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Association Between Patient Ability in Activities of Daily Living at Hospital Admission and Key Indicators

Stephanie Rosen

University of Nevada, Las Vegas

Amber Steele

University of Nevada, Las Vegas

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ASSOCIATION BETWEEN PATIENT ABILITY IN ACTIVITIES OF DAILY LIVING AT
HOSPITAL ADMISSION AND KEY INDICATORS

By

Stephanie Rosen

Amber Steele

A doctoral project submitted in partial fulfillment
of the requirements for the

Doctor of Physical Therapy

Department of Physical Therapy
School of Integrated Health Sciences
Graduate College

University of Nevada, Las Vegas
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This doctoral project prepared by

Stephanie Rosen

Amber Steele

entitled

Association Between Patient Ability in Activities of Daily Living at Hospital Admission
and Key Indicators

is approved in partial fulfillment of the requirements for the degree of

Doctor of Physical Therapy
Department of Physical Therapy

Daniel Young, Ph.D.
Research Project Coordinator

Kathryn Hausbeck Korgan, Ph.D.
Graduate College Dean

Merrill Landers, Ph.D.
Research Project Advisor

Merrill Landers, Ph.D.
Chair, Department of Physical Therapy

Abstract

Background: Illness and inactivity in the hospital frequently leads to disability that can reduce quality of life and increase costs. Early identification of people with limitations in activities of daily living (ADL) who are at risk for poor outcomes such as increased length of stay (LOS), hospital acquired conditions (i.e., falls and pressure injuries (PIs)), and discharge away from home can facilitate appropriate intervention. The Activity Measure for Post-Acute Care Inpatient Activity Short Form (AM-PAC IASF), a reliable and valid tool to measure ADL limitations, is scored at admission for all patients in our hospital. The purpose of this study was to determine the relationship between admission AM-PAC IASF and LOS, hospital acquired conditions (i.e., falls and PIs), and discharge disposition.

Design: Retrospective cohort study of 1899 consecutive patients.

Setting: Large academic hospital.

Materials/Methods: In this retrospective cohort study, we gathered data from the electronic medical records of patients at The John Hopkins Hospital. The AM-PAC IASF scale score (higher is better), scored within 48 hours of hospital admission, was the independent variable in multivariate regression models for each of the four dependent variables: LOS, hospital acquired conditions (i.e., falls and PIs), and discharge to facility. Models were also adjusted by patient demographic variables including gender, race, and payor.

Results: Our sample included 1039 males and 860 females with a mean age of 54 years (range of 16-95 years). The odds of a patient being in the highest quartile (≥ 8 days) for LOS was 1.91 ($p < 0.001$) times higher for every 10-point decrease in AM-PAC

IASF. For every 10-point decrease in AM-PAC IASF the odds of having an injurious fall was 1.66 ($p < 0.001$) times higher. The odds of acquiring a PI during hospitalization were 2.72 ($p < 0.001$) times higher for every 10-point decrease in AM-PAC IASF. Finally, for every 10-point decrease in AM-PAC IASF the odds were 3.02 ($p < 0.001$) times higher for patients to be discharged to a facility instead of home.

Conclusions: Lower ability in ADL's at hospital admission was significantly associated with poor outcomes.

Clinical Relevance: Early AM-PAC IASF scores could be used by providers to identify at risk patients and design treatment plans to mitigate those risks including early planning for discharge. This study supports using the AM-PAC IASF to aid the health care team in making evidence-based decisions about patient's care.

Acknowledgements

This work would not be possible without the contributions from the following individuals: Annette Lavezza for her knowledge of occupational therapy. Kelly Daley for data collection. Lisa Friedman and Elizabeth Colantuoni for statistical analysis. Jason Seltzer for chart review and data validation. Erik Hoyer for overall direction of the work. Most importantly, we would like to thank Daniel Young for mentoring this project as he has provided us with the resources to complete this paper and has directed the work.

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Introduction

In 2012 there were approximately 36.5 million hospital stays in the United States with an average cost of \$10,400 each.^{1,2} In the United States, most hospital care is paid by insurance in a bundled model based on patient diagnosis; a fixed amount regardless of length of stay (LOS) or the specific services that are provided.³ Identifying modifiable risk factors that drive up costs through hospital acquired conditions, increased LOS or post-acute care needs can help providers prioritize their care and aid in discharge planning.

In the United States hospitals are financially encouraged by Medicare to reduce hospital acquired conditions (HAC), such as falls and Pressure injuries (PIs).^{4,5} As part of their HAC Reduction Program, the Centers for Medicare and Medicaid Services (CMS) cuts all payments by 1% to hospitals ranking in the bottom 25% on HAC quality measures such as stage III and IV PIs and falls.^{6,7} In addition to overall payment reductions, the CMS no longer reimburses hospitals for treatment of HAC falls and HAC PIs.⁸ Patient falls, injurious or not, and hospital acquired PIs are considered largely preventable, but early risk identification for appropriate prevention efforts remains difficult.^{8,10,11} Although determining fall risk is multifactorial and complex there is a relationship between a patient's level of function in daily activities and their fall risk.¹² In one study, lower ADL performance was associated with higher risk of future falls in non-handicapped community dwelling adults.¹² In addition to this when patients are ill in the hospital, their bed mobility is strongly associated with hospital acquired PIs.^{13,14}

Once patients are discharged from the hospital they may return home or they may need placement in a post-acute facility for short or long-term help with medical or rehabilitation needs.¹⁵ Discharge planning involves coordination with patients and their families, health care workers (physical therapists, nurses, physicians, occupational therapists, etc.), social workers, case managers, and the receiving facility.¹⁶ Knowing about potential post-acute care needs early in hospitalization can allow health care providers to recognize need for, and begin coordinating services earlier.¹⁷ In addition, early discharge planning has been linked to improved patient outcomes following discharge.¹⁷

Having a standard measure of function, systematically collected during hospitalization, has the potential to enhance communication with patients and inform the plan of care for providers such as occupational therapists.^{18,19} The Activity Measure for Post-Acute Care Inpatient Activity Short Form (AM-PAC IASF) or '6-clicks' is a reliable and valid measure among patients' in the acute hospital, which quantifies a patient's ability to perform daily activities such as dressing and toileting.^{20,21} Previous research has revealed a relationship between the AM-PAC mobility score and discharge disposition and a similar relationship seems likely for the activity score.²² Therefore, the purpose of this study was to investigate the association between the AM-PAC IASF and LOS, discharge disposition, inpatient falls, and hospital acquired PIs.

Methods

Study Population and Setting

This retrospective cohort study was conducted using electronic medical record (EMR) data from patients that were discharged from The Johns Hopkins Hospital between January 1, 2015 and December 31, 2015. The 1899 patients included in this study were from two 32-bed acute care units. These patients had various diagnoses including but not limited to medical, neurosurgical, stroke, and general neurology. The Johns Hopkins Institutional Review Board (IRB) approved this study with a waiver of consent.

Data Source and Variables

The patient's age, gender, race/ethnicity, comorbidity index, payer, LOS, and discharge disposition were acquired from the EMR. The AM-PAC IASF scores are collected by nurses upon admission and three times each week throughout a patient's hospitalization.^{23,24} Occurrence of injurious falls and PIs are recorded in the patients' medical records according to the National Database of Nursing Quality Indicators (NDNQI) criteria. Falls were included in this study if they occurred during hospitalization and these data were specifically obtained through the patient safety event reporting system. PIs were included in this study if they were acquired during hospitalization and were Stage III or IV. Expected LOS was used as a covariate in models and is a calculated variable based on patients with a similar profile of clinical characteristics such as demographics, functional status, prognosis, clinical conditions, clinical treatments and clinical diagnoses.²⁵

Primary Exposures

The AM-PAC was originally developed as a computer adaptive test (CAT) containing 88 items in the daily activity domain.²⁶ The CAT employs a computer algorithm to choose from among the 88 items based upon patient response to a midpoint starter question.²⁷ Researchers have since created short form versions consisting of a small number of pre-selected items for specific populations.^{28,29} The AM-PAC IASF or '6-clicks' is one of these short forms with 6 questions, each scored on a 4 point ordinal scale designed for the hospital population.²⁰ Raw scores from both the short forms and the CAT can be converted to a standardized scale score allowing them to be compared to each other on a 0-100 scale.²⁷ AM-PAC IASF questions are scored based on how much assistance the patient requires from another person to perform a task (e.g. how much help from another person do they need to get dressed).^{20,21} For our analysis we used the standardized scale-scores. The AM-PAC IASF has high interrater reliability (ICC = 0.91) and evidence for its validity among patients with a variety of medical conditions in the acute care setting.^{28,30}

Statistical Analysis

Independent 2-tailed t-tests were used to compare the difference in AM-PAC IASF scores between groups within each outcome variable. Logistic regression was used to quantify the relationship between the independent variable, lowest AM-PAC IASF score within 48 hours of hospital admission, and the dependent or outcome variables (falls, PIs, LOS, and discharge disposition). The AM-PAC IASF was modeled in 10-point increments which is one standard deviation (SD) of the population score. Firth logistic regression was used when modeling falls and PIs to improve confidence in the estimates for these rare events.

Results

Study Population

There were 1899 patients with an AM-PAC IASF score acquired during the study period for analysis. The sample was composed of 54% males, 64% Caucasians, and 21% Blacks. Patients had insurance from Medicaid (11%), Medicare (32%), Private payor (30%) and other (27%). Table 1 summarizes the patient demographics by primary variables (PI, falls, disposition, LOS).

Table 1: Patient Sample Demographics by Primary Variables

| | Pressure Injuries | | Falls | | Discharge | | Length of Stay* | |
|--------------|-------------------|----------------|---------------|----------------|------------------|-----------------|-------------------|-----------------|
| | Yes (N=10) | No (N=1889) | Yes (N=50) | No (N=1849) | Home (N=1352) | PAC* (N=547) | Short (N=1114) | Long (N=785) |
| Sex | | | | | | | | |
| Male | 4 (0.4) | 1035 (0.6) | 25 (0.5) | 1014 (0.6) | 754 (0.6) | 285 (0.5) | 499 (0.5) | 361 (0.5) |
| Race | | | | | | | | |
| Black | 1 (0.1) | 411 (0.2) | 12 (0.2) | 400 (0.2) | 267 (0.2) | 145 (0.3) | 228 (0.2) | 184 (0.2) |
| Caucasian | 6 (0.6) | 1214 (0.6) | 29 (0.6) | 1191 (0.6) | 901 (0.7) | 319 (0.6) | 744 (0.7) | 476 (0.6) |
| Other | 3 (0.3) | 264 (0.1) | 9 (0.2) | 258 (0.1) | 184 (0.1) | 83 (0.2) | 142 (0.1) | 125 (0.2) |
| Payor | | | | | | | | |
| Medicaid | 0 (0.0) | 223 (0.1) | 5 (0.1) | 218 (0.1) | 152 (0.1) | 71 (0.1) | 121 (0.1) | 102 (0.1) |
| Medicare | 4 (0.4) | 612 (0.3) | 17 (0.3) | 599 (0.3) | 346 (0.3) | 270 (0.5) | 319 (0.3) | 297 (0.4) |
| Private | 3 (0.3) | 582 (0.3) | 21 (0.4) | 834 (0.5) | 691 (0.5) | 164 (0.3) | 560 (0.5) | 295 (0.4) |
| Other | 3 (0.3) | 202 (0.1) | 7 (0.1) | 198 (0.1) | 163 (0.1) | 42 (0.1) | 114 (0.1) | 91 (0.1) |

All values presented as n (%).

*PAC = Post-acute Care

*Length of stay separated into short and long based on the upper 50th percentile and lower 50th percentiles of this sample study.

Length of Stay

The mean LOS was 7.0 days with a standard deviation of 7.5. The odds of a patient with an AM-PAC IASF score that went down during hospitalization being in the highest quartile (≥ 8 days) for LOS were 1.91 (95% CI, 1.72-2.13, $p < 0.001$) times higher than for those that maintained or improved their score.

Hospital Acquired Conditions

We observed a statistically significant difference in mean admission AM-PAC IASF scores between fallers (mean=33, SD=8.7) and non-fallers (mean=39, SD=11, $p=0.000$) and those who acquired a PI (mean=27, SD=9.2) and those that did not (mean=39, SD=11, $p=0.000$), see Table 2.

For every 10-point decrease on AM-PAC IASF the odds of having an injurious fall went up by 1.66 (95% Confidence Interval [CI], 1.28-2.18, $p<0.001$) times. The odds of acquiring a PI during hospitalization were 2.72 (95% CI, 1.50-5.29, $p<0.001$) times higher for every 10-point decrease in AM-PAC IASF. The area under the curve (AUC) in the adjusted model for falls was 0.73 and for PI was 0.91.

Discharge to Post-Acute Care

There was a statistically significant difference in the mean AM-PAC IASF score between those who were discharged home (mean=42, SD=10) compared to those who went to post-acute care (mean=33, SD=9.8, $p=0.000$), see Table 2. For those with an AM-PAC IASF score that went down during hospitalization the odds of discharge to post-acute care were 3.02 (95% CI, 2.18-4.20, $p<0.001$) times higher compared to those who were able to maintain or improve their AM-PAC IASF scores.

Table 2: *Mean AM-PAC Activity scores by variable*

| Primary Variables | AM-PAC |
|--------------------------|---------------|
| PI | |
| Yes (N=10) | 27.14 (9.19) |
| No (N=1889) | 39.12 (10.80) |
| Falls | |
| Yes (N=50) | 33.11 (8.73) |
| No (N=1849) | 39.21 (10.83) |

| Discharge Disposition | |
|------------------------------|---------------|
| Home (N=1352) | 41.67 (10.10) |
| To Facility (N=547) | 32.58 (9.82) |
| LOS | |
| Low (N=1114) | 41.57 (9.70) |
| High (N=785) | 35.48 (11.33) |

All values presented as mean (standard deviation)

Table 3: Odds ratio by variable and AM-PAC score

| Variable | Odds Ratio |
|-----------------|-------------------|
| PI | 2.72 |
| Falls | 1.66 |
| Discharge* | 3.02 |
| LOS* | 1.91 |

Odds of poor outcome compared to good outcome for those with decreasing AM-PAC IASF scores

*Discharge to post-acute care

*Being in highest quartile LOS

Discussion

In this retrospective study, we found that patient ability in activities of daily living at hospital admission was significantly associated with LOS, hospital-acquired conditions (falls and PIs), and discharge disposition. Specifically, we found that patients who have a lower function in ADL ability (toileting, bathing, grooming, etc.) upon hospital admission exhibited a longer LOS, increased risk of hospital-acquired conditions, and were more likely to discharge to a post-acute facility instead of going home.

There is limited research published on the relationship between ADL ability and PI, falls, LOS or post-acute care need. Some research shows that there is a relationship in non-handicapped community dwelling adult's performance of ADL's and their risk of future falls.¹² Our results were similar showing that there are greater odds that someone with a decreasing AM-PAC IASF score (lower ADL function) will fall. There continues to be debate about how to best assess someone's risk of falling¹¹ and ADL ability may be an important variable to consider.

Since dependency of one or more activities of daily living may be present upon admission or develop during a hospital stay in older adults, it is important that patient's activity level is measured early and regularly for possible intervention and care planning.³² We found that patients with a declining AM-PAC IASF score had higher odds of being discharged to a facility rather than home. Early and ongoing scoring of the AM-PAC IASF may aid in the decision making and recommendations of occupational therapists for discharge disposition. Additionally, early discharge planning with occupational therapist involvement may even reduce patients overall LOS.¹⁷

One limitation to this study is that the sample was collected from two units within an urban academic medical center. While our patients did have diverse medical conditions, future research should consider other hospitals and patient populations. Additionally, there were few PI's and falls in our sample. Therefore, the relationship between ADL function and these two rare outcomes needs additional investigation. Finally, this retrospective, observational study indicates important and real associations between the AM-PAC IASF and the outcome variables but, does not allow for prediction or establish cause and effect. Despite these limitations, our robust associations are likely to be present in other populations and larger samples.

Decreased activity while in the hospital increases the negative risk for LOS, discharge disposition, inpatient falls, and hospital acquired PIs. Our study shows that one's ability to perform ADLs upon admission to the hospital can predict risk for key outcomes. Therefore, incorporating a systematic ADL measure such as the AM-PAC IASF into routine care can inform the healthcare team and may be beneficial in providing efficient patient care.

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Curriculum Vitae

Stephanie Rosen, SPT
Stephanie.rosen17@gmail.com

Education

| | | |
|-----|--|---------------------------------------|
| DPT | University of Nevada, Las Vegas – 2017 – anticipated May 2020 | Las Vegas, Nevada Physical Therapy |
| BS | University of Nevada, Las Vegas – 2012-2017 | Las Vegas, Nevada Kinesiology |

Certifications

- CITI Certification (Expiration March 2021)
- CPR and AED certified (Expiration April 2020)
- STEADI Exercise Program— Training Certification (February 2019)
- OTAGO Exercise Program: Falls Prevention Training Certification (February 2019)
- Blood-borne Pathogens Training Certified (September 2017)
- HIPAA Training Certified (September 2017)

Employment / Clinical Experience

| | |
|-----------------------------------|---|
| June 2018 – August 2018 | Student Physical Therapist — Leavitt Physical Therapy, 3037 West Horizon Ridge Parkway, #120, Henderson, NV 89052 |
| July 2019 – September 2019 | Student Physical Therapist — Summerlin Hospital, 657 North Town Center Drive, Las Vegas, NV 89144 |
| September 2019 – December 2019 | Student Physical Therapist — St. Rose Dominican Hospital- Siena Campus, 3001 St. Rose Parkway, Henderson, NV 89052 |
| January 2020 – March 2020 | Student Physical Therapist —Encompass Health, 10301 Jeffreys Street, Henderson, NV 89052 |

Current Research Activity

- **Rosen S, Steele A, Young D.** Association between Patient Ability in Activities of Daily Living at Hospital Admission and Key Indicators (January 2018 to present)
 - CSM 2020: Poster presentation

Membership in Professional Organizations

- Member American Physical Therapy Association (2017 to present) Member #: 795468
- Member Nevada Physical Therapy Association (2017 to present)
- Member Research Section of the American Physical Therapy Association (2018 to present)

Service

- **Professional**
 - UNLV PT interview volunteer (1/26/18, 2/1/18, 2/8/18), 20 hours
 - Dancing with Parkinsons (7/5/18-present), 10 hours
 - Nurse Practitioner Inter Professional discussion on the Basics of Joint Assessment (8/18/18), 4 hours
 - Rock Steady Boxing (2/16/19), 1.5 hours
 - Orthotic and Prosthetic Activities Foundation (8/24/19), 7 hours
 - UNLV Athletic Training Room (2/21/19), 6 hours
- **Community**
 - Volunteer: Magical Forest at Opportunity Village (11/12/16, 11/16/17, 12/16/18), 10 hours
 - Volunteer: Muscular Dystrophy Walk (9/2017), 2 hours
 - Volunteer: LKD mock interviewer (11/9/17)—1 hour
 - Volunteer: American Heart Association— Heart walk (9/2018), 1 hour
 - Volunteer: Parkinson’s Foundation— Moving Day (10/2018), 7 hours
 - Volunteer: Parkinson’s Foundation— Moving Day (9/2019), 7 hours

Continuing Education Attended (last 2 years)

- NPTA Meetings:
 - Nevada Physical Therapy Association: Brain injury 101. (9/2017)— 1 hour.
 - Nevada Physical Therapy Association: Engaging other members of the health care team to facilitate patient mobility in the hospital. (8/2018)- 1 hour.
- Distinguished Lecture Series:
 - “APTA: Pursuing our Transformative Vision”. (10/2017)— 1.5 hours.
 - “Disruption and Opportunity in Health Delivery: Go Hard or Go Home”. (10/2017)— 2.5 hours.
 - “Footwear Matters: Lets Think Differently about the Foot”. (11/2018)— 1.5 hours.
 - “Solving Running Injuries: Well Aligned, Soft Landings”. (11/2018)—2.5 hours.
 - “Implementation: Finishing the Job of Evidence Based Practice”. (9/2019)—1.5 hours.
- Combined Sections Meeting (1/24/19-1/26/19)
- Combined Sections Meeting (2/13/20-2/15/20)

Amber Steele, SPT, CSCS
ambersteele1@aol.com

Education

Doctorate of Physical Therapy (in progress)

University of Nevada, Las Vegas, 2017-present, expected graduation May 2020

- Dean's List all semesters

Bachelor of Science, Kinesiology

University of Nevada, Las Vegas, 2014-2016

- Graduated Cum Laude
- Dean's List all semesters

Certifications

- Emergency Medical Responder for the Athlete (ERA) Certified, 2018-2021
- BLS CPR Certification, 2018-2020
- Certified Strength and Conditioning Specialist (CSCS), 2019
- STEADI Exercise Program – Training Certification, 2019
- OTAGO Exercise Program – Falls Prevention Training Certification, 2019
- CITI Training, 2018
- HIPAA Certification, 2017
- Blood Borne Pathogen Certification, 2017

Clinical Rotations

- *Vanderbilt Stallworth Rehabilitation Hospital – Nashville, TN, Jan 2020-March 2020 (10 weeks)*
 - Inpatient rehabilitation hospital treating patients on the traumatic brain injury team with a patient population ranging from 21-87 years old and including but not limited to TBI, post-stroke, spinal cord injury and multi-trauma diagnoses.
 - Provided the therapy staff with a chart explaining how to use the Bioness BITS system and specific information it provides regarding patient outcomes and assessment for my in-service.
- *Physiotherapy Associates – Atlanta, GA, Sep 2019-Dec 2019 (10.5 weeks)*
 - Outpatient orthopedic therapy clinic with a patient population ranging from 19-85 years old, providing aquatic therapy when indicated.
 - Presented an in-service on balance protocols and how to implement them into evaluation and treatment planning in an outpatient setting.
- *Sunrise Hospital and Medical Center – Las Vegas, NV, June 2019-Sep 2019 (11 weeks)*
 - Acute care setting treating patients primarily in the Emergency Room and on the Advanced Wound Care Team.
 - Presented an in-service on Locked-In Syndrome and how Acute Care PT can impact that population following an experience with this diagnosis while on this rotation.
- *FIT Physical Therapy – Overton, NV, June 2018-Aug 2018 (6 weeks)*

- Outpatient therapy clinic treating patients ranging from 11-90 years old with orthopedic and neurologic diagnoses in rural Nevada.
- Presented an in-service on Pain Neuroscience/how to treat chronic pain.

Employment

- Sworkit Trainer - Sworkit Fitness & Workout App, Oct 2019-present
- Substitute Teacher - Kern County School District, Jan-May 2017

Membership in Professional Organizations

- *National Strength and Conditioning Association* # 001066705, 2019-present
- *American Physical Therapy Association* # 794378, 2017-present
 - Nevada Chapter and Sports Section

Service/Experience

Professional (Total hours: 28)

- UNLV Athletic Training Room (2/2019-3/2019), 5 hours
- UNLVPT Interview Days (1/19/2018, 1/26/2018 and 2/08/2019), 12 hours
- Nevada Parkinson's Movement Day (10/20/2018), 4 hours
- Synergy Physical Therapy New Clinic Opening (4/7/2018), 5 hours
- Health Fair at Saint Rose Hospital (12/15/2017), 2 hours

Community (Total hours: 314)

- Children's Ministry – Remnant Ministries (6/2018 – 5/2019), 110 hours
- Las Vegas Rescue Mission (10/18/2018 and 10/23/2018), 4 hours
- High School Volleyball Conditioning – Bakersfield, CA (6-7/2013), 200 hours

Research

- Co-investigator: "*Association between Patient Ability in Activities of Daily Living at Hospital Admission and Key Indicators*" Young, D. PT, DPT, PhD, Rosen, S. SPT, Steele, A. SPT, CSCS (1/2018– present)

Continuing Education

- UNLV Multidisciplinary Sports Didactic:
 - 3/30/2020: Jessica Albanese, M.D. "Approaching Hip Pain in the Athlete"
 - 9/16/2019: Daniel Diaz, D.O. "Calcific Tendinopathy" and Journal Club
 - 9/9/2019: Daniel Diaz, D.O. "Iliopsoas Syndrome"
 - 11/19/2018: Glenn Barnes D.O. "Nutrition for the Athlete"
 - 10/29/2018: Tyler Kent, M.D. "Diagnosis and Treatment of MCL Injuries"
 - 10/8/2018: Wade Gaal, M.D., CAQSM, UNLV Sports Medicine "Radiology Rounds"
 - 9/24/2018: Dr. David Holmes DC, CSCS, DACBSP "Principles of Functional Soft Tissue Examination"
- American Academy of Sports Physical Therapy Team Concept Conference: 2018 "Here It's Not a Game" (11/29/2018-12/1/2018)
- Combined Sections Meeting 2018 (2/22/2018-2/24/2018)