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School of Occupational Therapy

Title: Patient Readability and Clinician Education on Common Conditions in Outpatient Occupational Therapy

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A capstone project submitted in partial fulfillment for the requirements of the Doctor of Occupational Therapy degree from the University of Indianapolis, School of Occupational Therapy.

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A Capstone Project Entitled

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By

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Patient Readability and Clinician Education on Common Conditions in Outpatient Occupational Therapy

Abstract

The primary purpose of this Doctoral Capstone Experience (DCE), in unison with clinical skills, was to develop readable educational handouts for patients with various conditions to increase their functional outcomes while minimizing barriers due to poor health literacy. Additionally, clinician handouts were created to promote use of evidence-based interventions within an outpatient setting. Current literature justifies the need for improving readability of patient educational materials as this and overall health literacy can have a major influence on healthcare outcomes for patients and should always be considered. To improve patient comprehension with educational materials, content should be developed with simpler terms, shorter sentences, and use of pictures (Eltorai & Wang, 2014). A needs assessment consisting of semi-structured interviews with patients and clinicians was completed by an occupational therapy (OT) student to develop guidelines for educational handout creation. After completion of each handout, the OT student utilized the Hemingway App software to establish the grade level of readability to ensure it met the national recommendation from MedlinePlus (2017) of 7th – 8th grade. After 14 weeks, 11 educational handouts were completed for both clinicians and patients. Two outcome surveys were also developed to measure effectiveness of the project. Throughout the DCE, the OT student improved skills in patient care, program development, leadership, and advocacy.

Keywords: occupational therapy, patient education, health literacy, readability

Literature Review & Background

Health literacy

In many instances, research suggests that patients often have low health literacy and readability in relation to educational resources (Eberlin, Vargas, Chuang, & Lee, 2015; Perez et al. (2017). The Patient Protection and Affordable Care Act of 2010, defines health literacy as "the degree to which an individual has the capacity to obtain, communicate, process, and understand basic health information and services to make appropriate health decisions" (Centers for Disease Control and Prevention [CDC] 2016, p. 1). Health literacy throughout the United States has been a concern for many years. Berkman, Sheridan, Donahue, Halpern, & Crotty (2011) stated that over 80 million Americans have limited health literacy linking to a greater risk of poor healthcare accessibility and poor healthcare outcomes. Diminished health literacy can be the result of many sources, however the CDC (2016) states that health literacy issues are a direct result of written materials being too challenging. As a suggested improvement for health literacy across all healthcare, recommendations from the CDC include but are not limited to: 1) constructing educational materials that are written to match the skill set of the consumer, 2) working alongside educators to assist with building a health literacy curriculum, and 3) improving clinician communication skills when speaking with a consumer (CDC, 2016). These are all areas of improvement that can be addressed during the completion of this DCE project. It is imperative to note that health literacy should also be addressed for families, communities, and even organizations that provide health related services (Batterham, Hawkins, Collins, Buchbinder & Osborne, 2016). Uniformity of health literacy among all settings may contribute to improved functional outcomes for healthcare consumers. Additionally, health literacy improvements are an "effective education and prevention tool to improve disease management

and treatment adherence" (Zhang, Terry & McHorney, 2014, p. 1). The implications of poor health literacy from the literature confirm an appropriate rationale for addressing this need through this DCE.

Readability

Current literature justifies the need for rewording of patient educational materials to improve patient outcomes. According to Perez et al. (2017), health literacy and readability can have a major influence on healthcare outcomes for patients and should always be considered. The completion of this DCE project takes place in an outpatient hand and neuro setting where patients often receive educational handouts; however, these handouts often have medical terms and jargon that patients do not comprehend. MedlinePlus provides a national recommendation of writing health related education materials at a 7th - 8th grade reading level (MedlinePlus, 2017). As healthcare professionals, it is critical to provide patients with quality and client-centered care. Patient education is a characteristic of client-centered care in which clinicians should confirm readable education is prescribed to ensure healthy outcomes. Unfortunately, this is often not the case. According to researchers from the Association of Bone and Joint Surgeons, 81% of orthopedic patient education materials exceeded the 8th grade reading level (Eltorai & Wang, 2014). Similarly, researchers Shah, Yi, & Stein (2015) analyzed 227 patient educational resources with the Flesch-Kincaid readability tool. Results stated that that of the 227 articles, only 31 fell into the recommended sixth to eighth grade reading level, with a mean grade of 9.8. Kher, Johnson, and Griffith (2017) analyzed 70 patient education websites using various readability tools and identified that only five websites (7%) scored within the national recommendation of readability. Among the five different readability tools, the mean grade level averages of the 70 websites were: 9.79, 11.95, 15.17, 11.39, and 48.8 (Kher et al., 2017). In

addition, research has been completed on areas of specialty demonstrating readability concerns. Hand therapy education in relation to carpal tunnel surgery had an overall average reading level of 13.1 after analyzing 102 articles (Eberlin et al., 2015). Comparably, The American Laryngological, Rhinological and Otological Society, utilized valid tools to identify the readability of 14 subspecialty educational resources (Hansberry et al., 2014). The average readability for these resources exceeded well beyond the national recommendation at grades 10th through 15th (Hansberry et al., 2014). Other researchers suggested that readability and health literacy improvements in postoperative spine education would improve health outcomes for patients (Long, Modi, Haws, Khechen, Massel, Mayo, & Singh, 2018). In one study, a single two-hour educational session was administered to a group of patients with various spinal injuries prior to surgery (Eastwood et al., 2018). The results of the study revealed that after completion of the education session and surgery, reports of "reduced emergency room utilization, improved overall patient satisfaction, achievement of expected improvements and alleviation of back pain were documented with greater success" (Eastwood et al., 2018, p. 2). In summation, the results from the literature review in regards to readability reveal that there is a patient readability issue across multiple settings within the healthcare system. Based on research recommendations, using simple terms, shorter sentences, and adding pictures will aid in making education materials more understandable (Eltorai & Wang, 2014). By increasing readability in this DCE setting, there is a potential opportunity to reduce readmission rates and exacerbations of conditions, as well as provide additional resources to benefit the patient upon discharge (Berkman et al., 2011).

Assessing readability. After reviewing the literature, several readability tools were discovered consisting of different levels of complexity, pricing, and function. In this DCE project, it was imperative that the selection of a readability tool was both valid and reliable. One of the most common readability tools utilized among the literature was the Flesch Reading Ease and Flesch-Kincaid reading levels formula which can be accessed via Microsoft word (Howard & Smith, 2018; Kapoor, George, Evans, Miller, & Liu, 2017; Prabhu et al., 2016). Morony, Flynn, McCaffery, Jansen and Webster (2015) utilized this tool to estimate the average grade level on patient education for patients with chronic kidney disease. "The Flesch-Kincaid formula estimates the US [*sic*] grade level required to read text using the average number of words per sentence and the average number of syllables per word and is expressed as a grade" (Morony et al., 2015, p. 844). Other common and credible readability tools utilized throughout the literature included The Gunning Fog Score (GFS), The Coleman-Liau Index (CLI), and The Simple Measure of Gobbledygook (SMOG) (Betschart, Zumstein, Bentivoglio, Engeler, Schmid & Abt, 2017; Kher, Johnson & Griffith, 2017). Oddly, after attendance to a marketing forum within the DCE facility, the Hemingway Editor software was presented by chief of marketing staff as the readability software utilized for the hospital's website. This software is a free online service that assists with developing clear, concise, and readable written material by providing the precise grade level (Long & Long, 2016). Ferrari, Witschel, Spagnolo, & Gnesi, (2018) stated that selection of the Hemingway Editor had multiple benefits including: free access and download, identification of sentences that are hard to read, and providing suggestions for terms with simpler alternatives. Stephens (2015) completed a review on this editing software confirming it as a "dependable" (p. 1). The author also stated that a function of this software was to "interpret the grade level that is required to understand the content based on the vocabulary and writing style"

(Stephens, 2015, p. 1). Grade level readability was a primary focus of this DCE project, therefore, the Hemingway Editor was chosen. Due to the high volume of patient education development, it was necessary to have a software that was time efficient, accurate, and credible.

Clinician education

To complement the revised patient education handouts, a form of continuing education was established with the development of entry-level practitioner handouts containing current evidence-based practices for specific common conditions. Clinicians should always continue to improve their competence and learn new treatment strategies as a means to improve client care. For this DCE setting and across all settings, there is direct value in utilizing current evidence-based interventions. Wilson, Barger, Perez & Brooks (2018) stated that continuing education for clinicians is imperative to ensure client-centered care with an end goal of improving health related outcomes. By providing the OT practitioners on staff with current evidence on how to treat specific conditions, health outcomes will likely improve. Cervero & Gaines (2015) completed five systematic reviews to determine if continued education was effective for physicians. Results from the reviews indicated that continuing education improves physician performance and patient health care outcomes (Cervero & Gaines, 2015). At the physician level, benefits are reported for improving patient care (Cervero & Gaines, 2015) further justifying additional evidence for the purpose of developing current evidence-based interventions for the OT practitioners on staff. In a non-randomized control study, continuing education activities were prescribed to a variety of educators to learn a new intervention method for patients with chronic obstructive pulmonary disorder (COPD) (Gagné, Moisan, Lauzier, Hamel, Côté, Bourbeau & Boulet, 2018). Researchers from the study concluded “a possible increase in educators’ performance levels in delivering effective therapeutic patient education (TPE)

interventions, and, in turn, COPD patient outcomes" (Gagné et al., 2018, p. 10). Therefore,a common theme among the literature was that education for clinicians is imperative and should be specifically designed to improve patient health-related outcomes.

Theory & Model to Support DCE

To help guide this DCE, two OT theories were utilized: the Person-Occupation-Environment model (PEO) and the biomechanical/rehab frame of reference.

Person-occupation-environment model (PEO)

The PEO model values all aspects of a patient's life including the person, their environment, and their occupations as it relates to their ability to participate and engage independently in their daily routine (Cole & Tufano, 2008). According to Brown (2016), health literacy should be comprehensive of the person, situation, and environment; the inclusion of these factors when assessing health literacy is crucial to successful therapeutic outcomes. When assessing all three components of this model, it is key to start with the person. In this project, there were two people that were tailored to during the development of the handouts: the patient and the clinician. It was essential to first identify who the person is and what their needs are as a means to remain client-centered. For both projects, educational handouts were developed to benefit the consumer first, therefore it was imperative to maximize the fit for each of these consumers. The PEO model, according to Cole & Tufano (2008), is about maximizing fit to facilitate both appropriate assessment and function. To ensure this theory process, identifying the most client-centered approach is completed by taking into consideration all aspects of the person, environment, and occupation. This can be done simply by performing a needs assessment to get direct information from the person about these components. A perfect example of maximizing fit for the patient was developing the educational handouts for the

patient in readable language as a means to prevent further injury, exacerbation, and/or readmission. Additionally, an example of maximizing fit for the clinician would be to ensure that the educational handouts include pertinent content that will assist with their day-to-day interactions during patient care.

The next component of the PEO model considered for this project is assessing the environment (Cole & Tufano, 2008). The DCE environment was a hospital setting however, the handouts addressed different aspects of the patient's environment as a means to make modifications and promote education both inside and outside of the clinic. Multiple environments can be addressed when providing education so it is imperative that the patient is aware of how the content can apply and be generalized across different contexts. The clinician environment remained the same throughout the project as they were working in an outpatient setting.

The final component of the PEO model considered is occupation (Cole & Tufano, 2008). Occupation is extremely important as this helps guide the focus of determining what the consumer wants and needs to do in order to participate in desired tasks. From the patient perspective of the project, the focus was to utilize information from the needs assessment to develop the readable educational content as a means to assist the patient with improving their independence with occupational performance and engagement. From the clinician perspective of the project, utilizing information from the needs assessment was important to further understand their role as a healthcare practitioner to maximize benefit for the client during treatment.

Biomechanical and rehabilitative frame of reference

Since the DCE occurred in an outpatient hand/neuro setting, the biomechanical/rehab frame of reference also guided this project. The information being conveyed in the handouts

related directly to body mechanics, range of motion, strength, endurance, and overall function (Cole & Tufano, 2008). Clinicians in this practice setting typically use this frame of reference during evaluation and treatment. Use of appropriate language and terminology was imperative for providing information on specific common conditions in regards to the clinician handouts. In regards to terminology for patients and the development of their educational content, using simpler terms, pictures, and fewer words will maintain the integrity of this frame while making it readable for improved outcomes. Additionally, this frame of reference involves the knowledge and use of good body mechanics and ergonomics during occupational engagement to prevent injury (Cole & Tufano, 2008). By providing patients with materials they understand, it will likely facilitate improved function and participation in occupation.

Screening & Evaluation

Clinician assessment

To ensure this project would address site-specific needs, a plan was formulated by the OT student to complete a needs assessment prior to the development of the educational handouts. The OT student discussed the project content, completed a strengths-weaknesses-opportunities-threats (SWOT) analysis of current education materials, and identified the key components of patient education necessary with the two outpatient OT practitioners on staff. After presenting some previous literature statistics on readability, the clinicians agreed that their content material was indeed well above the 7th-8th grade reading level recommendation from MedlinePlus (2017). Clinicians communicated concerns of low health literacy and poor readability in their patient population leading to a direct impact on health related outcomes and diminished occupational performance. Authors Berkman, Sheridan, Donahue, Halpern, and Rotty (2011) stated that low health literacy is linked to poor medication adherence, re-hospitalizations, and

even increased mortality in some cases. A group of researchers working with COPD patients examined the difference between low health literacy written handouts versus traditional handouts and its effect on showing patients how to use their medications (Beatty, Flynn, & Costello, 2017). Patients who received the low literacy education demonstrated drastic improvements in their technique with use of inhalers when compared to the patients who received the traditional handouts (Beatty, Flynn, & Costello, 2017).

Another area of concern that was noted during the SWOT analysis and conversation with clinicians was that the educational content given out was too lengthy, making it hard to follow. The clinicians remarked that too much information can be just as harmful as too little, noting that a balance is key. Hansberry, Agarwal, & Baker (2015) stated that "if this material were rewritten in a simpler narrative, the general readership that would benefit from the material would likely increase" (p. 115). Lastly, the clinicians noted that the patient education handouts did not provide valuable resources. In a study with patients demonstrating chronic low back pain, patient education and advice was found to be just as effective as exercise (Otoo, Hendrick, & Ribeiro, 2015). As a result of this portion of the needs assessment, the OT student developed criteria for the educational handouts. Some items to highlight included: definition of OT, OT's role in treating the specific condition, simple description of condition, pictures, and additional resources as necessary. These results were concurrent with the literature recommendations of "using simple terms, shorter sentences and adding pictures" (Eltorai & Wang, 2014, p. 1184).

Additionally, the OT student presented the idea of developing entry-level handouts on common conditions seen in practice for clinicians' with current evidence-based interventions. The OT practitioners on staff discussed interest and support with both projects moving forward.

Patient assessment

The second priority task for the needs assessment was to engage in a conversation with various patients about previous educational handouts, pros and cons of handouts they have received in the past, items they would love to see on future handouts, and personal experiences about conversations they have had with clinicians that were beyond their understanding. In a review of the literature, several researchers used this direct feedback approach (Ndosi et al., 2016; Williams, Muir, & Rosdahl, 2016). Ndosi and colleagues (2016) utilized a formal tool called the Educational Needs Assessment with over 130 patients with rheumatoid arthritis (RA) to determine their educational needs. The results determined that "needs-based education helps improve patients' self-efficacy and some aspects of health status" (Ndosi et al., 2016, p. 1131). Comparably, Williams et al., (2016) interviewed five patients with glaucoma to review revision of educational materials to ensure a client centered approach. The literature provided a foundational guide for an appropriate measure to gather data.

The interview process with patients was very informal, yet effective. There were no specific guidelines or criteria for selection of patients, with the exception of being a patient at the site. Many patients interviewed provided passionate responses about this topic and were willing to provide valuable feedback. One concern during the interview was from a stroke survivor who stated "don't use 'don't.'" The patient went on to say, "This can be confusing, just tell us exactly what we should do and not what we shouldn't." This feedback was a crucial component in how to phrase and use specific verbiage when developing the handouts. Another patient suggested "using pictures or demonstrations to provide a visual for all of the big words." Alqubayshi, Alotaibi, & Al-Shahry (2018) measured effectiveness of different patient education approaches, finding that visuals and demonstrations had the most value. Discussion and

demonstration should be provided by clinicians upon distribution of educational materials to ensure further understanding.

Additional common concerns that patients presented during the needs assessment included: not understanding scientific language, being given the information as homework with no discussion, and receiving too much information at once. In one study, information overload was noted in patients with chronic conditions, having a direct negative impact on patients' intentions to utilize educational materials (Liu & Kuo, 2016). From the patient feedback, the OT student identified a "do's" and "don'ts" list as a guide for developing patient education content. This portion of the needs assessment provided insight from the consumer perspective, providing value to criteria. After reflection on the discussions with patients, an additional list of items was created to format into the educational handouts to ensure a client-centered approach.

Readability assessment

The final task of the needs assessment was to identify which readability tool would be the most practical and efficient. After reviewing the literature, several readability tools were listed consisting of different levels of complexity, pricing, and function (Kher et al., 2017; Betschart et al., 2017). After discussion with the OT practitioners on staff, it was recommended to utilize the Hemingway Editor Software to maintain uniformity with the marketing department. This is an efficient tool that can assist with developing clear, concise, and readable written material by providing the precise grade level (Long & Long, 2016). The tool was trialed with different educational materials, justifying the efficiency and convenience of the free software.

Compare and contrast how the screening/evaluation process may be different in existing and emerging areas of OT

The screening and evaluation process for development of educational handouts will look fairly different across existing and emerging areas of OT; However, Dumas, Carmody, Black and Blake (2018) stated that OT practitioners should be addressing readability in all patient education materials across all settings. One notable difference in the screening and evaluation process is how the setting will impact the efficiency of conducting the needs assessment. For example, in some existing areas of OT, such as acute care, rehab, and surgical care, patients require immediate care as the primary focus. Lower level patients may alter the screening and evaluation process making it challenging or inappropriate to interview the patient and clinician during the needs assessment. In this DCE, the interview was conducted in an outpatient setting, allowing for conversation that is more casual with increased time for follow up. In an acute/inpatient setting, immediate patient care is needed for assessing function and discharge planning. This may limit the amount of time dedicated to performing a needs assessment.

Another existing area of practice that will require a different screening and evaluation approach is with pediatrics. In a pediatric setting, the OT practitioner may need to screen and evaluate teachers, parents, and caregivers to get a valid understanding of educational handout needs. In contrast to this DCE where direct patient and clinician responses were incorporated into the development of the handouts, children may not be apt or understand how to express their educational concerns, creating an additional challenge.

In emerging areas of OT practice such as low vision, screening and evaluating may present with more difficulty. Warren, DeCarlo, & Dreer (2016) stated that older adults with low vision may take longer to read and understand health information. This poses a concern when performing a needs assessment on readability. However, it may provide relevant interventions to improve the health literacy of individuals with low vision.

Other emerging areas of practice such as mental health may also require a different screening and evaluation approach when completing a needs assessment for education materials. Patients may not be appropriate for interview or lack the ability to express concerns. Due to the variable conditions and presentations, it may not be feasible in some cases to provide educational materials. However, OT staff would benefit from screening and evaluation to identify their needs as it relates to treatment for the mental health population. This screening and evaluation process may look very similar to this DCE needs assessment with clinicians.

Implementation

Description of implementation

The implementation phase of this DCE project was organized and scheduled based on a weekly planning guide to ensure project success. Project success is defined as the completion of a project or program of interest by the consumer within the constraints of time, cost, performance, and without disturbance of workflow (Kerzner & Kerzner, 2017). The weekly planning guide provided a strict timeline for completion of the educational handouts as they were to be submitted and presented to the site committee by the end of week 11. Completion by week 11 allowed for a reasonable turnaround time for the OT student to make edits prior to departure at week 14. Each week a specific common condition was selected to be the primary focus of research and handout completion. Through the needs assessment, it was determined that the clinician handout was to be developed first to establish the “difficult” end of readability. The identification of readability for the clinician handout provided an opportunity for comparison when creating readable patient handouts. A separate duplicate document of each handout was created to maintain tracking of resources and citations.

Criteria selection for handouts. Inclusion and exclusion criteria for the educational handouts were established based on the results from the needs assessment. The patient education criteria included the following items: OT's role (advocacy), condition description, causes of condition, signs and symptoms, preventative measures (environmental and/or activity), daily task modifications (occupation), therapy focus, prognosis, and additional resources (Appendix A). The clinician criteria included: description of the condition, signs/symptoms/common patient complaints, appropriate provocative tests, evidence-based interventions, differential diagnoses, role of OT with specific condition, and orthosis options (Appendix B).

Clinician handout development. The clinician handouts were created in a logical sequence to promote flow and organization. The primary resource utilized for development of these handouts was the *Fundamentals of Hand Therapy, Clinical Reasoning and Treatment Guidelines for Common Diagnoses of the Upper Extremity* (Cooper, 2014). This is a relevant, common, and appropriate resource that is primarily used for entry-level outpatient therapy practice. The information from this text created a foundation for the basic concepts needing to be conveyed in the handouts. Information was extracted from the book, paraphrased, reworded, and placed into the appropriate category, utilizing page numbers to reference as needed. The information was synthesized through a subjective lens of importance. Information that was deemed "necessary" during the needs assessment was also taken into account when extracting specific content. Though the book provided foundational concepts, additional information was gathered through evidence-based research, organizations, and websites. There was no focus on word choice, phrasing, or inclusion of pictures, as the primary focus of these handouts were to provide evidence-based interventions. For comparison purposes with the patient handouts, the Hemingway Editor was used to assess readability and confirmed the level of all clinician

handouts as "post-graduate." This is the highest level of readability that can be assessed using this software and appropriate for clinician use due to their level of education. After completion of each clinician handout, the OT student presented the information to the site mentor to verify content and formatting. Once the information was confirmed, the OT student proceeded to begin development of the patient handouts.

Patient handout development. After completion of each clinician handout, the patient handout was constructed to be a simplified copy. As with the clinician handouts, the Cooper (2014) text assisted with developing general information for each category. The Cooper (2014) text was extremely effective in providing alternative ways to present complex information to patients. This was a useful blueprint, however it was not the only source of information for development. Additional information came from websites and organizations that already provided patient education such as the Mayo Clinic, MedlinePlus, and the American Society of Hand Therapists. One important feature for these handouts was to select an image that portrayed the condition in an effective and appropriate manner. Imaging provides a visual component that complements the goal of readability (Eltorai & Wang, 2014). As suggested by the literature, the OT student paraphrased, modified, and simplified the information once constructed (Eltorai & Wang, 2014). The written material required an extensive trial and error method for simplification of words and sentences. Utilization of the Hemingway Editor was key as it provided direct feedback on grade level and provided suggestions for simplification. As each section was written for the patient handouts, it was processed through the Hemingway Editor to ensure that the material was being written appropriately. At the completion of each handout, it was cross-referenced and checked for a readability grade level between 7th and 8th grades to align with the MedlinePlus recommendation (MedlinePlus, 2017).

Leadership and effective implementation

The leadership skills presented by the OT student in this DCE promoted effective implementation of this project. According to Sonnino (2016), there are two types of leadership behaviors: task behaviors and relationship behaviors. The task behaviors allow the individual to accomplish their desired goals while influencing other leaders to meet their objectives, whereas the relationship behaviors allow professional relationships to develop and thrive for project completion (Sonnino, 2016). In this DCE, a combination of task and relationship behaviors was utilized to guide the implementation of this project. Specific leadership skills also complemented these behaviors.

The primary leadership skill to promote effective implementation was communication. This was a key component during the implementation phase as it guided and facilitated an organized completion of the educational handouts. Project completion objectives were established with the site mentor as a preceding task. Frequent communication with patients and clinicians throughout the implementation phase ensured a client-centered approach. This type of communication also allowed for additional improvements to be made throughout the development process. The OT student frequently communicated with the site mentor as a means to receive professional feedback, implement recommendations, and confirm progress. This was an effective strategy to ensure successful completion and maintenance of a professional relationship.

The second leadership skill that promoted effective implementation was responsibility. As a self-directed project, it was imperative that the OT student remained responsible, productive, and organized each week. Several tasks were necessary to complete each week to balance the clinician handouts, patient handouts, research, and clinical skills. During the

implementation phase, it was a necessity to delegate the appropriate amount of time to each component to ensure quality and timely completion. An even distribution of workload promoted a successful outcome for project completion.

The last leadership skill that complemented effectiveness was flexibility. This skill was a key attribute as it required adaptability and improvisation throughout the implementation phase. Throughout this phase, many changes, recommendations, and tasks were presented. Each day varied, requiring different levels of workload. Having the ability to adapt and improvise along the way improved the production and quality of the educational handouts.

Staff development

Staff development was promoted with the implementation of the clinician educational handouts, providing evidence-based interventions to improve clinical practice skills. This staff development project was created under the foundational principle of beneficence which is an ethical principle established by the occupational therapy code of ethics (AOTA, 2015). One aspect of this principle states that "when possible, clinicians should use evaluation, planning, intervention techniques, assessments, and therapeutic equipment that are evidence-based, current, and within the recognized scope of occupational therapy practice" (AOTA, 2015, p. 2). For common conditions seen in this outpatient clinic, therapists will now have current, up-to-date evidence-based interventions to improve their patient care. Evidence-based interventions were provided to the outpatient OT team to utilize in future practice as a means to "demonstrate a concern for the well-being and safety of the recipients of their services" (AOTA 2015, p. 2). Continuing education in this manner can be an effective way to promote staff development as it carries ethical tenants of the OT profession.

Committee submission

According to site policy, committee approval was required prior to distribution of any educational materials to clients. To meet this requirement, the OT student held a luncheon presentation with committee members, OT staff across all practice settings within the organization, to provide a better understanding of the project. During this presentation, the OT student provided background information, a purpose statement, evidence-based research, and process of completion for the educational handouts. This presentation was also utilized as a discussion forum in which feedback was provided throughout. Excitement and positive feedback were provided to the student following the presentation as the staff was eager to implement the project. A two-week deadline was established with staff to make edits and suggestions on the handouts as needed. This was a timeline that gave the OT student an opportunity to make edits prior to the departure from the site.

Discontinuation and Outcome

Design of the ongoing process for quality improvement and project outcomes

Due to limited time for edits on the educational handouts following the committee review, the implementation of the handouts and use of the outcome measure will be carried on by staff. The completed educational handouts and outcome measure tool were given to the therapists in final form via binder. This gives the therapists on site an opportunity to utilize the handouts as needed, well after the departure of the OT student. The development of the outcome measure and the handouts were reviewed with the OT's on staff to ensure proper use. The design method for continued quality improvement and assessing project outcomes has been selected based on current evidence. The OT student selected and developed an outcome measure using Likert scales for both the patient and clinician educational handouts to continue with the theme of simplicity and readability in order to identify quality improvements and outcomes. Likert scales are typically used in medical education and medical education research (Sullivan &

Artino, 2013). Sullivan & Artino (2013) stated that common uses of the Likert scale include "end-of-rotation trainee feedback, faculty evaluations of trainees, and assessment of performance after an educational intervention" (p. 541). The outcome measure in this DCE will be used to assess the educational handout effectiveness in a pre- and post-test method. The pre- and post-test method is effective in gathering data prior to and after an intervention to identify a difference in knowledge, skills, or attitudes to help advance practice (Zientek, Nimon, & Hammack-Brown, 2016). These results will also provide valuable feedback for therapists on staff to continue quality improvement for the education.

Outcome measure content. The outcome measure using Likert scale questions for the patients were developed by the OT student and cross-referenced with OT's on staff to parallel the content that is presented in the handouts. Each question addresses current levels of understanding in reference to a specific topic on the educational content. Further, it was imperative that the patient outcome measure was written at a 7^{th} – 8^{th} grade reading level to maintain the project theme of readability and health literacy. To keep simplicity with patient responses, each question was scored using the following scale: "1 – no understanding at all, 5- somewhat understand, or, 10- full understanding".

The outcome measure for the clinicians also used a Likert scale and was specifically created for the site mentor to determine the effectiveness and sustainability of the project upon OT student departure. The measure helped to ensure project specific feedback for the OT student and will allow the site mentor to reflect on specific aspects of the project. The site mentor will also be able to indicate future use of the project and perceived impact on the facility.

Process of assessing outcome for this project. Upon patient arrival to the facility, the OTR will distribute the pretest outcome measure as well as the QuickDASH, which is the

functional outcome measure utilized at this site. To avoid bias, the pretest outcome measure will be given to the patient at the evaluation, prior to distributing the educational handout. This allows the clinician to identify the patient's level of understanding and general health literacy prior to the evaluation. Additionally, with this information, the clinician will have the ability to simplify verbal communication in reference to vocabulary and explain specific aspects of the evaluation to the patient in a comprehensive manner. After educating the patient and sending him/her home with the handout, the post-test outcome measure will be given to the patient at the beginning of the 2nd visit. This method will be effective at determining the patient's comprehension for the educational content, allowing the clinician to provide clarity as needed. From the results of these assessments, clinicians can use results and patient feedback to continue improving the quality and effectiveness moving forward.

How the project meets societal need

The development of this project for the DCE site was in response to the expression of societal needs which were identified through a needs assessment and site mentor insight. The societal needs that were noted included: lack of education, decreased health literacy, and readability concerns in the department. The OT student directly addressed these needs by creating readable patient educational handouts and clinician handouts for the most common conditions seen in outpatient therapy practice. Increased health literacy and improved readability in patient education may improve functional outcomes and directly address the concerns within the department. Ideally, as understanding increases for the patient, so does implementation and adherence (Zhang et al., 2014). Additionally, with evidence-based practice provided through the handouts, clinicians can incorporate evidence-based treatment to improve functional outcomes for patients (Wilson et al., 2018).

Overall Learning

Leadership and advocacy

Leadership and advocacy skills were utilized throughout the DCE by the OT student to ensure a professional and successful capstone. Leadership skills such communication, responsibility, decision making, accountability and patience all played a role in the development of the educational handouts over the course of the DCE. As a self-directed capstone, the OT student ensured organization by laying the foundation for expectations prior to beginning the needs assessment. This tied directly into the leadership role of responsibility, as each week required a specific task completion. Other than deadlines, there were no additional accountability measures or parties responsible for the completion of this capstone project. However, discipline was required to maintain communication with the site mentor, complete handouts each week, and continue research. Often, priorities had to be established, forcing the OT student to make individual, on-site decisions for efficiency of task completion. Being a 14-week capstone, the OT student had to develop the leadership skill of patience to manage the trial and error process of handout creation.

Additionally, advocacy skills were implemented during the development of the educational handouts. In addition to the educational content provided on the handouts, the OT student included: “what is occupational therapy” and “the role of occupational therapy” into every common condition handout (Appendix A). This was an effective opportunity to advocate for the profession, as the OT staff (including myself) noted that patients were typically unaware of the difference between OT and physical therapy (PT). Addressing the description and role of the OT profession is imperative and crucial to the credentialing of OT services. Inclusion of this

information on the educational handouts was a strategy to separate the profession of OT in a manner that is comprehensive and relatable to each patient.

Overall learning

The completion of this DCE project was complemented by diverse and effective channels of communication. The OT student was able to establish professional relationships with clients, clinicians, and other professional colleagues throughout the DCE to ensure a successful experience. To establish a client-centered and effective project, the OT student utilized oral and written communication to implement feedback into the educational handouts. During non-structured interviews, the OT student found that the ability to listen to clients was a key communication skill that provoked personal growth as a future clinician and provided a true understanding of perspectives. This type of communication was also appropriate for the topic of readability as it was imperative the OT student utilized vocabulary that was relatable and comprehensive. The OT student and the clinicians on staff had several open discussions about quality improvement for educational handouts. This was professional feedback that increased the validity and reliability of the project. Additionally, upon a rough draft completion of the educational handouts, patients and clinicians were asked to read and offer suggestions. This was an effective form of written communication that influenced the development of the project. The site mentor and OT student had consistent and frequent discussions each day about quality improvement for both project completion and patient care. This was a method that provided organization, structure, and opportunities for suggestions. This DCE experience provided the OT student with the necessary skills to be effective in program development, patient education, clinical skills, and establishment of professional relationships.

References

Alqubayshi, T., Alotaibi, A., & Al-Shahry, F. S. (2018). Measure effectiveness of different approaches of patient education in rehabilitation services. *Indian Journal of Public Health Research & Development, 9*(9).

Beatty, C. R., Flynn, L. A., & Costello, T. J. (2017). The impact of health literacy level on inhaler technique in patients with chronic obstructive pulmonary disease. *Journal of Pharmacy Practice*, *30*(1), 25-30. https://doi.org/10.1177/0897190015585759

Berkman, N. D., Sheridan, S. L., Donahue, K. E., Halpern, D. J., & Crotty, K. (2011). Low health literacy and health outcomes: An updated systematic review. *Annals of Internal Medicine, 155*(2), 97-107. doi: 10.1059/0003-4819-155-2-201107190-00005

Betschart, P., Zumstein, V., Bentivoglio, M., Engeler, D., Schmid, H. P., & Abt, D. (2017). Readability assessment of online patient education materials provided by the European Association of Urology. *International Urology and Nephrology*, *49*(12), 2111-2117. doi:10.1007/s11255-017-1695-7

Brown, F. K. (2016). *Integrating health literacy into occupational therapy* (Unpublished doctoral dissertation). Texas Woman's University, The Repository.

Cervero, R. M., & Gaines, J. K. (2015). The impact of CME on physician performance on patient health outcomes: An updated synthesis of systematic reviews. *Journal of Continuing Education in the Health Professions*, *35*(2), 131-138. https://doi.org/10.1002/chp.21290

Centers for Disease Control and Prevention [CDC]. What is Health Literacy? (2016). Retrieved from https://www.cdc.gov/healthliteracy/learn/index.html

Cole, M. & Tufano, R. (2008). Applied theories in occupational therapy: A practical approach. Thorofare, NJ: SLACK Incorporated.

Dumas, M., Carmody, V., Black, J., & Blake, M. (2018). Readability and quality of patient education materials targeted toward vulnerable populations. *American Journal of Occupational Therapy*, *72*(4_Supplement_1), 7211510194p1-7211510194p1. doi:10.5014/ajot.2018.72S1-PO6015

Eastwood, D., Manson, N., Bigney, E., Darling, M., Richardson, E., Paixao, R., & Abraham, E. (2018). Improving postoperative patient reported benefits and satisfaction following spinal fusion with a single preoperative education session. *The Spine Journal, 0*(00), 1-6 https://doi.org/10.1016/j.spinee.2018.11.010

Eberlin, K. R., Vargas, C. R., Chuang, D. J., & Lee, B. T. (2015). Patient education for carpal tunnel syndrome: Analysis of readability. *Hand*, *10*(3), 374-380. https://doi.org/10.1007/s11552-014-9718-7

Eltorai, A. E., Sharma, P., Wang, J., & Daniels, A. H. (2015). Most American Academy of Orthopaedic Surgeons' online patient education material exceeds average patient reading level. *Clinical Orthopaedics and Related Research*, *473*(4), 1181-1186. https://doi.org/10.1007/s11999-014-4071-2

Ferrari, A., Witschel, H. F., Spagnolo, G. O., & Gnesi, S. (2018). Improving the quality of business process descriptions of public administrations: Resources and research challenges. *Business Process Management Journal*, *24*(1), 49-66. https://doi.org/10.1108/BPMJ-05-2016-0096

Gagné, M., Moisan, J., Lauzier, S., Hamel, C., Côté, P., Bourbeau, J., & Boulet, L. P. (2018).

Comparative impact of two continuing education activities targeted at COPD educators on educational outcomes: Protocol for a non-randomized controlled study using mixed methods. *BMC Health Services Research, 18*(1), 460. https://doi.org/10.1186/s12913-018-3284-6

Hansberry, D. R., Agarwal, N., Shah, R., Schmitt, P. J., Baredes, S., Setzen, M., & Eloy, J. A. (2014). Analysis of the readability of patient education materials from surgical subspecialties. *The Laryngoscope, 124*(2), 405-412. https://doi.org/10.1002/lary.24261

Hansberry, D. R., Agarwal, N., & Baker, S. R. (2015). Health literacy and online educational resources: An opportunity to educate patients. *American Journal of Roentgenology*, *204*(1), 111-116. doi:10.2214/AJR.14.13086

Howard, R., & Smith, G. (2018). Readability of iPledge program patient education materials. *Journal of the American Academy of Dermatology*, *79*(4), e69-e70. https://doi.org/10.1016/j.jaad.2018.05.038

Kapoor, K., George, P., Evans, M. C., Miller, W. J., & Liu, S. S. (2017). Health literacy: Readability of ACC/AHA online patient education material. *Cardiology, 138*(1), 36-40. https://doi.org/10.1159/000475881

Kerzner, H., & Kerzner, H. R. (2017). *Project management: A systems approach to planning, scheduling, and controlling.* Hoboken, N.J. John Wiley & Sons.

Kher, A., Johnson, S., & Griffith, R. (2017). Readability assessment of online patient education material on congestive heart failure. *Advances in Preventive Medicine, 2017*. 1-8. https://doi.org/10.1155/2017/9780317

Liu, C. F., & Kuo, K. M. (2016). Does information overload prevent chronic patients from reading self-management educational materials? *International Journal of Medical Informatics, 89*, 1-8. https://doi.org/10.1016/j.ijmedinf.2016.01.012

Long, A., & Long, B. (2016). Hemingway Editor (version #1) [Mobile application software]. http://www.hemingwayapp.com/

Long, W. W., Modi, K. D., Haws, B. E., Khechen, B., Massel, D. H., Mayo, B. C., & Singh, K. (2018). Assessing online patient education readability for spine surgery procedures. *Clinical Spine Surgery, 31*(2), E146-E151. https://doi.org/10.1097/BSD.0000000000000575

Morony, S., Flynn, M., McCaffery, K. J., Jansen, J., & Webster, A. C. (2015). Readability of written materials for CKD patients: A systematic review. *American Journal of Kidney Diseases, 65*(6), 842-850. https://doi.org/10.1053/j.ajkd.2014.11.025

MedlinePlus. (2017). How to write easy-to-read health materials. Retrieved from https://medlineplus.gov/etr.html

Ndosi, M., Johnson, D., Young, T., Hardware, B., Hill, J., Hale, C., & Adebajo, A. (2016). Effects of needs-based patient education on self-efficacy and health outcomes in people with rheumatoid arthritis: A multicenter, single blind, randomized controlled trial. *Annals of the Rheumatic Diseases, 75(6),* 1126-1132. doi.org/10.1136/annrheumdis2014-207171

American Occupational Therapy Association [AOTA]. (2015). Occupational Therapy Code of Ethics. *American Journal of Occupational Therapy, 69* (Supplement_3):6913410030p1-6913410030p8. doi: 10.5014/ajot.2015.696S03.

Otoo, S. K. W., Hendrick, P., & Ribeiro, D. C. (2015). The comparative effectiveness of advice/education compared to active physiotherapy (manual therapy and exercise) in the management of chronic non-specific low back pain. *Physical Therapy Reviews*, *20*(1), 16-26. https://doi.org/10.1179/1743288X14Y.0000000164

Perez, J. L., Mosher, Z. A., Watson, S. L., Sheppard, E. D., Brabston, E. W., McGwin, G., & Ponce, B. A. (2017). Readability of orthopaedic patient-reported outcome measures: is there a fundamental failure to communicate? *Clinical Orthopaedics and Related Research, 475(8)*, 1936-1947. https://doi.org/10.1007/s11999-017-5339-0

Prabhu, A. V., Gupta, R., Kim, C., Kashkoush, A., Hansberry, D. R., Agarwal, N., & Koch, E. (2016). Patient education materials in dermatology: Addressing the health literacy needs of patients. *JAMA Dermatology*, *152*(8), 946-947. doi:10.1001/jamadermatol.2016.1135

Sonnino, R. E. (2016). Health care leadership development and training: Progress and pitfalls. *Journal of Healthcare Leadership, 8,* (19). doi: 10.2147/JHL.S68068

Shah, A. K., Paul, H. Y., & Stein, A. (2015). Readability of orthopedic oncology-related patient education materials available on the internet. *Journal of the American Academy of Orthopaedic Surgeons*, *23*(12), 783-788. doi: 10.5435/JAAOS-D-15-00324

Stephens, A. (2015). Hemingway Editor. *Children's Book and Media Review*, *36*(5), 20.

Sullivan, G. M., & Artino Jr, A. R. (2013). Analyzing and interpreting data from Likert-type scales. *Journal of Graduate Medical Education*, *5*(4), 541-542. doi: 10.4300/JGME-5-4-18

Warren, M., DeCarlo, D. K., & Dreer, L. E. (2016). Health literacy in older adults with and without low vision. *American Journal of Occupational Therapy*, *70*(3), 7003270010p1 7003270010p7. doi:10.5014/ajot.2016.017400

Williams, A. M., Muir, K. W., & Rosdahl, J. A. (2016). Readability of patient education materials in ophthalmology: A single-institution study and systematic review. *BMC Ophthalmology*, *16*(1), 133. https://doi.org/10.1186/s12886-016-0315-0

Wilson, A. B., Barger, J. B., Perez, P., & Brooks, W. S. (2018). Is the supply of continuing education in the anatomical sciences keeping up with the demand? Results of a national survey. *Anatomical Sciences Education, 11*(3), 225-235. https://doi.org/10.1002/ase.1726

Zhang, N. J., Terry, A., & McHorney, C. A. (2014). Impact of health literacy on medication adherence: A systematic review and meta-analysis. *Annals of Pharmacotherapy, 48*(6), 741-751. https://doi.org/10.1177%2F1060028014526562

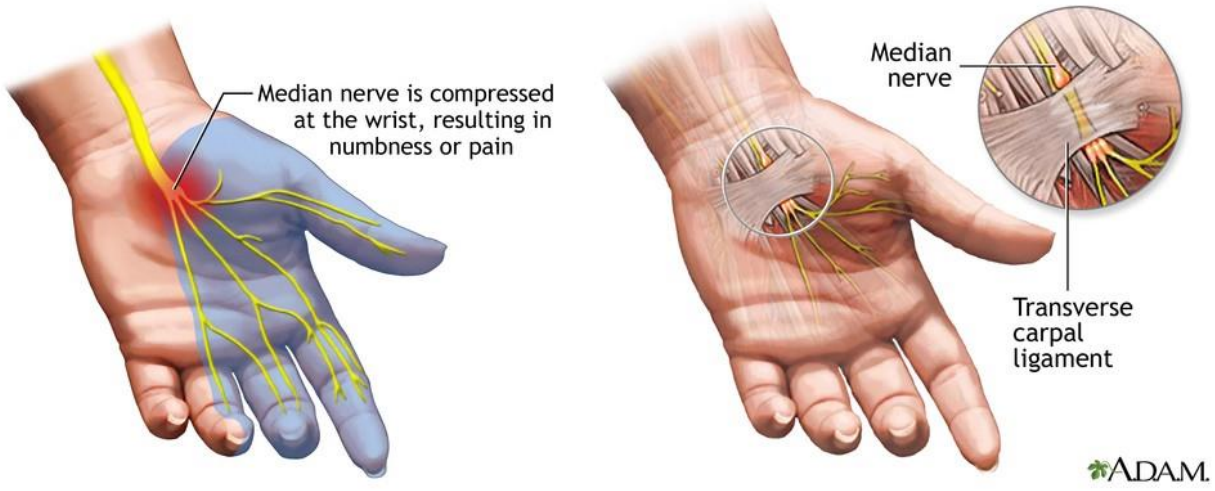
Zientek, L., Nimon, K., & Hammack-Brown, B. (2016). Analyzing data from a pretest-posttest control group design: The importance of statistical assumptions. *European Journal of Training and Development*, *40*(8/9), 638-659. https://doi.org/10.1108/EJTD-08-2015-0066

Appendix A

Patient educational handout

Carpal Tunnel Syndrome and Occupational Therapy

What is carpal tunnel syndrome? Injury or compression to what we call the "median nerve", which is a nerve that starts in your spine and travels down into your hand through a tight space called the "carpal tunnel" (located in your wrist). This nerve controls muscles in your hand and provides sensation to the palm side of your forearm, your thumb, pointer finger, and half of your middle finger



What causes carpal tunnel syndrome?

- If you bend or straighten your wrist over and over again
- Holding your wrist in a stretched, extended, or bent position (often)
- Arthritis or swelling in wrist
    - Any of the above items may pinch or squish the nerve running through the wrist causing symptoms of carpal tunnel

What are the signs or symptoms of carpal tunnel syndrome?

- Numbness and tingling on the palm side of wrist, thumb, pointer, and half of middle finger
- Loss of muscle around the thumb
- Sometimes muscles in the hand will not work
- Dropping items
- Sleep disturbances

Possible ways to prevent or treat carpal tunnel symptoms:

- avoid sustained pinching or gripping
- avoid bent or flexed wrist postures - keep wrist neutral
- avoid repetitive movement
- schedule positional changes during work or tasks
- occupational therapy
- surgical intervention is possible if conservative management does not relieve symptoms

What is occupational therapy? Occupational therapy (OT) is a healthcare job that is able to test and treat any person in any setting who has an injury or disability to help them be able to do the things they want and need to do.

- Occupational therapists will develop a relationship with you to gather relevant information about your life and daily routine
- Occupational therapists will test:
    - your ability to move during daily tasks
    - strength
    - range of motion
    - sensation
    - brain function (if necessary)
- Occupational therapists will create solutions to fit your needs.

Role of occupational therapy with your carpal tunnel:

- Identify the source of your carpal tunnel symptoms
- Identify what specific challenges you have every day as a result of your carpal tunnel and create solutions
- Increase independence by using special equipment, manual techniques, exercise demonstration, general education, activity modification strategies, and splinting to help you regain motion, strength, sensation, and function.
    - range of motion exercises (shoulder, elbow, forearm, wrist, fingers)
    - nerve glides
    - massage (wrist)
    - stretches (shoulder, elbow, forearm, wrist, fingers)
    - strengthening (shoulder, elbow, forearm, wrist, fingers)
    - ice/heat - contrast bath (hot and cold submerge)
    - Ultrasound, fluidotherapy, paraffin
- Custom make splint for you if necessary
- Discuss and show home exercise program
- WHATEVER YOU NEED!

Types of splints: neutral wrist splint, recommended to wear at night

Daily activity modifications:

- Plan rest breaks
    - Complete wrist stretches during this time
- Avoid carrying heavy items
- Wear clothing that is easy to fit (button up shirt, slip on shoes)
- Increase grip handles when cooking in kitchen
- Use electronic items in kitchen (e.g. electric can opener vs. a hand can opener)
- Reduce resting your hand on surfaces for long periods of time

When will I recover from carpal tunnel syndrome? Every client has different carpal tunnel symptoms, making it difficult to set a timeline for recovery. However, with occupational therapy and completion of home exercises, you will have the tools to recover.

Resources

Ergonomic tools: https://www.brownmed.com/blog/carpal-tunnel-syndrome/5-carpal-tunnel-relief-products-you-need-at-work/

Appendix B

Clinician educational handout

Carpal Tunnel

What is a carpal tunnel syndrome (CTS)? Carpal Tunnel Syndrome (CTS) is a common problem affecting hand function, caused by compression of the median nerve at the wrist. (**https://www.aans.org/Patients/Neurosurgical-Conditions-and-Treatments/Carpal-Tunnel-Syndrome)**

What causes CTS? The terminal portion of the median nerve is particularly vulnerable to compression in this area because it is sandwiched between these flexor tendons and a volar carpal ligament (Cooper, 2014, pg. 288)

Signs or symptoms of CTS: numbness, tingling, muscle deformity (ape hand), first web space shortening, muscle weakness. Areas primarily affected include: volar thumb, index, long, and medial half of the ring digits, dropping items, sleep disturbance (Cooper, 2014, pg. 289)

Role of occupational therapist with CTS:

- Build rapport with your client
- Educate and advocate for OT
- Identify source of your clients symptoms (cervical, CTS, pronator syndrome, anterior interosseous syndrome)
- Identify what specific challenges the client has every day as a result of CTS and implement solutions (ADLs, IADLs, community/mobility, leisure, and social participation)
    - Assess: ROM, MMT, grip/pinch strength, fine motor, pain, sensation, edema, positioning, skin integrity, comorbidities
- Increase independence for the client by developing strategies/interventions to help them regain strength, motion, sensation, and overall function
- Instruct/demonstrate home exercise program (tendon glides, AROM, massage, etc.)
- Fit client for orthosis if necessary

Provocative tests: Phalen's, reverse phalen's, tinel's sign, ballantine's sign (AIN), berger's test (lumbrical contribution), resisted elbow flexion/pronation (pronator syndrome)

Evidence based interventions: ***wrist immobilization splint*** (Ghasemi-rad, 2014), ***tendon glides (***Hirata et al., 2016) ***nerve glides (***Hirata et al., 2016), ***manual therapy*** (Bongi, Signorini, Bassetti, Del Rosso, Orlandi, & De Scisciolo, 2013; Mohamed, Hassan, Abdel-Magied, & Wageh, 2016), ***kinesio taping*** (Chesterton, 2018; Kaplan,Akyuz, Kokar,& Yagci, 2018), ***low laser treatment*** (Chesterton, 2018), ***mechanical wrist traction*** (Meems, 2017) ***scapular strengthening***, ***corticosteroid injection*** (Martins & Siqueira, 2017), ***wrist AROM***, ***strengthening***, ***yoga (Wipperman, & Goerl, 2016)***

Common modalities: ultrasound, ice, heat, paraffin (Ordahan & Karahan, 2017)

Common Orthoses used: wrist immobilization splint - primarily worn at night but can be used during the day to control work postures and symptoms (cooper, 2014, pg. 291) (Martins & Siqueira, 2017)

Differential diagnosis: Anterior nerve palsy, pronator syndrome

CTS EBP References

Bongi, S. M., Signorini, M., Bassetti, M., Del Rosso, A., Orlandi, M., & De Scisciolo, G. (2013). A manual therapy intervention improves symptoms in patients with carpal tunnel syndrome: a pilot study. *Rheumatology international*, *33*(5), 1233-1241.

Chesterton, L. S., Blagojevic-Bucknall, M., Burton, C., Dziedzic, K. S., Davenport, G., Jowett, S. M., & Hay, E. M. (2018). The clinical and cost-effectiveness of corticosteroid injection versus night splints for carpal tunnel syndrome (INSTINCTS trial): an open-label, parallel group, randomised controlled trial. *The Lancet*, *392*(10156), 1423-1433.

Cooper, C. (Ed.). (2013). *Fundamentals of hand therapy: clinical reasoning and treatment guidelines for common diagnoses of the upper extremity*. Elsevier Health Sciences.

Ghasemi-rad, M., Nosair, E., Vegh, A., Mohammadi, A., Akkad, A., Lesha, E., & Hasan, A. (2014). A handy review of carpal tunnel syndrome: From anatomy to diagnosis and treatment. *World journal of radiology*, *6*(6), 284.

Hirata, J., Suzuki, T., Yamamoto, T., Miyazaki, Y., Ogasahara, Y., Hashizume, H., & Inoue, K. (2016). Effects of tendon and nerve gliding exercises and instructions in activities of daily living following endoscopic carpal tunnel release. *Asian Journal of Occupational Therapy*, *11*(1), 35-41.

Kaplan, B. M., Akyuz, G., Kokar, S., & Yagci, I. (2018). Comparison of the effectiveness of orthotic intervention, kinesiotaping, and paraffin treatments in patients with carpal tunnel syndrome: A single-blind and randomized controlled study. *Journal of Hand Therapy*.

Martins, R. S., & Siqueira, M. G. (2017). Conservative therapeutic management of carpal tunnel syndrome. *Arquivos de neuro-psiquiatria*, *75*(11), 819-824.

Meems, M., Spek, V., Kop, W. J., Meems, B. J., Visser, L. H., & Pop, V. J. (2017). Mechanical wrist traction as a non-invasive treatment for carpal tunnel syndrome: a randomized controlled trial. *Trials*, *18*(1), 464.

Mohamed, F. I., Hassan, A. A., Abdel-Magied, R. A., & Wageh, R. N. (2016). Manual therapy intervention in the treatment of patients with carpal tunnel syndrome: median nerve mobilization versus medical treatment. *Egyptian Rheumatology and Rehabilitation*, *43*(1), 27.

Ordahan, B., & Karahan, A. Y. (2017). Efficacy of paraffin wax bath for carpal tunnel syndrome: a randomized comparative study. *International journal of biometeorology*, *61*(12), 2175-2181.

Wipperman, J., & Goerl, K. (2016). Carpal Tunnel Syndrome: Diagnosis and Management. *American family physician*, *94*