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PRESSURE INJURY ASSESSMENT COMPARISON:

BEDSIDE NURSE VS. EXPERTS

By

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A doctoral project submitted in partial fulfillment

of the requirement for the

Doctorate of Physical Therapy

Department of Physical Therapy

School of Allied Health Sciences Division of Health Sciences

The Graduate College

University of Nevada, Las Vegas

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THE GRADUATE COLLEGE

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Ali'itasi Kelemete, Brandi Hillock, and Casey Snell

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ABSTRACT

Background and Purpose: The National Pressure Ulcer Advisory Panel (NPUAP) defines a pressure injury (PI) as, “A localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear.” PIs affect millions of people each year creating a substantial financial burden. Medicare has created policies for reimbursement and reporting of PIs making it financially important for hospitals to correctly assess PIs upon admission. A basic skin assessment to categorize PIs has not been standardized among facilities, resulting in inaccuracies, poor documentation, and gaps in the reporting and quality of preventative care. Therefore, the purpose of this study was to compare the accuracy of standard bedside clinical PI assessment to expert assessment of the same patients using photographs and clinical history.

Subjects: All patients with a PI at a 500 bed acute hospital on one day. Sixty-three patients were included with a range of 1-7 PIs on each patient.

Methods: A point prevalence count of PIs was conducted by bedside nurses and documented. Four wound care experts also reviewed the wound documentation and photo documentation for these same patients to independently classify the skin injuries as PI or not and further to stage the PI. The bedside nurse data was then compared with the experts data.

Results: Bedside nurses identified 105 PIs and experts identified 96 PIs. Kappa analysis was used to determine the amount of agreement between the two groups regarding the staging of PIs as well as classification of the PI as present on admission or hospital acquired. A 64% disagreement was found between the two groups for present on admission status ($K=0.364$, $p<0.000$). A 54% disagreement was found between the two groups regarding staging of PIs ($K= 0.460$, $p>0.000$).

Discussion: Results of this study suggest there is a discrepancy in the identification, staging and determination present on admission status of PIs between bedside nurses and

wound care experts. The likely explanation for these findings is a lack of experience or expertise by the bedside nurse in PI assessment. While these findings suggest that there is decreased accuracy in PI assessment by bedside nurses, further research is warranted to determine the cause of this discrepancy.

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INTRODUCTION

The National Pressure Ulcer Advisory Panel (NPUAP) defines a pressure injury (PI) as, "A localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear."[1] PIs affect 1 to 2.5 million people each year, at an estimated cost of $11 billion.[2–5] In the United States, the cost of care for each PI is between $500 and $70,000 depending on the individual circumstances.[6] It is also noteworthy that the Department of Health and Human Services' Agency for Healthcare Research and Quality (AHRQ) compared the average hospitalization to that of a PI-related stay. They found that the PI-related stay increased the cost by $6,755-$10,430 and increased the length of stay by 8-11 days.[7] While all confounding causes associated with PI occurrence have yet to be elucidated, most are preventable.[8] Prevention, accurate assessment, and treatment of PIs are therefore essential in the healthcare system.

Important issues of morbidity and mortality can be attributed to PIs. Sepsis is one of the most serious complications leading to PI morbidity. It has been shown that for every 10,000 hospital discharges there are 3.5 cases of PI-associated sepsis.[9] Among cases of sepsis for which PIs were the known source, 60% of the patients died in the hospital.[9] Among hospital patients with a secondary diagnosis of PI, 11.6% of the hospitalizations ended in death, compared with only 2.6% mortality for all other hospitalizations.[9] Finally, the number of patients that die after having a hospital-acquired PI within 1 year is 59% compared to 38% for patients without a PI.[10] Taken together, these data indicate that 60,000 people die from complications related to PIs each year.[7]

Correct assessment of a PI involves distinguishing these lesions from other wound types, and then assigning them to one of four stages or two categories, as defined by the NPUAP.[11,12] Stage 1 is defined as a PI with non-blanchable skin redness. Stage 2 features a partial loss in thickness of the dermis. Stage 3 is a loss of the full thickness of the skin without

exposure of bone, tendon, or muscle. Stage 4 mirrors Stage 3 with the addition of exposed bone, tendon, or muscle. In addition to these stages, there are two categories to describe other presentations of tissue injury resulting from pressure. “Deep tissue injury” (DTI) is used to define underlying tissue damage without a current loss of the overlying skin, as evidenced by changes in color, temperature, or firmness. “Unstageable” is the term used to describe a wound covered with necrotic tissue that obscures the deepest layer of involved tissue.[11,12]

Identification of the correct stage for a PI is important when making treatment decisions, but it also has major implications regarding health care costs, especially considering the advanced age of the majority of sufferers.[13,14] Medicare has become the largest payer for the care of individuals with PIs. Accordingly, the Center for Medicare/Medicaid Services (CMS) have created reimbursement and reporting policies for facilities that care for people with PI.[15–19] In addition, changes have been made to Medicare’s reimbursement policy regarding the care of PIs. In an acute rehabilitation hospital, Medicare will reduce reimbursement if the facility does not report PIs that are a facility-acquired condition (FAC) or worsen since admission.[19] Physician documentation of PI present on admission (POA) within 24 hours of patient admission is essential to make this distinction. Therefore, it has become financially important for hospitals to correctly identify, define, and accurately report the occurrence of PIs upon admission, and then prevent their development during the patient’s stay.

In spite of efforts to reduce PIs, and the NPUAP’s well-defined stages, a basic skin assessment to categorize PIs has not been standardized among facilities.[20] Currently, assessments of PIs in many institutions are inaccurate, with poor documentation, and gaps in the reporting and quality of preventative care.[20] The accuracy of the average clinician (e.g., nurse, physical therapist, and physician) to correctly assign a stage to a PI is low, ranging from 23% to 58%.[21,22] Dark skin makes the identification of Stage 1 and the distinction between Stage 1 and DTI very difficult.[12,23–30] The addition of a photograph to the documentation of PI

has the potential to improve the accuracy of assessment by allowing a wound care expert to view the wound later in time while still having documentation of the wound at the original time of assessment. The limited availability of wound experts and the requirement that documentation occur within 24 hours of patient admission make photo documentation attractive. The research on this topic shows that if an *expert* views the picture and has clinical context regarding the historical origin of the wound, photograph based assessments can be reliable and valid.[21,29,31–42] Therefore the purpose of this study was to compare the accuracy of standard bedside clinical PI assessment to expert assessment of the same patients using photographs and clinical history.

The first aim was to compare the identification of prevalent PIs by bedside nurses to that of wound care experts. Our correlating hypothesis was that the bedside nurses would not identify some integumentary injuries correctly, with some PIs being classified as other wound types and some other wound types being classified as PIs.

The second aim of the study was to compare PI staging between bedside nurses and wound care experts. We hypothesized that there would be differences in the assignment of PI staging between bedside nurses and wound care experts.

Lastly, the third aim was to compare the identification of PIs being present on admission (POA) or a facility-acquired condition (FAC) between bedside nurses and wound care experts. Our final hypothesis was that the bedside nurses would not correctly identify all PIs as being either POA or FAC.

METHODS

Subjects

All patients with a PI identified by either a bedside nurse or an expert on a single day at a 500 bed acute hospital were included. Sixty-three patients (mean age = 63.5 years, females = 30, males = 31, unidentified = 2) were included with a range of 1-7 PIs on each patient. The only exclusion criteria included was that a patient did not have a PI.

Procedures

Point prevalence counts of PI are routinely conducted at acute care hospitals with the assistance of Hill Rom employees. These counts are conducted on a pre-planned day where a Hill Rom representative comes to the hospital and goes from room to room asking the nurse caring for that patient if their patient has a PI, location of the PI on the body, what stage it is if present, and the admit status of the PI distinguished as either POA or FAC. Admit status is defined as whether the PI was present prior to admission to the hospital (POA) or developed during the hospital stay (FAC). This was the source of bedside nurse data. Concurrent with, but independent of this Hill-Rom count, one wound expert reviewed the wound documentation and photo documentation for all hospital patients on the same day to identify all patients with a PI. The bedside nurse data was then compared with the expert data to identify discrepancies. Any discrepant cases were then reviewed and discussed by a group of wound care experts. This expert group included 2 nurses and 2 physical therapists, each with a minimum of 15 years of PI assessment experience. The consensus of this expert group was used as the source of the expert PI point prevalence data.

Data Analysis

All statistical analysis of data was performed using SPSS, version 23. Descriptive statistics were analyzed for patient demographics, PI stage, PI locations, admit status of PI, admitting diagnosis, and hospital unit. To assess agreement between expert data and bedside nurse data regarding the staging and POA vs. FAC status of PIs, a Cohen's Kappa was calculated. This test assesses for inter-rater agreement by factoring out the amount of agreement that may occur by chance to provide a more accurate depiction of agreement between the two groups.[43]

Chi Square Contingency analyses were used to assess for association between nominal or categorical variables within the data set. For these analyses, expert data was considered accurate with discrepancies resulting from bedside nurse error. For statistical analysis purposes, researches further categorized expert report of location into general regions. The category of "leg" included reported PIs on the leg, thigh, IT band, knee, and ankle. The category of "head" included reported PIs on the posterior head and occiput. All other categories directly reflected expert report of PI location.

Assessments between the following variables were tested with the Chi Square: expert stage vs. expert location of PIs, bedside nurse admit status vs. expert admit status of PIs, bedside nurse stage vs. expert stage of PIs, and finally, the difference between unit and admit status for bedside nurse vs. experts. Significant Chi Square tests were further investigated with adjusted standardized residual post hoc-testing to identify individual associations between variables. The alpha level for all analyses was set *a priori* at <0.05.

RESULTS

Descriptive Statistics

On the day of PI prevalence counting, 63 patients were identified by the expert, bedside nurse, or both as having a PI. Among patients in the study, 31 were male, 30 were female and 2 were missing sex information. Patients age ranged from 1 to 90 years, with a mean age of 63.5 years and a standard deviation of 20.2 years. Patients were admitted into 14 different units within the hospital. These units included: Rehab, Neuroscience Intensive Care Unit (NSICU), Observed Neuro Trauma and Shock 2 (ONTS 2), Outpatient and Ambulatory Surgery (OAS), Trauma Intensive Care Unit (TICU), Intensive Care Unit- Pediatrics (ICU-PEDS), TCS/W5, Observed Neuro Trauma and Shock 1 (ONTS 1), NSS/W5, General medical unit (GMU), 4E, Pediatric Oncology Unit (Peds ONC), Cardiovascular Trauma Unit (CVTU), Care Management Unit (CMU), Medical Intensive Care Unit (MICU), Cardiovascular Unit (CVU), and Surgical Intensive Care Unit (SICU). PIs were identified on patients within each of these units. Bedside nurses identified 105 total PIs where experts identified a total of 96 PIs.

PIs were found on multiple body locations. Both the bedside nurse and experts found the same percentage of PIs for the foot (3.4%), hip (5.2%), ischium (3.4%), and back (2.6%) locations. The greatest difference between the bedside nurse and the expert identification of PI location occurred at the sacral location (43.1% bedside nurse, 37.1% expert) and where there was a discrepancy as to the identification of the injury as a PI (7.8% bedside nurse, 19.1% expert).

PI staging in the expert and bedside nurse data were compared to assess for discrepancies. Both the bedside nurse and experts identified the same number of stage 1 PIs (2.6%), with the greatest amount of discrepancy occurring with DTI classification (40.5% bedside nurse, 35.3% expert) and regarding the identification of the injury as a PI for staging

(7.8% bedside nurse, 17.2% expert). Both bedside nurse and experts identified DTI's as the most common PI stage (40.5% bedside nurse, 35.3% expert).

Comparisons were also conducted between bedside nurse and expert data regarding PI admit status. Bedside nurses determined that 33.3% of the PIs were FAC and 66.7% were POA, where experts determined that 16.7% of the PIs were FAC and 83.3% were POA.

Cohen's Kappa Analysis

Fair agreement, defined by Cohen as K values ranging from 0.21-0.40[43] was found between expert and bedside nurse identification of admit status for PIs (K=0.364, p<0.000). The results of this Kappa analysis indicate a 64% disagreement between the two groups. A moderate agreement, defined by Cohen as K values ranging from 0.41-060,[43] was found between expert and bedside nurse staging of identified PIs (K= 0.460, p>0.000). The results of this Kappa analysis indicate a 54% disagreement between the two groups on stage.

Chi-Square Analysis

A significant association was found between expert stage and expert location of PIs (54, n=116)=176.81, p<0.001. Post hoc testing revealed that the significant association exists between expert identification of a Stage 1 PI and expert location of the injury on the subject's back (p<0.001). Another significant association was identified between the unit where the subject was assessed and the admit status of the PI (26, n=116)=60.42, p<0.001. Post hoc testing revealed that a significant association exists between the TICU and development of a FAC PI (p<0.001).

There was a significant association between the unit where the subject was assessed and the expert's determination of the stage of the PI (78, n=116)=103.51, p=0.028. Post hoc testing indicated no significant associations between any two individual variables within the data.

No significant association was found between the subject's categorized diagnosis and the stage of the PI as identified by the experts (54, n=116)=52.44, p=0.535. Additionally, no significant association was found between the subject's gender and agreement of the two parties regarding the stage of the identified PI (2, n=116)=1.965, p=0.374. Finally, there was no significant association found between the subject's gender and the expert determination regarding admit status of the identified PI (2, n=116)=0.526, p=0.769.

Independent T-test Comparisons

No significant difference was found between the subject's age and agreement of the two parties regarding the stage of the identified pressure ulcer (p=0.671).

DISCUSSION

The primary purpose of this study was to compare the accuracy of standard bedside clinical PI assessment (bedside nurse) to expert assessment of the same subjects using photographs and clinical history. The information presented in this study is important as it has financial implications for the hospital in terms of Medicare payments and accuracy in reporting.

One primary outcome of studied was staging of PIs. We found a 54% disagreement between expert and bedside nurse assessment for this outcome. The results of our study indicate that bedside nurses frequently incorrectly identify stages of pressure injuries in a hospital setting. This finding is supported by Kelly and Isted, who examined the ability of nursing staff to correctly stage pressure injuries. They found that the nurses in this study were only able to correctly stage pressure ulcers 56% of the time.[44] A possible explanation for the disagreement could stem from bedside nurses lacking proper training in identification and staging of PIs.

In contrast, Hart et al. performed a study looking at classification of pressure injuries by bedside nurses in 55 hospitals.[39] They found that with use of digital photographs, nurses were able to distinguish between PIs and other ulcerous wounds. They also found that the nurses were able to differentiate between PIs that were categorized as POA or FAC using Web-based technology. The authors drew the conclusion that the nurses had moderate to near perfect levels of reliability when staging PIs. However, an additional finding in support of our study indicated, nurses who are certified in wound care are more accurately able to stage PIs than nurses that are not, so more training for the latter is warranted. Although we do not know the level of experience or PI education the individual nurses in our study received, we assume that they have less experience than the wound care experts. Additionally, in this study by Hart et al, nurses used photographs of wounds rather than bedside examination. This could provide some

evidence to the benefits of using pictures as opposed to bedside examinations.[39] Defloor and Schoonhoven report inter-rater reliability of experts in the assessment of PI photographs to be high (94.1%).[36]

There was a significant association found between the experts staging of the PI and the location of the PI on the patient's body. We found that if a PI was located on a patient's back, it was likely to be a Stage 1. We believe this may be due to the frequency of assessing skin integrity in locations of increased pressure within the hospital setting. It is the goal for hospital staff to perform continual examination of the skin on the back and other high-risk areas during the subject’s length of stay, and thereby these PIs would be found in the early stages of development. Duncan reported that high-risk patients need thorough daily inspection of all skin surfaces, especially in areas more susceptible to prolonged pressure such as the sacrum, back, buttocks, heels, and elbows.[45]

There was also a significant association found between the unit where the subject was assessed and the admit status of the PI. We found that subjects being treated in the TICU were more likely to have a FAC PI in comparison to other units of the hospital. In support of this finding, Nijs N et al reported that incidence of PI in the intensive care unit (ICU) is more prevalent than in non-ICU due to the patient being immobilized, mechanically ventilated or sedated.[46] Shahin, Dassen & Halfens also reported that patients in the ICU are more at risk for developing PIs due to immobility, increased acute physiology, and greater severity of illness.[47] An individual admitted into an ICU is likely to be in a more critical condition than those on other units as they often have multiple traumatic injuries. This elevated level of condition severity may result in a restriction of patient function and movement, which can lead to development of PIs.

We expected that the subjects assessed on units providing higher levels of critical care would present with more advanced stages of PIs due to lack of subject mobility and focus of care on life threatening or functionally limiting factors. We saw a significant association here, but post hoc analysis did not reveal a significant association between a specific unit and PI stage.

Overall, bedside nurses classified skin damage as a PI more frequently than did the experts. This may be due to lack of experience of the bedside nurse in the assessment of skin damage generally or PI specifically. This lack of experience may contribute to improper identification of un-related skin irregularities such as moisture lesions. Beeckman et al. defined a moisture lesion as skin maceration and erythema resulting from presence of urine, feces, perspiration, and wound fluid. They indicated that PIs were often classified erroneously by qualified nurses. It was found that grade 1 PIs were often classified as blanchable erythema, and that moisture lesions were commonly misidentified as grade 2 pressure injuries.[48]

We observed that DTI was the most common type of PI identified by bedside nurses (40.5%). However, it is possible that injuries such as contusions, skin tears, hematomas and even stage 2 PIs, which are all common in the hospital setting, could be mistaken for a DTI, especially if the injury is in a location paralleling that commonly associated with PI occurrence.[49,50] Although we did not have access to the subject's ethnicity, another possible explanation may be that the pigment of the subjects skin, resulting in mistaken identification of a PI stage, yielding inaccurate report of a stage 1 PI as a DTI classification.[12]

Limitations

Some limitations are present in this study. A lack of information regarding wound care education and/or experience of the individual bedside nursing staff participating in PI assessment, skin color of the patients that may or may not have interfered with identification of a PI, and the source of the skin abnormalities misidentified by bedside nurses when disagreement of PI prevalence occurred. Differences existed between number of bedside nurses (50) and experts (4) creating a higher risk for decreased inter-rater reliability between nursing staff. Differences also occurred between types of collection: bedside nurse- live documentation vs. expert- review of photo documentation from hospital record. It is a possibility that photo documentation may provide limited information of relevant wound presentation such

as wound texture and dimension if a standardized photographing procedure is not followed.[51] Finally, where the information provided by the study is valuable to similar acute care hospitals, a sample of convenience was utilized in our design which may have created bias in the result.

CONCLUSION

Results of this study identify a gross discrepancy between the identification, staging, and determination of admit status of PIs between bedside nurses and wound care experts. A disagreement of 54% for staging and 64% for admit status between the two groups is notable. A review of the literature reveals an inconsistency in reported information regarding the incidence and prevalence of PI counts as assessed by bedside nurses. The direct cause for the evidenced reduction in accuracy of PI assessment as conducted by the bedside nurse is unclear, therefore, further research is warranted to determine the cause of this discrepancy.

APPENDIX - TABLES

Table 1. Comparisons of PIs identified between Bedside Nurse (%) and Expert (%) of 10 General Body Locations.

Body Location	Bedside Nurse (%)	Expert (%)
Heel	14.7%	9.5%
Foot	3.4%	3.4%
Leg	9.5%	11.2%
Hip	5.2%	5.2%
Ischium	3.4%	3.4%
Buttocks	6%	7.8%
Sacrum	43.1%	37.1%
Back	2.6%	2.6%
Head	2.6%	1.7%
Unsure	1.7%	0%
None	7.8%	19.1%

Table 2. Comparisons of identified PI stage between Bedside Nurse (%) and Expert (%).

Stage	Bedside Nurse (%)	Expert (%)
1	2.6%	2.6%
2	2.6%	4.3%
3	10.3%	12.1%
4	15.5%	12.9%
DTI	40.5%	35.3%
Unstageable	19%	15.5%
None	7.8%	17.2%
Unsure	1.7%	0%

Table 3. Comparisons of Identified PI Admit Status (POA vs. FAC) between Bedside Nurse (%) and Expert (%).

PI Admit Status	Bedside Nurse (%)	Expert (%)
Present on Admission (POA)	66.7%	83.3%
Facility Acquired Condition (FAC)	33.3%	16.7%

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https://www.researchgate.net/profile/Robert_Rennert/publication/23677232_Standardization_of_Wound_Photography_Using_the_Wound_Electronic_Medical_Record/links/00b4953c2cb1d34f3b000000.pdf

CURRICULUM VITAE

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EDUCATION

University of Nevada, Las Vegas — Las Vegas, NV, 2014-2017
Doctorate of Physical Therapy

Idaho State University — Pocatello, ID, 2012-2014
B.S. in Physical Education
Emphasis in: Exercise Science

Weber State University — Ogden, UT, 2010-2012
Zoology Candidate

EXPERIENCE

George E. Wahlen Department of Veterans Affairs Medical Center — Salt Lake City, UT, 2017

- *12 week outpatient rotation*

Bridgeview Estates — Twin Falls, ID, 2016

- *10 ½ week SNF rotation*
- *Responsible for initial evaluations, treatment sessions, and care conferences*
- *Patient population primarily seen: Medicare patients & generalized weakness/balance deficits*

St. Rose Dominican Hospital- Rose de Lima Campus — Henderson, NV, 2016

- *11 week acute rotation*
- *Responsible for initial evaluations to determine if patient is safe to return home*
- *Patient population primarily seen: Total hip/knee replacements & s/p falls*

Henderson Physical Therapy — Henderson, NV, 2015

- *6 week outpatient rotation*
- *Responsible for initial evaluations and treatment of select patients*
- *Patient population primarily seen: Rotator cuff repairs & total knee replacements*

PROFESSIONAL DEVELOPMENT

Professional Conferences and Courses Attended

- *Combined Sections Meeting* — Anaheim, CA, 2016
- *National Student Conclave* — Omaha, NE, 2015
- *UNLV Distinguished Lecture Series* — Las Vegas, NV, 2014-2016
- *AMBUCS: Adaptive Bike Day* — Las Vegas, NV, 2015
- *APTA Member* — 2014 – Current

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EDUCATION

UNIVERSITY OF NEVADA, LAS VEGAS | 2014-2017 | DOCTORATE OF PHYSICAL THERAPY

- Graduate Assistant-First Year Seminar Specialist for HSC 100 course

SOUTHERN UTAH UNIVERSITY | 2009-2013 | BACHELOR OF SCIENCE

- Major: Exercise Science
- Minor: Psychology

EXPERIENCE

INTERMOUNTAIN MEDICAL CENTER | MURRAY, UT | JANUARY 9, 2016 – MARCH 31, 2016

- Acute care clinical affiliation

VA-GEORGE E. WHALEN | SALT LAKE CITY, UT | OCTOBER 3, 2016 – DECEMBER 9, 2016

- Outpatient clinical affiliation
- Participated in orthopedic, vestibular, neurological and cardiac rehabilitation of disabled veterans

SUNRISE HOSPITAL AND MEDICAL CENTER | LAS VEGAS, NV | JULY 18, 2016 – SEPTEMBER 30, 2016

- Rehab clinical affiliation
- Observed and practiced wound care debridement and dressing techniques
- Participated in training and use of the lite gait therapy device
- Participated in team conference as a member of an interdisciplinary team to provide patient centered care

PROFESSIONAL DEVELOPMENT

CONFERENCE ATTENDANCE

- Combined sections meeting February 2016
- National student conclave October 2014
- UNLV distinguished lecture series 2014-2017

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EDUCATION

2014.2017 ***UNIVERSITY OF NEVADA LAS VEGAS*** ***Las Vegas, NV***

- Doctor Of Physical Therapy

2008-2011 ***UTAH VALLEY UNIVERSITY*** ***Orem, UT***

- Bachelor of Science in Psychology

EXPERIENCE

2017 ***JORDAN VALLEY MEDICAL CENTER*** ***West Jordan, UT***

- Provided therapy in an outpatient setting for pts with shoulder and knee pathologies

2016 ***INTERMOUNTAIN MEDICAL CENTER*** ***Murray, UT***

- Provided therapy for pts in acute care setting
- Provided wound care for many types of wounds

2016 ***SUMMERLIN HOSPITAL*** ***Las Vegas, NV***

- Provided therapy in a rehab setting for orthopedic and neurologic pt populations

2015 ***BOULDER CITY HOSPITAL*** ***Boulder City, NV***

- Performed initial evals and treatment for pts in outpatient setting over a 6 wk period
- Pt population consisted primarily of back, hip and knee pain over age of 50
- Also participated in some acute care

PROFESSIONAL DEVELOPMENT

2015-2017 ***PROFESSIONAL CONFERENCES AND COURSES ATTENDED***

- Combined Sections Meeting 2016
- National Student Conclave 2015
- UNLV distinguished lecture series 2014-2015
- Therapeutic Neuroscience Education on Pain 2015-2016
- Member of APTA since 2014
- Attended selected meetings for NPTA 2014-2015