically normal and abnormal groups at 18-24 months postoperatively.



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## Psychological Distress is a Predictor of Poor Outcome Following Rotator Cuff Repair

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### DISCUSSION

Psychosocial factors influence patients' subjective assessment of pain and disability [30] and impact outcome in a variety of musculoskeletal ailments [3,5,7,11,25,26,27,28]. Psychological distress has also been known to correlate with poor self-assessment of shoulder function [4,22,23] although there has not yet been a study investigating the impact of psychological distress on postoperative rotator cuff repair outcomes. Our study aimed to investigate the correlation between psychological distress and poor patient self-assessment of shoulder function both before and after rotator cuff repair. We found that psychological status was a strong predictor of subjective assessment of shoulder function both before surgery and for up to two years after surgery.

The study has several limitations. First, our clinic is not a surgery center so we do not have access to specific information that may have influenced outcomes such as the size of each tear, the number of different surgeons utilized, surgical methods, or postoperative complications. Because these are acute methods and problems, their influence on a patient's function would be negated over the two years of tracking patients in the study. Therefore these limitations should not have jeopardized the study significantly. Second, we did not control for other variables known to influence rotator cuff repair outcomes such as smoking, body mass index, and insurance type. Third, there were 126 patients in the database who underwent rotator cuff repair surgery but did not answer all of the necessary postoperative SST questionnaires for the study and were excluded, thus potentially introducing selection bias. Fourth, only one functional assessment, the SST, was utilized in this study while previous studies have studied the effect of psychological distress on two or more shoulder outcome instruments. Nonetheless, the SST is a validated [8] and reliable [1] instrument for assessing patient perception of shoulder function. It is also brief and straightforward, thus placing almost no burden on the patient and it is convenient for use in a small private practice, making it ideal for our study setting. Given that our study took place in a busy physical medicine and rehabilitation practice it would have been time prohibitive to implement multiple patient derived outcome tools. Fifth, the DRAM is a self-administered questionnaire rather than a comprehensive psychological battery. This could have lead to misclassification of patients. However, comprehensive psychological testing is impractical in an outpatient physical medicine or orthopedic clinic and the Distress Risk and Assessment Method is a widely used instrument to assess psychological distress and its influence on physical functioning [3,14,22,28]. This validated screening tool does not overly burden the patient or clinician. Sixth, the DRAM was not repeated by patients at any of the follow-up appointments, therefore we cannot be sure whether any of the patients' psychological status changed over the course of the study. Herein lies the underlying question of causation; we cannot be sure if shoulder pathology causes psychological distress, or if a patient's psychological issues are the etiology of poor shoulder function following rotator cuff repair.

Our study endorsed the correlation between psychological distress and lower baseline (preoperative) scores on shoulder self-assessment in patients with full-thickness rotator cuff tears. In a cross-sectional cohort study of 107 patients with partial or full-thickness rotator cuff tears scheduled for repair, Cho et al [4] found

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that psychological distress such as depression and anxiety had a negative impact on preoperative pain, disability, and quality of life. Cho et al [4] did not separate patients into high and low distress groups, but rather, utilized the Hospital Anxiety and Depression Scale (HADS) scores as a continuous spectrum in a univariate analysis. It was found that high levels of anxiety correlated with inferior baseline scores on the American Shoulder and Elbow Surgeons scale (ASES), the Korean Shoulder Scale (KSS), and the WHO Quality of Life Scale (WHOQOL-BREF). High levels of depression were even more significantly correlated than anxiety with inferior scores on the ASES, KSS, and WHOQOL-BREF, in fact, depression was found to be an independent predictor of scores after controlling for five other confounding variables: sex, education, affected side, tear size, and retraction of the torn cuff. In another study, Potter et al [22] utilized the DRAM to categorize patients into two groups: normal and distressed, before they underwent arthroscopic rotator cuff repair for a full thickness tear. Clinical significant differences on the VAS pain scores, SST questionnaire scores, and ASES scores were found between the normal and distressed groups, indicating that psychological distress is associated with poor patient self-assessment of shoulder pain and function before surgery. Both Cho et al [4] and Potter et al [22] recommended a prospective longitudinal study to investigate the effect of psychological distress on postoperative outcome measurements. Not only does our study confirm the correlation between psychological distress and inferior preoperative shoulder scores, it also analyzes SST scores for up to 2 years postoperatively for each patient.

We found that there was a significant correlation between psychological distress and poor self-assessment of shoulder function that persisted for up to two years following rotator cuff repair surgery. This finding is not astonishing, as psychosocial factors have been shown to correlate outcome in a variety of musculoskeletal ailments [3,5,7,11,25,26,27,28] In a study of patients undergoing lumbar surgery, Trief et al [28] found that failure to return to work, failure to report improvement and pain, and failure to report improved functional abilities were all predicted by presurgical somatic anxiety and depression as assessed by the DRAM. In a study of patients with low back pain, Carragee et al [2] observed that patients in the distressed categories of the DRAM had significantly greater long-term disability, short-term work loss incidence, and use of medical resources than patients in the "Normal" and "At Risk" groups. In another study of patients with lower back problems undergoing experimental discography, Carragee et al [3] demonstrated that psychometric scores from the beginning of the study independently predicted future back pain, future medication usage, and work loss over the four year study. Hirschmann et al [11] studied a population undergoing total knee arthroplasty and concluded that depression, anxiety, a tendency to somatize, and psychological distress were significant predictors for poorer clinical outcomes before and/or after total knee arthroplasty. In another study of patients who underwent total knee arthroplasty, Urtillas-Compaired et al determined that patients with psychological distress, according to the Hospital Anxiety and Depression Scale, obtained significantly poorer outcomes in function one year after surgery, as assessed by the Knee Society Score. Because we found that psychological status affects rotator cuff repair outcomes, our study supports the findings of the above studies, which all indicate correlation between psychological status and orthopedic surgery outcomes.

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## Psychological Distress is a Predictor of Poor Outcome Following Rotator Cuff Repair

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### CONCLUSIONS

Greater psychological distress is associated with poor patient self-assessment of shoulder function both before and after rotator cuff repair surgery. Our results suggest that psychosocial screening of patients before rotator cuff repair should be instituted to help identify patients who are at risk for poor outcomes, thus allowing for intervention in effort to improve patients' shoulder function. Further research is warranted to evaluate whether presurgical psychological treatment to alleviate distress would improve functional outcome of rotator cuff repair. Aside from tracking shoulder function postoperatively, future studies could also assess changes in psychological distress secondary to preoperative intervention. This would provide insight to help determine the causal relationship behind the correlation of psychological distress and poor shoulder function, thus creating a true biopsychosocial model for enhanced treatment and recovery.

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### DECLARATIONS

#### List of abbreviations

DRAM- Distress Risk Assessment Method

SST- Simple Shoulder Test

#### Ethics approval and consent to participate

Due to the nature of our study, Psychological Distress is a Predictor of Poor Outcome Following Rotator Cuff Repair, we have decided not to seek IRB or ethical board approval. The only human data that was used in the study were patients' answers to questionnaires that they voluntarily completed. Therefore, we believe that this questionnaire study is exempt from IRB or ethical board approval.

#### Consent for publication

Not applicable.

#### Competing interests

The authors Scott Primack, Kaitlyn Brunworth, Andrew Hammes, and David Weitzenkamp declare that they have no competing interests.

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#### Authors' contributions

Scott Primack: Responsible for original conception of study and design, data collection at Colorado Rehabilitation and Occupational Medicine through Comprehensive Outcome Management Technologies database, supervision of drafting of the article, critical revision of the article, final approval of the article

Kaitlyn Brunworth: Responsible for reviewing previous literature related to the topic, organizing and interpreting data, drafting and writing the article, critical revision of the article, submission of final article.

Andrew Hammes: Responsible for statistical analysis of the data.

David Weitzenkamp: Responsible for the supervision and final approval of statistical analysis.

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Not Applicable.

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## Video: ME and HVLA Treatments For The Cervical Spine Cervicals Oa, Aa, Typical

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## Back to the Basics of Medicine

by John Lavelle, DO



As we witness frustration and confusion surrounding health care, both within the political realm and within our daily practice, I realize how essential it is for us physicians to start getting back to the basics of medicine. We have slowly been losing the art of medicine, the physician-patient relationship and the ability to truly examine and bond with our patients. We have become lost in a medical world of test results, algorithms and computers.

I recently saw a patient for a second opinion of his low back pain and right leg weakness. He had been seen by six (6) other healthcare professionals over the past year from primary care physicians, urgent care providers, a spine specialist and a chiropractor. As I reviewed the patient's prior medical records, I saw his most recent evaluation documented full strength in the bilateral lower extremities including bilateral great toe extension. I found this interesting since the patient had a prior right metatarsal-phalangeal amputation many years ago and had clear weakness with right ankle dorsiflexion. Also during the examination the patient commented that he has never had such a thorough examine before and had never been asked extensive history questions. The patient had been seen by six (6) other clinicians, had multiple lumbar spine radiographs, lumbar magnetic resonance imaging and a nerve conduction velocity/electromyography study but never a thorough history and physical exam.

What has happened to our health care system that we no longer use our minds to assess a patient's gestalt and obtain a detailed history or use our hands to passionately diagnose? Why is that so many office visits or hospital rounds are centered around the computer and what the lab data reveals? Who decided that the best way to treat a patient was to see how they best fit into a certain algorithm or clinical pathway?

As early as medical school, students are losing the personal connection. Many schools are conducting classes via live streaming and video recordings. There is no longer a close interaction between medical students spending hours together in the classroom and library, developing relationships and sharing knowledge. This continues into the clinical rotations as students learn examination skills on simulators and history taking skills with pretend patients instead of being exposed to hospitals and speaking with actual patients with feelings and concerns. Furthermore, as new physicians begin practice, they are pushed to rapidly increase their collections and pressured to meet specific quality guidelines, instead of investing time on developing relationships with patients, colleagues and the community. Health care is moving away from patient care and becoming more focused on data points and diagnostic tests.

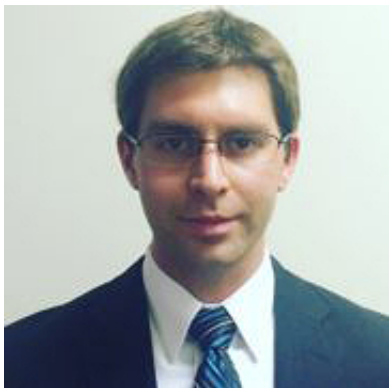
Too much of the advancement of medicine and the delivery of health care has moved the focus of physician's care away from the patient. Hippocrates, the father of medicine, believed *"it is far more important to know what person the disease has than what disease the person has."* Similarly, Dr. A.T. Still, the founder of osteopathic medicine, believed in making the patient the center of treatment. By taking the time to learn and know the patient, not just their complaint, and using his hands to diagnose and treat, Dr. Still's focus was to help patients maintain health. Josef Auenbrugger who founded percussion and Wilhelm Erb who popularized the muscle stretch reflex are examples of physicians who utilized their minds and hands to develop a personal connection with patients to more accurately diagnose and care for them.

It is time we look back to our early physicians and make sure we maintain a strong foundation in the basics of medicine as we move forward with new innovations. We should always strive to improve patient care, but remember to not lose sight of the patient.



## Guardians of Hope

by Adam Lewno, DO



**THE WHITE COAT.** To society it is a symbol of our profession and it is a badge of honor among those who don it. When we were medical students our short white coats would often be seen with pockets bulging with every medical device and book we could get our hands on. They became a ten-pound medical Swiss army knife ready for any and every medical emergency but often it was just a resource for the sleepy-eyed intern looking for the latest labs or an otoscope.

As interns, our jackets became longer and we stood quite proudly in them on our first day. Sadly, we were misled; the extra length was needed to accommodate the 2-3 demanding pagers we carried while our pockets slowly filled with list after list of patients and the occasional misplaced snack, of course. As PGY2s, our white coats no longer were impromptu pillows as we began our foray into the world of rehabilitation medicine. We were filled with knowledge about our patients, social histories, clock drawings and a memento from the patient in room 3.

Reflecting our growing knowledge of function as PGY3s, our white coats were the epitome of functional use. Safety pins festooned the button holes, cotton swabs in our left pocket, an Allen wrench for pesky headrests and there in our right pocket, the sword of all physiatrists... a fancy and functional reflex hammer. As PGY4s, we were often seen without our white coat which seemed to have been misplaced while we were on call. In the rare times we do don our white coat, an occasional safety pin and our favorite pen would be found next to our ever-present reflex hammer. Despite how few things now hide within our pockets, as PGY4s our white coats seem even heavier as the weight of patient responsibility and our approaching graduation replaced the latest journals and the empty ASIA charts. Somewhere over the course of the last four years and among countless patient stories, our white coats have become something more than just a badge of honor; they are our capes as guardians of hope.

Our white coat is our suit of armor -- the symbol of empathy and comfort in a world of fear, pain and illness that pervades a hospital. Yet we are not a symbol. Under our white coats lie our own hopes and dreams tinged with hidden fears veiled to those around us. The recent fight with our parents about not coming home for the holidays, the frustration we bear from our significant other as we work late again, the near collision in the parking lot after night float and even the weight of last words uttered by the gentleman in room 3, are the lessons we learn that were never contained in our medical school curriculum. They are the lessons etched into our hearts that often force us to take a deep breath before entering the next patient's room. They are the lessons that we keep hidden within ourselves and are seen and echoed in the eyes of the physicians around us.

We may be guardians of hope; we are also mothers, fathers, sons, daughters, brothers, sisters and even lovers. This message is not for everyone. Instead this is a message for those who feel crushed by the weight of their white coat and I hope it serves as a reminder that you are not alone. Our white coat is not just a symbol of hope; it is a connection to all who wear it.



## The Value of Mentorship

By Mathew Cowling



There are times when medicine becomes grueling on all of us. Sometimes it happens during the first two years of medical school while we grind away at the books, other times it is on the ward as we learn the ropes during third year and then there are times in fourth year on those late night flights and long interviews that feel never-ending. There is nothing I have found to be more helpful in times of need than having a mentor by my side. Since I can remember, I have looked up to those who have achieved the same goals that I strive for. A mentor has encountered similar struggles and succeeded and is willing to lend a helping hand to those that come after.

My first mentor was my high school football coach. He would stay after practice and load weights on the bar that I didn't think I would ever lift. He made me believe in myself and I eventually lifted those weights with ease.

It was because of his guidance and support that I was able to achieve a college football scholarship. I applied the same concepts to my schoolwork and quickly found success in my academics as well. When I joined AOCPMR, I was greeted by several residents who were willing to help me along in my journey and mentor me. One of my mentors was kind enough to let me stay at his apartment during my interview days and give me a tour around the city to make me feel as comfortable as possible all the while sharing his experiences with me as I prepared for my own PMR interviews. This is mentorship at its finest.

Improving our Mentorship Program has been one of the main goals of the AOCPMR Student Council this past year and we have made great progress. I strongly believe that mentorship is one of our most valuable tools, one where we can pass along our triumphs and our failures and impact the future of our student members. As I prepare to graduate from medical school and move into residency, my hope is to be as great to those that come after me as the mentors that have come before me.

Sincerely,  
Mathew Cowling  
AOCPMR Student Council President 2017



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