# Web-Based Education to Support Treatment of Low Back Pain

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## Abstract

**Background:** Low back pain is one of the most common causes for seeking medical care in the United States. It is estimated that nearly 85% of individuals will experience back pain in their lifetimes with 23% of them progressing to chronic low back pain. The use of technology has been documented as a potential method for improving outcomes associated with musculoskeletal complaints such as function, pain, quality of life, and self-efficacy.

**Objective:** The purpose of this study was to evaluate the effectiveness of implementing web-based education to support low back pain treatment for working-aged patients with low back pain when integrated with standard care. Secondary aims of this study are to examine the impact on reported pain levels, self-efficacy, and satisfaction with the web-based intervention in managing low back pain.

**Methods:** A convenience sample of 17 participants was recruited from a sub-specialty spinal clinic and pre- and post-intervention comparisons were completed using validated questionnaires to evaluate function, pain, and self-efficacy. All participants were encouraged to complete questionnaires online and then to access web-based intervention throughout study period. Descriptive statistics and inferential statistics were completed on participants completing pre-intervention questionnaires (n=15) and post-intervention questionnaires (n=6).

**Study Design:** Pre- and post-intervention design

**Results:** Overall response rate for intervention was 35%. Demographics showed the majority of the sample to be female, white, and over the age of 40. There was no statistical significance in changes in function, pain, self-efficacy, or within group differences of pre- and post-intervention groups. Qualitative data suggests participants find this intervention acceptable and of value for obtaining education and information.

**Conclusions:** The use of web-based education is to support treatment of low back pain and further research is needed to determine impact to function, pain, and self-efficacy.

**Key Words:** low back pain, web-based, education, function, self-efficacy

Web-Based Education to Support Treatment of Low Back Pain

## Introduction

Low back pain (LBP) is one of the most common complaints that causes individuals to seek care in the United States and around the world (Casazza, 2012). These complaints may range from acute pain lasting less than six weeks to chronic pain lasting more than six weeks causing loss of optimal function of one or more components of the musculoskeletal system (Dunphy, 2017). Even more significantly, LBP has been identified as the leading cause for disability worldwide and has been shown to be more prevalent in countries with higher life-expectancies (Hoy et al., 2014). LBP is also the highest ranked cause of years lived with disability in the United States and the burden of this disorder expected to rise as populations age (Mokad et al., 2018). The prevalence and potential for disability related to LBP necessitates the implementation of effective strategies to treat this condition. Evidence shows that there is a high risk of relapse of LBP, making it imperative to provide quality education and support to those who present with this condition (Hestbaek, Leboeuf-Yde, & Manniche, 2003). The purpose of this project was to evaluate the effectiveness of using web-based education to support restoration of function, reduction of pain, and improvement of self-efficacy in patients with LBP.

## Background

The 2016 American College of Occupational and Environmental Medicine guidelines differentiate back pain into varying groups of acute (less than one month), subacute (one to three months), and chronic (more than three months) with recommendations for each category. Guidelines from American College of Physicians, Department of Veteran Affairs, and American College of Occupational and Environmental Medicine have little variance in treatment recommendations for the LBP (Qaseem et al., 2017; Hegman, 2008; U.S. Department of

Veterans Affairs, 2017). Acute back pain treatment consists of promoting activity as tolerated, heat and ice application, non-steroidal anti-inflammatories, and education on managing LBP (Qaseem et al, 2017). Patients whose back pain becomes subacute are recommended to include medically prescribed exercise, skeletal muscle relaxers, massage, and acupuncture as additional treatment options (Hegman, 2008). Patients with LBP lasting more than three months are categorized as having chronic back pain and many guidelines prompt providers to consider adding modalities such as multidisciplinary rehabilitation, cognitive behavioral therapy, and mindfulness training to the plan of care. Initial complaints of acute and subacute back pain have high rates of resolution regardless of treatment modality (Qaseem et al., 2017). Self-management strategies, including exercise in the form of stretching and strengthening for the management of LBP, are recommended for treatment and prevention of LBP (Schaafsma, Anema, & van der Beek, 2015). The use of general stretching and strengthening exercises may be beneficial when teaching self-care to patients with more individualized regimens providing greater improvement in pain (Matheve, Brumagne, & Timmermans, 2017). The primary goal in the treatment and management of LBP is to restore function while pain management and promotion of self-efficacy are secondary goals (Hegmann, 2008).

The costs associated with the treatment and management of back pain have steadily risen since 1996 according to the Agency for Healthcare Research and Quality (AHRQ) in the 2014 Medical Expenditure Panel Survey (MEPS). MEPS data indicate that the direct cost of LBP has risen from $12 billion annually in 1996 to more than $47 billion in 2014. While the direct costs associated with LBP are high, there are other indirect costs associated with these conditions that are estimated to be several times higher than direct costs alone (Katz, 2006). Substantial indirect costs to consider include lost wages, decreased productivity, and time lost due to treatment of

LBP. The American Federation of Labor and Congress of Industrial Organizations (AFL-CIO) reports that musculoskeletal disorders are attributed to up to 35% of all events that result in work days lost in the United States (Bhattacharya, 2014). In 2016, the Bureau of Labor Statistics (BLS) reported that 12 days is the median number of days needed for recuperation from musculoskeletal disorders. Exploration into cost-effective interventions to promote return to function and work is needed to reduce the burden of this disorder.

**Technology Support**

The use of telehealth in the form of web-based interventions as a method for addressing health concerns has been growing as technology has become more readily available. The Center for Connected Health Policy defines telehealth as the use of a variety of technologies to provide education and services that contribute to the management of health. There has been considerable promise shown in several telephonic, web-based, and mobile application interventions in treatment of musculoskeletal disorders including LBP (del Pozo-Cruz, Adsuar, Parraca, Pozo-Cruz, Moreno, & Gusi, 2012; Ellander, Robinson, & Morris, 2011). These methods of care delivery have been shown to be effective ways to provide education and resources that can improve outcomes associated with pain, function, and beliefs about self-efficacy (Bhattarai & Phillips, 2017). The use of telehealth options for the delivery of healthcare interventions is generally accepted as a supplement to face-to-face interactions and not as a stand-alone replacement for traditional therapy (Cranen et al, 2017). While several studies have shown promise of the positive impacts in the management of back pain, there appears to be little standardization of methods for implementation and content along with mixed results of measurements (Dario et al., 2017; Tenforde et al., 2017).

LBP is a prevalent and costly condition affecting individuals all around the world. The need to develop and implement efficient and cost-effective methods for providing care to reduce the burden to patients and organizations is evident. There may be opportunities for application of technology to support patient education, self-management, and adherence to prescribed treatment plans for LBP to improve function. The purpose of this project was to determine the effectiveness of implementing a web-based educational self-management program to support management and treatment of LBP.

## Literature Review

### Search Strategy

A review of the literature was conducted to determine current evidence concerning web-based interventions to support management of LBP with a focus on improving function in working age adults. Additional outcomes evaluated included decreasing pain, increasing self-management efficacy, and promoting quality of life. A search for articles that focused on web-based interventions in the treatment or management of adults with musculoskeletal LBP was conducted. The initial search was kept broad in scope to allow for a larger number of initial results. A search for peer-reviewed, scholarly articles was conducted within the following databases: CINAHL, PubMed, Web of Science, SPORTDiscus and Cochrane Library. MeSH terms and Boolean phrases were used to define and revise the initial search for articles. There was discrimination of articles based on level of evidence for the purpose of this review and studies were limited to randomized control trials (RCTs). The search was conducted with year restrictions of 2008-2018, adult populations, and was limited to articles published in the English language. The search terms that were used included the following: “web”, “internet”, “online”, “telehealth”, “low back pain”, “dorsalgia”, “dorsodynia”, and “lumbar pain”. Additional

ancestry searches were performed on previously performed systematic reviews on telehealth options for the assessment and management of musculoskeletal back pain.

**Inclusion and Exclusion Criteria**

Inclusion criteria for articles included being published in the English language, adults ages 18 and older who are primarily working-aged (less than 65 years), and discussing any form of web-based intervention for LBP. Level of evidence was considered to be valuable for evaluating best evidence leading to selection of only RCTs for inclusion. Exclusion criteria included studies addressing multiple areas of pain, chronic or systemic diseases that could contribute to back pain, such as fibromyalgia, frail elderly, upper back pain, and prevention only focus.

**Selection of the Articles**

Once the initial search was completed, a total of 103 articles were found and exported to a citation manager that allowed for sorting and reviewing of article data. The Prisma diagram found in Figure 1 highlights the steps in the article selection process. The articles were evaluated for redundancy using an "exact duplicate" and "close duplicate" function to eliminated multiple instances of the same work. The remaining 93 articles were then evaluated by title using inclusion and exclusion criteria. Ambiguous titles were advanced to allow for further evaluation. Titles that contained terms not readily identified as being associated with web-based interventions or LBP were excluded, resulting in 39 articles for abstract review. Abstracts were reviewed and any articles that did not meet inclusion criteria or were found to meet exclusion criteria were eliminated, leaving 26 articles for full text review. Full article reviews were completed on the remaining articles and were included or excluded depending on the contents. Articles found to meet inclusion criteria had their reference lists evaluated for articles that could

be considered relevant for inclusion through ancestry search with only one further addition. A total of nine RCTs were found that met the criteria for inclusion in this literature review. A brief synopsis of the characteristics and findings associated with these articles can be found in Table 1.

**Telehealth and Guidelines**

Current guidelines advise providing evidence-based treatment information concerning management and self-care options but do not advocate one method of delivery over another (Qaseem et al., 2017). The increasing availability of access to technology and the internet encourages the exploration of telehealth modalities for supporting patient education and treatment needs. Multiple studies have sought to determine the effectiveness of differing methods of telehealth interventions in promoting prevention and treatment of LBP, but the results are mixed with no clear superior method. While there are mixed results, data support the continued examination and use of telehealth in the support of treatment and self-management of LBP. This supports investigation of a web-based telehealth program to support improved function and return to work rates in working aged adults with LBP

**Telehealth and Function**

The literature review identified nine RCTs that met inclusion criteria for how web-based interventions were being used to support treatment of patients with LBP. Five of the studies focused on web-based interventions to improve function in managing back pain (Calner et al., 2017; Chiauzzi et al., 2010; Del Pozo-Cruz et al., 2012; Irvine et al., 2015; Krein et al., 2013); eight included pain level assessment (Calner et al., 2017; Carpenter, Stoner, Mundt, & Stoelb, 2012; Chiauzzi et al., 2010; Del Pozo-Cruz et al., 2012; Irvine et al., 2015; Krein et al., 2013; Nordin, Michaelson, Gard, & Eriksson, 2016; Riva, Camerini, Allam, & Schulz, 2014); and five addressed perceived self-efficacy (Carpenter et al., 2012; Chiauzzi et al., 2010; Irvine et al.,

2015; Krein et al., 2013; Nordin et al., 2016). Three of the trials did not perform a power analysis or failed to document analysis (Carpenter et al., 2012; Chiauzzi et al., 2010; Irvine et al., 2015) and five did not meet the power needed for statistical significance (Calner et al., 2017; Del Pozo-Cruz et al., 2012; Krein et al., 2013; Nordin et al., 2016; Weymann, Dirmaier, von Wolff, Kriston, & Harter, 2015).

There were several different methods of measurement used among the trials with no two using the exact same methods of measurement for primary outcomes. Two articles, authored by Irvine et al (2015) and Del Pozo-Cruz et al. (2012), described web-based interventions for the management of LBP to improve functionality and quality of life. Irvine et al. (2015) performed an RCT of a web-based program, Fitback®, to determine the efficacy in improving functionality and quality of life for individuals with LBP compared with an alternate treatment group and a non-intervention group. The authors reported significant change (*p*-values less than 0.05) associated with prevention-helping behaviors, knowledge, self-perceived responsibility, and emotional aspect of SOPA at the two-month reassessment. Additionally, the final assessment found significance for improvement in pain level, knowledge, self-efficacy, control aspect of SOPA, and self-reported health status. There was no power analysis for this study. Del Pozo-Cruz et al. (2012) performed a similar study to determine the effects of a web-based program for back pain compared to standard occupational care. The results found were comparable to the findings from Irvine et al. with significance in improvement in self-reported functionality, quality of life, and chronicity based on ODQ, STarT Back Screening Tool, and European Quality of Life questionnaire Five Levels Three Dimensions (EQL-5D-3L). However, this trial failed to meet the necessary sample size for the power analysis that was performed.

Chiauzzi, et al. (2010) performed a similar study on the effectiveness of the web-based self-management and cognitive-behavioral therapy (CBT) program, painACTION-Back Pain, compared with text only back pain guide in improving function, pain levels, self-efficacy, and beliefs about LBP. Measures were taken using the Brief Pain Inventory (BPI), Oswestry Disability Index (ODI), Depression Anxiety Stress Scale (DASS), Patient Global Impression of Change (PGIC), Chronic Pain Coping Inventory-42 (CPCI), PCS, Pain Self-Efficacy Questionnaire, and FABQ. Chiauzzi et al. found that there were significant improvements in stress management, positive outlook, and coping ability from DASS, CPCI, and PGIC but no significant improvement in function, self-efficacy, or pain levels according to the PSEQ, BPI, and FABQ. The authors reported improvement in several of the aims but had a substantial attrition rate for control and intervention groups of 69% and 70% respectively. There was no power analysis performed and generalizability of the study appears poor. Conversely, a trial conducted by Krein et al. (2013) found that the use of a pedometer and web-based goal setting, education materials, and peer support had the opposite effect. The results of the trial found significant increases in improved function based on the Roland-Morris Disability Questionnaire (RMDQ) and a functional pain scale while showing a significant decrease in perceived self-efficacy. This trial also failed to meet power.

Carpenter, Stoner, Mundt, & Stoelb (2012) found that a web-based self-help program promoting education on management of LBP was effective. The study found significance in improvement for five of seven areas of the Survey of Pain Attitudes (SOPA), Pain Self-Efficacy Scale, physical activity portion of the Fear Avoidance Beliefs Questionnaire (FABQ), Pain Catastrophizing Scale (PCS), and Negative Mood Regulation Scale. However, no significant improvement was found for the RMDQ the impact of work portion of the FABQ, and Pain

Assessment Questionnaire. The study did use randomization for the comparison groups but failed to perform a power analysis. The research from this article does show significance for the assessment and management of LBP but fails to show any real direct impact to pain levels.

**Telehealth and Self-Efficacy**

Only one study focused on impact of telehealth for LBP on ability to perform work, measuring perceived impact of work-related tasks and health through the Work Ability Index (Calner et al., 2017). Pain, disability, and quality of life were measured secondary outcomes utilizing the Visual Analogue Scale, Pain Disability Index, and Short Form 36. This was one of the few studies that was based out of a primary care clinic instead of a preventive or rehabilitative setting. The study failed to find significance for the interventions. However, the study did fail to meet power.

A final study by Riva et al. (2014) sought to determine the impact of web-based telehealth interventions on patient empowerment, self-efficacy, and health status. The Psychological Empowerment Scale was used to determine empowerment and self-efficacy for the trial while a Short Questionnaire to Assess Health-Enhancing Physical activity and Chronic Pain Grading Scale were used to determine health status. The study did find significant improvement in empower, self-efficacy, and pain, but failed to have improvement in physical activity. While the trial did meet power, the sample sizes were small, not generalizable, and was conducted over a limited time frame of 8 weeks.

**Research Gaps**

The literature review revealed that there is variance in the outcomes of many of the studies with regards to pain and function. The area of mobile health applications and web-based methods had the most readily available information considered to be of high level of evidence in

the form of RCTs. There is evidence to support the use of these intervention styles in the self-management of LBP, but there is still mixed evidence of impact on return to function, pain, and disability. Variation in these findings could be explained by the use of multiple differing scales of measurement instead of a standardized method. Mobile and web-based options are varied and can be highly customizable to support a more tailored approach for self-management of LBP arguing that differences in procedure may impact outcomes. There are study protocols published that begin to address the use of tailored interventions, however, no data had been collected to date (Dirmaier, Harter, & Weymann, 2013). Further investigation into the standardization of tailored self-care applications and the impact on LBP could prove to be beneficial.

Functional ability was a common theme in the literature and was measured using multiple differing questionnaires and indexes in five of the studies reviewed. The results of studies were varied along with the tools used for assessment. An example is the ODI and Fear Avoidance Beliefs Questionnaire being the only two function measurements that were similar in two different studies (Carpenter et al., 2012; Chiauzzi et al., 2010; Del Pozo Cruz et al., 2012; Krein et al. 2013). The resulting measurements of functional ability were split with two studies showing no statistically significant improvement and three showing improvement. The two trials utilizing the ODI found conflicting evidence of functional ability measured (Chiauzzi et al., 2010; Pozo-Cruz et al., 2012). Only one trial focused on work ability specific outcomes and found no significant improvements compared to the control group (Calner et al., 2017). While there is apparent variance between studies in terms of measures and outcomes, it is noted that these studies were lacking in power analyses or did not meet the power needed causing the significance of results to be called into question.

Participant pain level was another common theme that was measured using multiple methods and with mixed results across studies. Four of the studies reported significant reductions in LBP while another four found no statistically significant reductions. Methods of pain measurement ranged from numerical pain scales reporting alone to embedded measurements is other questionnaires. Unlike with functional measurements, there did not appear to be any method of measurement for pain alone that was used more than once.

Self-efficacy is a supported component of managing LBP and was measured in a majority of the trials. There was no clear consensus on the efficacy of web-based interventions for improving self-efficacy with three of the trials showing no significant improvement and three showing significant improvement. Of the three studies that showed no improvement in self-efficacy, one found that there was an actual decrease in the self-efficacy for management of LBP (Krein et al., 2013). Only one study focused on empowerment as a measure of self-efficacy and found improvements to be significant (Riva, Camerini, Allam, & Schulz, 2014). As with the previous themes, there was no standard unit of measurement for self-efficacy and little redundancy of tools used. Again, only two of the studies provided both a power analysis and met the power required to show significance with two of the remaining failing to note performing an analysis and four failing to meet power.

The literature review revealed many common themes but lacked any standardized methods for eliciting data. The measurement scales used in the majority of the trials were very subjective in nature and relied on self-reporting of patient information for results of interventions. There appeared to be very few tools that utilized objective data for measurements presented in the trials, but still relied on self-reporting of this data. Across the nine studies there was no consistent method of outcome measurement with more than five tools function, six for

pain, four for self-efficacy, and four for quality of life. Aside from the heterogeneity of the outcome measures, instances of research studies that measured outcomes using the same tools were found to have some conflicting results. Del Pozo-Cruz and Chiauzzi measured function with the ODI and reported conflicting results for their interventions showing significant improvement and no improvement respectively. While the interventions for many of the studies are not completely homogenous, there is enough similarity to raise questions concerning the need for further research surrounding these results. There is a clear need for further investigation into the effects of web-based support interventions for the treatment of LBP.

### Purpose

LBP is one of the most common causes for patient to seek medical care and is estimated to affect more than 80% of the population at one point (Golob &Wipf, 2014). Patient education and resources are important aspects in promoting self-care activities that support the management of LBP. Providing readily available and accessible education in conjunction with standard of care improves patients' self-efficacy in managing LBP. The purpose of this study is to utilize a web-based education program in conjunction with standard treatment for LBP to improve patient's reported function, pain, and self-efficacy. Secondary aims will focus on the evaluation of patient satisfaction in the method of education delivery.

## Methods

### Research Design

This project used a quasi-experimental approach to examine the effectiveness of and satisfaction with a web-based education intervention in the support of treatment and management of LBP. A one group pretest/posttest design was used to determine the effectiveness of the intervention in promoting function, reducing pain, and improving self-efficacy. Satisfaction

scores were obtained to identify patient perceptions surrounding the method of intervention delivery.

**Hypotheses**

The null hypothesis is that using a web-based education intervention to support LBP management will have no effect on function, pain, or self-efficacy. The alternative hypothesis is that using a web-based education intervention to support LBP management will have an effect on function, pain, or self-efficacy.

**Definition of Terms**

Acute LBP: pain lasting less than four weeks (Hegmann, 2008)

Chronic LBP: pain lasting great than 12 weeks (Hegmann, 2008)

Function: the ability to perform or participate in a physical task with regards to a body system or activity (Cifu, 2016)

Low back pain (LBP): pain resulting from injury, such as sprain or strain, to the supporting musculature around the lumbar vertebrae (Dunphy, 2017).

Pain: perceived noxious stimuli that results in unpleasant sensations or decreased tolerance for activities

Self-efficacy: beliefs pertaining to one's ability to perform tasks such as physical function or managing pain (Nicholas, 2012).

Subacute LBP: pain lasting more than four weeks but less than 12 weeks (Hegmann, 2008)

Web-based technology: any method of using equipment, such as computers, laps tops, tablet, or phones, to access the internet to obtain information or support.

Telehealth: any method of technology used to deliver education, support, or interventions that impact knowledge, behaviors, or activities directly relating to health.

**Setting**

Recruitment for this project took place in an academic healthcare system clinic that focuses on orthopedic spinal complaints. The clinic consists of a multidisciplinary staff mix of three physicians, rotating medical students, two physician assistants, and nursing staff. This specialty clinic was capable of providing care to patients with spinal complaints with over 90 encounters per day among the provider staff. The intervention portion of this project was web-based and could be accessed from a variety of settings including home, work, or other setting that supported access to the intervention.

**Protection of Human Subjects**

Study approval was obtained through the University of Virginia Institutional Review Board for Health Sciences Research, IRB-HSR # 21018 and is shown in Appendix A along with modification approval. Consent was obtained prior to participant inclusion into the study and only limited personal information, in the form of name and e-mail address, was obtained. Participants were instructed to perform any activities prescribed to a level that is comfortable to them and to reduce the activity if it is too high. Any harm as a result of the study was to be recorded and reported to faculty members for appropriate reporting procedures. Data was collected through university approved software that met requirements for collection of highly sensitive data and personally identifiable information was removed prior to data analysis.

**Program Description**

All patients received standard care and assumed education as indicated by current guidelines and were given an additional online education intervention. This intervention was to

serve as a supplement to the standard of care and education provided and was not intended to be utilized as stand-alone therapy. The web-based educational intervention consisted of patient education material located on a website that was readily accessible to patients. Access was obtained through a link provided via handouts during initial intake into the study and embedded links in scheduled follow-up emails to participants.

The intervention consisted of a centralized collection of educational text, video, and other resources addressing a range of information and activities to promote treatment and management of LBP. A commercially available web-site generator was used to house this information and was made available at https://tca6gp.wixsite.com/lowbackpain (Appendix B). The text-based materials were obtained from reputable patient education resources such as UpToDate, nationally recognized healthcare organizations, and government run health agencies. These resources provided information on common causes of LBP, back anatomy, medical and self-care treatment options, and recommended prevention activities. Currently, many of these materials are readily available through a patient education repository but only accessible by healthcare workers for use in providing patient education. While these materials may be provided to the patient, they are not readily available for patients to access on his or her own. Video links were provided that directed patients to websites from nationally recognized organizations that provided care and education to patients with LBP. These videos served to educate patients on activities that can aid in managing current episodes and strategies in preventing future occurrences of LBP. Video demonstrations of stretching and strengthening exercises instructed patients on the correct performance of these activities. Additional links to external resources were provided to allow patients opportunities to examine other educational materials from reputable entities.

## Description of Sample

The sample consisted of a convenience sample of working-age adults, ages 18-65, from a specialty clinic within an academic healthcare system who presented with complaints of LBP. Participants were screened for inclusion criteria of: the presence of LBP, access to the internet, working e-mail account, and primary language of English. Patients were not included in the study if comorbid conditions or red flag symptoms existed that could confound or contribute to the presence of LBP such as: history of malignancy or cancer, spinal surgery, autoimmune disorders, recent spinal fracture, bowel or bladder dysfunction, perineal or saddle anesthesia, weakness or loss of sensation in lower extremities, recent history of fever or chills, or conditions that the patient feels would limit his or her ability to participate in the study. Patients could not have serious spinal conditions, pre-existing disability, no functional limitations to required treatment, or be enrolled in another program from management of LBP. Demographic data was collected on participants through the use of an online survey that can be seen in Appendix C.

## Measures

### Function

The ODI was selected as the measure of function for participants for its ease of use, reliability, and low time burden for patients. The ODI, as seen in Appendix D, is a validated method of functional measurement and may be used to determine levels of perceived function or disability (Lee, Fu, Liu, &Hung, 2017). This tool is a 10-section questionnaire that asks patients to evaluate how LBP is affecting their ability to perform tasks associated with daily living. Sections address pain intensity, ability to perform physical activities such as lifting, walking, and standing, sleep, social activity, and traveling. The selections for each item in the ODI are assigned point values ranging from zero to five. The responses are then tallied to produce a total

score ranging from 0 to 50, unless the optional item of Sex Life is omitted, in which case the total possible score is adjusted to 0 to 45. The total score is then divided by total possible score to provide a percentage level that is associated with levels of disability. Calculated scores of 0% to 20% indicate minimal disability, 21% to 40% indicate moderate disability, 41%-60% are severe disability, 61% to 80% are considered crippled, and 81% to 100% are bed bound or exaggerating their symptoms (Fairbanks & Pynsent, 2000). Chiarotto et al. (2016) performed a systematic review with meta-analysis and found that the ODI had better reliability and lower errors compared with other physical functioning tools. This measurement tool has a low time burden for completion with average completion of five minutes (Vianin, 2008).

**Pain**

A simple numeric pain scale was used in this study to evaluate the participants' perceived level of pain across four characteristics due to high reliability scoring and low patient burden. The numeric pain scale provides a single dimension measurement of pain intensity reported by the patient (Hawker, Mian, Kendzerska, &French, 2011). Patients are asked to rate current pain levels or pain level within a time period on a scale of 0 to 10 with 0 representing no pain and 10 representing the worst pain imaginable. This scale has a high test/retest reliability and is easily scored without additional materials. This scale is simple to use, validated, reliable, and able to detect changes in reported pain intensity. The version used for this study (Appendix E) included four domains addressing current pain, usual pain, worst, and best pain levels within the last week.

**Self-efficacy**

Self-efficacy measurement was completed using the Pain Self-Efficacy Questionnaire (PSEQ) developed by Michael Nicholas (Appendix F). This scale measures more generalized

activities and has been used as a measure of self-efficacy in multiple LBP studies (Nicholas, 2007; Jackson, Wang, Wang, 7 Fan, 2014). The questionnaire consists of ten items that utilize a Likert scale ranging from zero to six, with zero being assessed as not effective and six being very effective. Values for each item can be scored and tallied to provide a total score ranging from 0 to 60. The PSEQ is a strong measure of perceptions of self-efficacy and has been validated in studies showing internal consistency, test-retest reliability, and validity (Gibson & Strong, 1996).

### Satisfaction

There was a lack of questionnaires found in literature review that addressed education intervention satisfaction in the treatment and management of LBP. An eight-item patient satisfaction questionnaire was developed to address patient satisfaction with the intervention. The questions used Likert scale answers with free text options to assess satisfaction with ease of accessing the intervention, quality of material provided, impact to knowledge, desire to see other health related topics in this manner, and if they would choose this option again. This questionnaire is found in Appendix G.

## Procedures

### Setting Preparation

Providers and staff within the recruitment setting were contacted in advance via e-mail, phone, and in-person interactions to discuss the project. Participating staff were given an introduction to the purpose and methods of the study along with inclusion and exclusion criteria for participants. Staff members were involved in identifying patients for inclusion into the study based on patient reported history and knowledge of inclusion criteria. Schedules for being present were developed with the input of providers to ensure maximum opportunities for recruitment of subjects. Information flyers were made to allow providers to provide study

information and researcher contact information to patients during times that the researcher was not present in clinic.

### Participant Recruitment and Enrollment

The researcher maintained a physical presence within the clinic several days per week to allow maximum opportunity to engage providers and patients to gather participants. Small flyers were provided that indicated the researcher's contact information for when he was not present in clinic. Patients who reported to the clinic were assessed for inclusion criteria during their initial appointment and solicited for participation if appearing to meeting all inclusion criteria described in the Sample section. The researcher was then notified of the patient's desire or willingness to participate in the study and contacted the patient prior to the patient leaving the clinic. The patient was then educated on the purpose of the study, completing the supplemental education program, and required data collection procedures. Patients who agreed to the conditions previously listed were then enrolled in the study.

### Data Collection

Once a patient became a participant, he or she was given baseline survey questionnaires related to function, pain, and self-efficacy along with a demographic information survey. Surveys were administered online utilizing secured survey software. A computer was provided to allow participants to complete the surveys while in office. With respect to participant and provider time, there was an option offered to have a link to the questionnaires e-mailed for later completion. Participants were educated on how to access the web-based program and verified that they understood how to access the educational material. Patient's information was de-identified by assigning each a numerical identifier with a researcher-controlled paper key. The key was kept separate from associated data and stored according to IRB approved data security

plans. The study was conducted over the course of eight weeks due to time constraints of the researcher and comparable timelines from RCTs included in the review of literature. Participants received routine follow-up e-mails throughout the course of the study to serve as reminders to access the web-based program and encourage adherence to the program. This contact occurred at one-week intervals to reinforce understanding of program, identify any questions, and address any technical difficulties with using the website.

Upon completion of the intervention portion of the study, participants were asked to repeat the online questionnaires. Enrollment into a drawing for a gift card was offered as incentive to complete the final questionnaires. Participants were contacted via e-mail with instructions and a link to access the questionnaires. A reminder email was generated one week out from the end of the intervention period and sent to all participants who had not completed the questionnaires. A final reminder email was sent two weeks after the initial e-mail request to complete the final surveys. Low participant response rates prompted an IRB modification to increase the number of drawings for gift cards.

**Data Analysis**

Data was exported from the approved data collection system and analyses were conducted utilizing IBM SPSS Statistics for Windows, Version 24. Descriptive statistics on age, race, marital status, employment status, annual income, and chronicity of pain were performed. Due to a limited number of respondents for the post-intervention survey, many of the demographic responses were recoded into dichotomous groupings to facilitate data analysis. Analysis of differences between participants who completed the study and those who did not were also conducted using Fisher's exact test (see Table 2). ODI and PSEQ scores were computed and overall scores were compared using the nonparametric Wilcoxon matched pairs

test as presented on Table 3. Descriptive statistics were computed on the differences in total scores for the PSEQ, each section of the pain questionnaire, and the PSEQ used in this study and are presented in Table 3. Mann Whitney U testing for independence was performed to determine the significance between the pre-intervention and post-intervention score differences and demographic variables (Table 4).

## Results

### Completion

Fifty-six patients were screened for inclusion in the study, of which, seventeen individuals (30%) met inclusion criteria and were consented to participate. Only fifteen of the seventeen consented participants completed the initial questionnaires. The two who did not complete these questionnaires requested to be sent a link to the data collection site for completion at a more convenient time. Six of fifteen participants provided responses for the final questionnaires. The attrition rate for consented participants was 65% and attrition rate for participants completing initial questionnaires was 60%.

### Demographics

Fifteen participants completed the initial pre-intervention questionnaires. Descriptive statistics, reported in Table 2, show an age range of 28 to 57 with a mean age of 42.7 and standard deviation of 9.7. The majority of participants were female (60%), white (60%), had collegiate level education (60%), made less than $24,999 per year (53.3%), were employed (66.7%), and had been experiencing LBP for more than three months (73.3%). A total of six participants completed the post-intervention questionnaires and satisfaction survey. Analysis showed that this group was very similar to the pre-intervention group with the majority of returning participants being white (66.7%), having a college degree (83.3%), and being

employed (66.7%). The other demographic variables were evenly split or had equal values in multiple categories with no variable clearly identified as the majority. Fisher's exact test was performed and found no statistically significant difference in the demographics of the participants who completed the study and those who did not (see Table 2).

**Function**

Pre-intervention ODI surveys were scored for the 15 participants who completed the initial questionnaires. The total scores ranged from 2 to 33 with a mean score of 16.27 (SD=9.5). There was little difference to these totals for those who completed the post-intervention questionnaire. Post-intervention scores varied slightly with a range of 3 to 28 and with a mean of 14.8 (SD=9.6). Wilcoxon matched pair analysis, presented in Table 4, found no statistical significance ($p$=.344) between pre- and post-intervention ODI scores. A difference-score was calculated that ranged from -5 to 6 with a mean of -1.17 (SD=3.8). Mann-Whitney U testing was performed to identify if significant differences could be found in the distribution of demographic variables with regards to the ODI score differences. The results found no significance when comparing differences of of pre- and post-survey gender ($p$=.100), education status ($p$=1.000), race ($p$=1.000), marital status ($p$=.100), employment status (.267), or chronicity of pain ($p$=.700).

**Pain**

Each characteristic of the pain scale for pre-intervention was evaluated. Current pain scores reported for pre-intervention group (n=15) ranged from zero to eight with a mean of 4.3 (SD=2.4), usual pain was two to ten with a mean of 5.6 (SD=2.3), best pain was one to seven with mean of 3.9 (SD=2.1), and worst pain zero to ten with mean of 7.4 (SD=2.7). Analysis of pre-intervention scores of only those who completed both pre- and post-surveys found current pain ranges of one to four with a mean of 3.33 (SD=1.2), usual pain range three to seven with a

mean of 4.5 (SD=1.4), best pain range one to four, mean of 2.67 (SD=1.2), and worst pain range of five to ten, mean 6.8 (SD=1.8). The post-intervention scores for current pain ranged from one to six with mean of 3.3 (SD=1.9), usual pain was zero to six with mean of 2.8 (SD=2.2), best pain zero to four with mean of 1.7 (SD=1.4), and worst pain four to ten with mean of 6.7 (SD=2.3). Wilcoxon matched pair analysis found no statistically significant difference in current pain ($p$=.891), usual pain ($p$=.059), best pain ($p$=.059), or worst pain ($p$=.783). Differences in pre- and post-intervention scores for current pain ranged from -2.0 to 3.0, mean 0.0 (SD=1.8), usual pain ranged -3.0 to 0.0 with a mean of -1.7 (SD=1.5), best pain range of -3.0 to 0.0 with a mean of -1.0 (SD=1.1), and worst pain range of -2.0 to 2.0 with a mean of -.2 (SD=1.5).

Analysis of pre- and post-survey demographic difference were performed on each of the four areas of pain measurement. Mann-Whitney U testing found no significant differences in pre- and post-intervention current pain scores for the variables of gender ($p$=1.000), education ($p$=.667), race ($p$=.800), marital status ($p$=.700), employment ($p$=.533), or chronicity of pain ($p$=1.000). Usual pain scores we not significantly different for gender ($p$=.700), education ($p$=.333), race ($p$=.800), marital status ($p$=.400), employment ($p$=.800), or chronicity of pain ($p$=.400). Likewise, best pain score demographic differences were no significant for gender ($p$=.700), education ($p$=1.000), race ($p$=.800), marital status ($p$=.700), employment ($p$=.533), or chronicity of pain ($p$=.700). Worst pain scores also showed no significant differences in demographics variables of gender ($p$=.700), education ($p$=.667), race ($p$=.133), marital status ($p$=1.000), employment ($p$=.533), or chronicity of pain ($p$=.200).

**Self-Efficacy**

Total scores of the pre-intervention PSEQ for all participants (n=15) ranged from 14 to 60, mean 35.2 (SD=14.0) and post-intervention PSEQ scores ranged from 19 to 56, mean 39.5

(SD=14.7). When adjusting to evaluate the pre-intervention scores of only those who completed the study (n=6), the scores ranged from 32 to 51 with a mean score of 39.7 (SD=7.9). Analysis of the differences in pre- and post-intervention scores found a range of -14.00 to 10.00 with a mean of -0.2 (SD=8.7). Mann-Whitney U analysis of differences by demographic variables found no statistically significant results for gender ($p$=.200), education ($p$=.667), race ($p$=.800), marital status ($p$=.700), employment ($p$=1.000), or chronicity of pain ($p$=.700). Wilcox matched-pairs testing found no statistically significant difference ($p$ = .916) between pre- and post-intervention scores.

**Satisfaction**

The satisfaction questionnaire used six Likert scale questions and three free text items to assess participants perceptions and attitudes associated with the intervention. The majority (83.3%) of participants indicated agreement that the information was easy to access, they would recommend this resource to a friend, the information obtained through the intervention was meaningful, they learned something new, and were satisfied with the intervention. Participants were encouraged to access the information as often as they needed in order to become comfortable with the web-based information. Participants indicated that accessing the intervention once a week was most common (83.3%) with only one participant accessing it two to three times per week.

Qualitative information in the form of comments were obtained through the patient satisfaction questionnaire along with an anonymous feedback option that was embedded directly into the website. Responses associated with indicating the most helpful aspects of the intervention appeared positive and are as follows:

-The Information and exercises.

-The various research-based articles and the information contained therein

-The low back pain exercises.

-The links to other resources. It was like a private library

The following comments were stated as suggested areas of improvement:

-How to relay you issues with your doctors so they understand how to help you.

-The page feels a bit clunky, could use some updates to make it more user-friendly.

-Wasn't well organized and the info was very basic

-FAQs and question answer section. Also, for it to be referenced in other hospital sites

Participants were asked to provide any comments concerning the project or intervention and only two responses were obtained from both the questionnaire and website:

-I enjoyed accessing this resource. Thank you!

- I hope this site will find an audience with other hospitals, and doctors' offices since it has been a great resource for information.

## Discussion

### Summary

This project was intended to determine the effectiveness in implementation of a web-based education intervention to support low back pain treatment with a focus on function, pain, and self-efficacy. Patient satisfaction with this method of information delivery was also evaluated to evaluate patient perceptions of the intervention along with acceptability. The ability to perform statistical analysis was impacted by a high attrition rate (65%) resulting in one data pair more than the minimum required for completing non-parametric analysis. While there was limited data to support significance testing through inferential statistics, analysis of quantitative

and qualitative findings does provide some insights into the overall effectiveness and acceptability of web-based education for low back pain support.

**Attrition**

There can only be speculation as to the causes of the attrition rate and Childs et al. (2011) presented some potential explanations for poor follow-up compliance with web-based interventions. One possible explanation is that the setting was a sub-specialty clinic and there is not an established relationship between the participants, the clinic, and the researcher, resulting in decreased buy-in to complete the required surveys. This study was initially envisioned as being implemented in a primary care setting where participants were more likely to have an established relationship with providers and staff. Additionally, many participants were not located near the clinic and had considerable drive times to be seen, with some time reaching upwards of 90 minutes. This could have impacted on participants' willingness to continue care at this location and compliance with this study could be reduced.

Another factor may be the time burden associated with completing the intervention and questionnaires. In the planning of this intervention, time was considered in the selection of measurement tools and calculated time for completion of questionnaires estimated at less than ten minutes. Incentive in the form of entry into a gift card drawing was offered to encourage survey completion and to offset the negative perceptions of time spent completing the surveys. At the end of the study, the response rate was 35% and prompted a modification to be submitted to the project proposal. This modification was approved and a second drawing was announced to encourage more participant completion. However, no additional surveys were submitted after this announcement. While there was limited data obtained, analysis could be performed to assess the significance of the interventions on the variables of interest.

A final consideration on attrition rate was the amount of attention given to participants during the course of the study. Loftin et al. (2000) found that regular follow-up with participants while creating a caring relationship helped to improve retention rates in studies. Again, this was considered prior to implementation of the study and weekly communication with participants was conducted. Each week participants were contacted via e-mail with updates on progress through the intervention with encouragement and expressions of gratitude for being involved in the study.

**Demographic**

Making a laptop computer available for patients to complete pre-intervention questionnaires greatly enhanced the ability to collect completed demographic data. By allowing participants the opportunity to complete surveys at the point of initial contact positively impacted the likelihood of completion. A total of 15 out of 17 consented participants completed the initial questionnaires despite weekly reminders concerning initial survey completion and intervention instructions. The two participants who did not complete the questionnaire asked that the links to the online surveys be sent to them outside of the clinic encounter due to time constraints. The demographic findings from the initial surveys were congruent with epidemiologic literature showing that the majority of the participants were white, female, and over the age of 40 (Manchikanti, Singh, Falco, Benyamin, & Hirsch, 2014).

Collection of demographic data revealed that the sample was heterogenous in all variables. Due to the limited number of responses it cannot be assumed that results could be applicable to the general population despite the similarity of sample characteristics to epidemiologic findings. Nevertheless, comparison of variables between pre- and post-intervention groups were evaluated and no significant differences were found, indicating that

there were no major differences in the groups' demographics. Due to the fact that chronic low back pain may require the use of multimodal approaches in management, the chronicity of LBP in participants may have impacted the effectiveness of the intervention (Webster & Markman, 2014). Chronicity may also explain improvements identified in the pain sections since acute and subacute low back pain will typically improve despite the intervention (Qaseem et al., 2017).

**Function**

Functional assessment was performed utilizing the ODI and the delivery of web-based education was found to have no statistical significance in improvement. Similar to other studies, there was no statistically significant difference in the two groups in this study (Chiauzzi et al., 2010; Carpenter, Stoner, Mundt, & Stoelb, 2012). Despite finding that there was no statistical significance in improvement of function, five out of six participants did report at least some improvement in function. The scores for these five decreased by a range of one to five points out of possible fifty while the one participant who did not improve reported a score increase of six points. It can be argued that the small sample size is impacting the ability of this study to show improvement in function. The decrease in functional limitation is encouraging but may be impacted by other confounders or treatments. This supports the need for future research that incorporates larger sample sizes to determine true effects of the intervention on function.

**Pain**

Pain was assessed across four dimensions with numeric pain scales ranging from zero to ten. The results of the Wilcoxon matched pairs test did not find statistical significance in the differences in reported pain between the pre- and post-intervention surveys. However, two of the dimensions, "Usual Pain" and "Worst Pain", were found to be very close to meeting significance with $p$=.059 for both items. It is possible that these findings could reach statistical significance

if a larger sample size was obtained in future research. However, the chronicity of LBP may have played a role in the improvement of pain instead of the intervention. Half of the participants reported chronicity of either acute or subacute LBP, each of which have a high rate of resolution with or without intervention (Qaseem et al., 2017). This fact could provide the rationale of near significance in light of the rest of the measures showing no significant differences.

**Self-Efficacy**

The PSEQ was completed by participants to assess his or her perceived self-efficacy in managing low back pain. No statistical difference was found between the two groups based on inferential testing. Six participants completed the study with half of the group reporting improved feelings of self-efficacy and the other half reporting reduced feelings of self-efficacy. Despite the lack of statistical significance, it was expected that more participants would experience an improvement in self-efficacy scores similar to the positive trends of function measured by the ODI. Despite the mixed trends of self-efficacy, the range of scores for the PSEQ did increase making an argument for a net improvement. Previous systematic reviews have shown that the use of web-based interventions can have positive impacts on participants' self-efficacy, but that these results are often mixed (Garg, Garg, Turin, & Chowdhury, 2016). The conclusion is that the results for the PSEQ are consistent with the findings reported in the literature.

**Satisfaction**

While the results of this study were not significant in terms of impact to pain, function, and self-efficacy, there was encouraging qualitative data obtained in the satisfaction surveys. The majority of participants (83%) reported that they found the information easy to access,

would recommend this information to a friend, found the information meaningful, learned something new about their condition, and were satisfied with the information provided. These findings support the assumption that the intervention was appropriately designed and met the goal of providing useful information to the participants. Comments such as, "I enjoyed accessing this resource. Thank you!" and "It was like a private library" further reinforced this assumption and indicated that this type of intervention is an acceptable method of receiving information within the completion group. Items that were found most helpful were the links to resources that highlighted exercises and additional LBP information. One comment in particular highlighted the need for this type of intervention: "I hope this site will find an audience with other hospitals, and doctors' offices since it has been a great resource for information."

There was one comment that was meant as a recommendation for improvement that, in reality, reinforced the desired outcome of understandability. It is recommended that patient education and information materials be easily understood and written at a 5$^{th}$ grade reading level or below (Joint Commission, 2014). The comment stated that "the info was very basic", which was the intended outcome of the information. The majority of participants who completed the study were educated with at least a college degree making the statement reinforce the readability for those with less education. Additionally, consultation with hospital education staff during the planning phase and use of word processor embedded Flesch-Kincaid Grade Level tests for text added to the basic readability of information.

**Strengths and Limitations of Design**

The design of this study utilizes many components of the Social Cognitive Theory by addressing the individual self-efficacy, knowledge and skill, and self-control as well as environmental factors such as vicarious learning, situations, and reciprocal determinism. The

use of a theoretical framework is a strength of study in that it helps to guide the project interventions and outcomes. Availability of the intervention is another strength of the design, allowing participants to access the intervention at a time and place that is convenient. This had the potential to impact adherence to the intervention and increase the quality of the data obtained from the study.

Several limitations have been identified in the project. There was a small recruitment window of only eight weeks that may have limited the number of participants that could be recruited for the study. The clinical setting was assessed before implementation to have adequate numbers of patients with low back pain for the time frame, but still failed to meet desired participants. The limited timeframe for completing the study is considered a limitation in that it only provided an 8-week assessment of the intervention. A long intervention assessment period that possibly captured subsequent episodes of low back pain might have impacted participants views on self-efficacy in LBP management. Additionally, conducting the study over a longer period of time would give more credibility to the findings and the long-term benefits of the interventions provided. While the SCT was determined to be the best framework to base this study, it is a complex model that can lack the ability to accurately identify the role of individual factors on outcomes (Edberg, 2015). Inability to control for these individual factors or variables can cause inconsistencies in analysis of outcomes related to LBP.

The use of the intervention itself may be considered a limitation as it may have lacked the ability for interactiveness with the participants. Use of web-based platforms to provide static information may have reached a saturation point with participants and decreased the view of the novelty of the intervention. This may have made the intervention seem less worthwhile and more of a “same old, same old” education program despite the validity of the information and

sites delivered. Providing a more robustly interactive intervention may encourage participants to be more involved by making the intervention more engaging and increasing interest and buy-in from participants.

A final limitation of the project was in the selection of the recruitment site. This site is a sub-specialty clinic that focuses on spine and spine-related complaints. Due to the specialized nature of this clinic, it may not be the first point of care for LBP. While this facility is well-equipped to manage initial complaints of LBP, the majority of evaluations were for those who had been experiencing LBP chronically. A potential solution for future iterations of this study would be to change the setting location to a facility or clinic serves as the initial point of care. This would allow early intervention on lifestyle modification and back health maintenance techniques to reduce the chronicity of LBP.

**Nursing Practice Implications**

A large percentage of Americans who use the internet have admitted to seeking out health information (Fox & Duggan, 2013). The use of technology in healthcare can aid providers in providing knowledge and skills necessary to support management and treatment of LBP. Participant comments showed that there was strong support for having a web-based education platform that allowed them to "have a personal library" at his or her fingertips. While the intention of this method is not to replace beside and clinic-based teaching, it may serve as reinforcement to that education, allowing participants to review information at a later date and time from convenient location. Having the educational material readily available and accessible through leveraging technology away from the clinic could aid in reducing patient confusion surrounding treatment option, improve compliance with medical management, and improve utilization rates of self-care for LBP. By implementing a more readily available, robust network

of information practitioners can hopefully improve the patients' knowledge and understanding of his or her health concerns. Due to many individuals using the internet to seek medical information, this practice will also serve as a means for practitioners to provide higher quality information. This should also prompt providers to assess what information patients have sought in the past and the quality of sources those sources of information. This can provide an opportunity for further discussion surrounding where to find the most up to date and accurate information for future inquiries. While it is unlikely to remove the need to seek medical advice and treatment, it may improve patient compliance and satisfaction with care.

**Conclusion**

Web-based education may be a viable option to support patients with LBP by providing an easily accessible means of information. However, there needs to be further investigation into how this information is delivered to encourage participant engagement in the activities. While the use of this intervention was not shown to be significantly effective in improving pain, function, or self-efficacy it did show the acceptability of accessing healthcare information through a web-based method. The availability of information and creating a robust network for patients is seen as a benefit for and by patients. Further research is needed with larger sample sizes and better randomization and controls to help identify if there is potential for impact on the measures discussed in this study. The use of web-based education for low back pain should be evaluated at the point of primary care or initial evaluation to fully leverage existing relationships for study completion and subsequent analysis.

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Table 1

*Studies evaluated for web-based intervention use in patients with low back pain*

| Reference | Subjects | Outcomes based on stated aim | Limitations |
|---|---|---|---|
| Calner et al., 2017, RCT | musculoskeletal pain *n* = 109, online intervention, 12-month study | No statistical significance found for intervention improving work ability<br>No significant impact to pain<br>No significant impact to disability | Not powered<br>Intervention use declined throughout study<br>Lacks generalizability<br>18% dropout |
| Carpenter et al., 2012, RCT | Low back pain<br>*n* = 164, online completion<br>6-week study | Showed partial efficacy of intervention based on standardized questionnaires with CBT focus<br>Disability significance reported<br>Pain Attitudes significant improvement<br>Self-Efficacy significant improvement<br>No significance for work avoidance | No power analysis<br>No comparison to other treatments<br>Short time period |
| Chiauzzi et al., 2010, RCT | Low back pain *n* = 164 online completion<br>6-month study | Partially met aims, showed statistical significance in affective, coping, and outlook<br>No statistical significance for pain, function, or self-efficacy, but clinical significance found | No power analysis<br>No evidence of blinding |
| Del Pozo-Cruz, 2012, RCT | Low back pain *n* = 100 online completion<br>9-month study | Showed significance in quality of life and function compared to standard treatment | Did not meet power |

| Reference | Subjects | Outcomes based on stated aim | Limitations |
|---|---|---|---|
| Irvine, 2013, RCT | Low back pain *n* = 597<br>online completion<br>4-month study | Shows significance in pain improvement, function, and self-efficacy<br>Significance in work limitation improvement and presenteeism | No power analysis |
| Krein et al., 2013, RCT | back pain *n* = 229, VA Clinic | Significance in improved disability and function.<br>No significance noted for pain reduction. | Did not meet power<br>Lack generalizability |
| Nordin et al., 2016, RCT | Low back pain *n* = 99<br>online completion<br>12-month study | No significance in pain reduction, self-efficacy or coping ability | Did not meet power<br>Measurements with self-reported low reliability |
| Riva et al., 2014, RCT | back pain, *n* =51, select clinics and rehabilitation sites | Patient empowerment improved significantly with intervention, physical activity declined in all groups, pain decreased significantly in both groups, significant decrease in medication misuse in intervention group | Small sample<br>Lack generalizability<br>Short study time |
| Weymann et al., 2015 | back pain *n*=382, online intervention, 3-month study | Significant improvement of knowledge immediately following intervention<br>Significant empowerment improvement at 3 months | No comparison of knowledge at 3 months<br>Did not meet power<br>23% dropout |

*Note.* RCT = randomized control trial, CBT = cognitive behavioral therapy, significance defined as $p<0.05$, QoL = quality of life, VA = veterans affairs.

Table 2

*Demographic Characteristics of Participants (N = 15)*

| Variable | Pre-intervention Group (n=15) | Range | Mean(*SD*) | Post-Intervention Group (n=6) | Range | Mean(*SD*) | Fisher's Exact Test |
|---|---|---|---|---|---|---|---|
| Gender, n (%) | | | | | | | .622 |
| Male | 6 (40.0) | | | 3 (50.0) | | | |
| Female | 9 (60.0) | | | 3 (50.0) | | | |
| Race/Ethnicity | | | | | | | 1.000 |
| White | 9 (60.0) | | | 4 (66.7) | | | |
| Non-white | 6 (40.0) | | | 2 (33.3) | | | |
| Education | | | | | | | .287 |
| College degree | 9 (60.0) | | | 5 (83.3) | | | |
| No college degree | 6 (40.0) | | | 1 (16.7) | | | |
| Marital Status | | | | | | | .329 |
| Married | 5 (33.3) | | | 3 (50.0) | | | |
| Not married | 10 (66.7) | | | 3 (50.0) | | | |
| Yearly Income | | | | | | | .580 |
| Less than $24,999 | 8 (53.3) | | | 2 (33.3) | | | |
| More than $25,000 | 6 (40.0) | | | 3 (50.0) | | | |
| Prefer not to state | 1 (6.7) | | | 1 (16.7) | | | |
| Employment | | | | | | | 1.000 |
| Working | 10 (66.7) | | | 4 (66.7) | | | |
| Not working | 5 (33.3) | | | 2 (33.3) | | | |
| Chronicity of pain | | | | | | | .235 |
| Less than 3 months | 4 (26.7) | | | 3 (50.0) | | | |
| More than 3 months | 11 (73.3) | | | 3 (50.0) | | | |
| Age | | 28-59 | 42.67(9.73) | | 30-57 | 39.67(9.35) | |

Note. Values expressed as *p*-values, significance set at .05

Table 3

*Pre- and Post-Intervention Results with Significance*

| | Pre-Intervention (n=15) | | Post-Intervention (n=6) | | Wilcoxon Matched Pairs Results |
|---|---|---|---|---|---|
| | Range | Mean(SD) | Range | Mean(SD) | |
| ODI Scores | 2-33 | 16.27(9.48) | 3-28 | 14.83(9.60) | .344 |
| Current Pain Scores | 0-8 | 4.33(2.38) | 1-6 | 3.33(1.86) | .891 |
| Usual Pain Scores | 2-10 | 5.57(2.31) | 0-6 | 2.83(2.23) | .059 |
| Best Pain Scores | 1-7 | 3.93(2.09) | 0-4 | 1.67(1.37) | .059 |
| Worst Pain Scores | 0-10 | 7.4(2.72) | 4-10 | 6.67(2.34) | .783 |
| PSEQ Scores | 14-60 | 35.2(14.03) | 19-56 | 39.5(14.71 | .916 |

Note. ODI = Values expressed as *p*-values, significance set at .05, Oswestry Disability Index, PSEQ = Pain Self-Efficacy Questionnaire

Table 4
*Mann Whitney Test independence testing*

| Characteristic | ODI | Current Pain | Usual Pain | Best Pain | Worst Pain | PSEQ |
|---|---|---|---|---|---|---|
| Gender | .100 | 1.000 | .700 | .700 | .700 | .200 |
| Education | 1.000 | .667 | .333 | 1.000 | .667 | .667 |
| Race | 1.000 | .800 | .800 | .800 | .133 | .800 |
| Marital Status | .100 | .700 | .400 | .700 | 1.000 | .700 |
| Employment Status | .267 | .533 | .800 | .533 | .533 | 1.000 |
| Chronicity | .700 | 1.000 | .400 | .700 | .200 | .700 |

Note. Values expressed as *p*-values, significance set at .05, ODI = Oswestry Disability Index, PSEQ = Pain Self-Efficacy Questionnaire

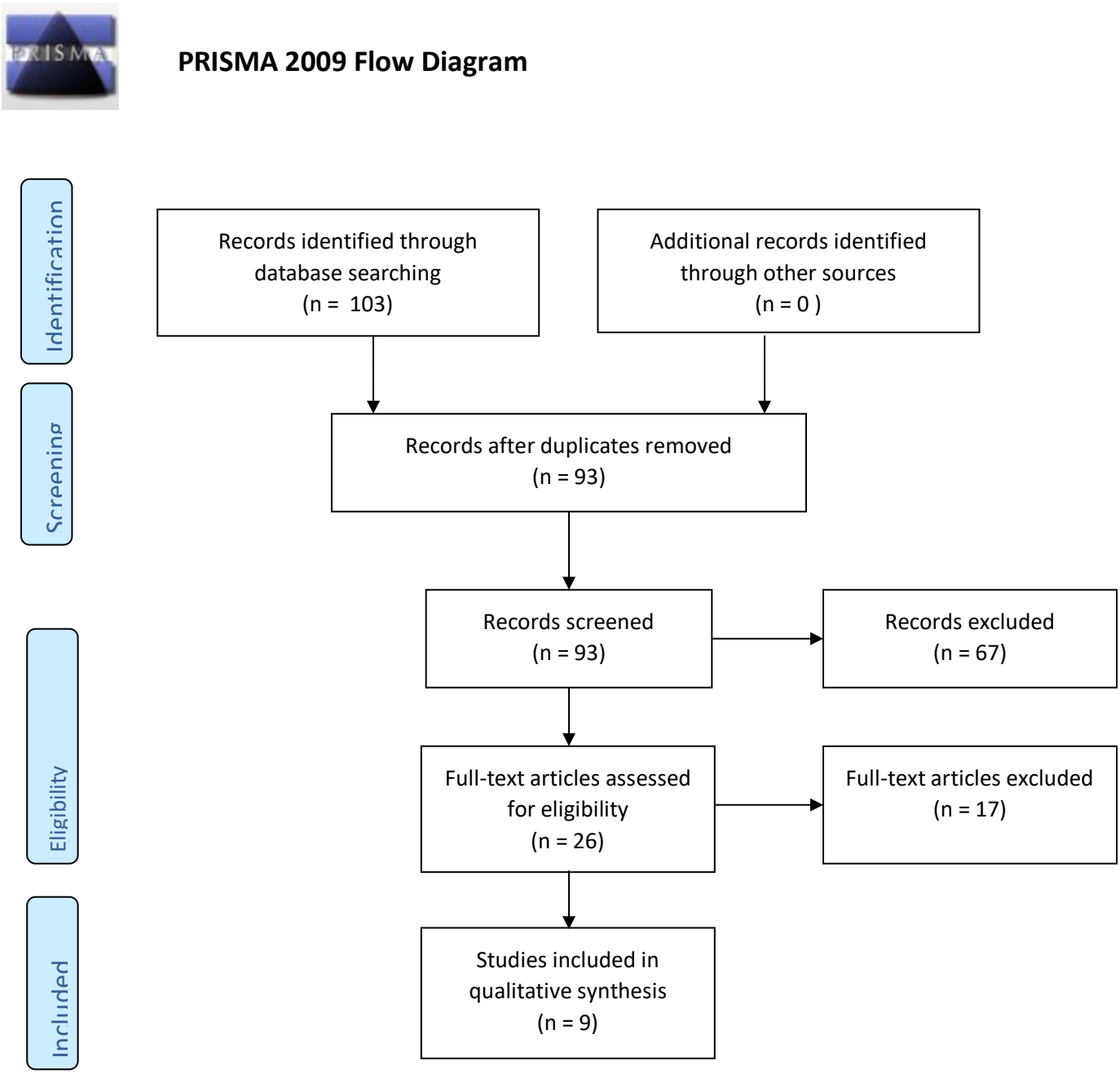


*Figure 1.* Prisma Flow Diagram

# Appendix A. Institutional Review Board Approval



**ASSURANCE FORM**
**University of Virginia**
**Institutional Review Board for Health Sciences Research**
**HIPAA Privacy Board**

**IRB - HSR # 21018**

Event: Approval New Protocol - Expedited
Type: Protocol
Sponsor(s):
Sponsor Protocol #:
Principal Investigator: Kathryn Reid, MSN, RN

Title: Web-based Education to Support Treatment of Low Back Pain

Assurance: Federal Wide Assurance (FWA)#: 00006183 **IRB#00000447**

Certification of IRB Review:
The IRB-HSR/HIPAA Privacy Board abides by 21CFR50, 21CFR56, 45CFR46, 45CFR160, 45CFR164, 32CFR219 and ICH guidelines as compatible with FDA and DHHS regulations. This activity has been reviewed in accordance with these regulations.

Event Date: 09/24/18

Protocol Expiration Date: 09/23/19

Number of Subjects: 160

HSR Protocol Version Date: 09/20/18

UVA Site Only
IRB Application Date: 09/20/18
Data Security Plan Date: 09/05/18

Current Status: Open to enrollment

Consent Version Dates:

Adult Consent -- 09/20/18

Committee Members (did not vote):

Comments: The IRB determined the protocol met the criteria for approval per the federal regulations and was approved. It is open to enrollment.

The purpose of this study is to evaluate web-based education program to support Low back pain (LBP) management.

In this study participant will have access to the web-based education program for 8 weeks. Surveys will be completed before and after.

There is no outside sponsor for this study.

N 100 Ages 18 to 64 years of age

The following documents were submitted with this protocol:
- Demographics
- Oswestry Low Back Pain Disability Questionnaire
- Pain Numeric Rating Scale
- Pain Self-Efficay Questionnaire

- Low Back Pain Web-based Education Survey
- Pre-screening document
- Screen shots of education program content

This study is not regulated by the FDA as it does not involve research on a drug, biologic or device.

The content of the educational program has been reviewed by the IRB.

No vulnerable populations to be enrolled.

No additional committee approvals are required.

Compensation via alternative route and tax information will not be collected.

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REGULATORY INFORMATION:

The IRB determined this protocol met the criteria of minimal risk.

Protocol Expedited by Category #7: Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

This protocol has been granted a Waiver of Consent to identify potential subjects via 45CFR46.116.

This protocol has been granted a Waiver of Consent via 45CFR46.116 and a Waiver of HIPAA Authorization via 45CFR 164.512(i)(2) to contact subjects by direct contact by a person who is not their health care provider. Direct contact may include phone, letter, direct email or approaching potential subject while at UVa. Phone, letter or emails will be approved by the IRB-HSR prior to use. The following HIPAA identifiers may be collected: Name, medical record number, date of birth and contact information appropriate to the recruitment plan. The minimum necessary PHI to be collected includes only those items related to the inclusion/ exclusion criteria.

This protocol has been granted a Waiver of Consent via 45CFR46.116 to contact potential subjects by direct contact by a person who is their health care provider. Direct contact may include phone, letter, direct email or potential subject approached at UVa by a person is their health care provider. Phone, letter or emails will be approved by the IRB-HSR prior to use.

This protocol has been granted a waiver of documentation of consent for pre-screening questions under 45CFR46.117(c).

Written consent will be obtained for this study. The consent form signed will have a non-expired IRB-HSR approval stamp.

---

PLEASE REMEMBER:

* If an outside sponsor is providing funding or supplies, you must contact the SOM Grants and Contracts Office/ OSP regarding the need for a contract and letter of indemnification. If it is determined that either of

these documents is required, participants cannot be enrolled until these documents are complete
* You must notify the IRB of any new personnel working on the protocol PRIOR to them beginning work.
* You must obtain IRB approval prior to implementing any changes to the approved protocol or consent form, except in an emergency, if necessary to safeguard the well-being of currently enrolled subjects.
* If you are obtaining consent from subjects, prisoners are not allowed to be enrolled in this study unless the IRB-HSR previously approved the enrollment of prisoners. If one of your subjects becomes a prisoner after they are enrolled in the protocol you must notify the IRB immediately.
* You must notify the IRB-HSR office within 30 days of the closure of this study.
* Continuation of this study past the expiration date requires re-approval by the IRB-HSR.

The IRB-HSR official noted below certifies that the information provided above is correct and that, as required, future reviews will be performed and certification will be provided.

Name: Amy E. Blackman, MSN, RN, CCRC
Title: Member, Institutional Review Board for Health Sciences Research
Phone: 434-924-9634 Fax: 434-924-2932

Name and Address of Institution:
IRB for Health Sciences Research
University of Virginia, PO Box 800483
Charlottesville, VA 22908
**OR**
IRB for Health Sciences Research
One Morton Drive, Suite 400
Charlottesville, VA 22903

Approval:
Approved by: Amy E. Blackman, MSN, RN, CCRC From IP Address: 172.28.22.76
Date: 09/24/18 at 03:47 PM

**ASSURANCE FORM**
**University of Virginia**
**Institutional Review Board for Health Sciences Research**
**HIPAA Privacy Board**

**IRB - HSR # 21018**

| Event: | Type | Sponsor(s) |
|---|---|---|
| Approval Protocol Modification - Expedited | Protocol | Sponsor Protocol #: |
| | | Principal Investigator: Kathryn Reid, MSN, RN |

Title: Web-based Education to Support Treatment of Low Back Pain

Assurance: Federal Wide Assurance (FWA#): 00005193
UVa IRB #2 Registration: IRB#00000447

Certification of IRB Review:
The IRB-HSR/HIPAA Privacy Board abides by 21CFR50, 21CFR56, 45CFR46, 45CFR160, 45CFR164, 32CFR219 and ICH guidelines as compatible with FDA and DHHS regulations. This activity has been reviewed in accordance with these regulations.

Event Date: 01/15/19
Projected Expiration Date: 09/23/19
Number of Subjects: 100
Protocol Version Date: 09/20/18

UVA Site Only
IRB Approval Date: 01/15/19
Date Yearly Due Date: 09/05/18

Current Status: Open to enrollment

Current Version Dates:
Adult Consent -- 09/20/18

Committee Members (did not vote):

Comments: The IRB determined the modification met the criteria for approval per the federal regulations and was approved per 45CFR46.110(b)(2). Modification expedited: minimal risk/minor changes.
The revised IRB Application included the following key changes:
1.) Added second drawing for a $25 Amazon Gift Card to be awarded to participants that complete both the pre- and post- education questionnaires.

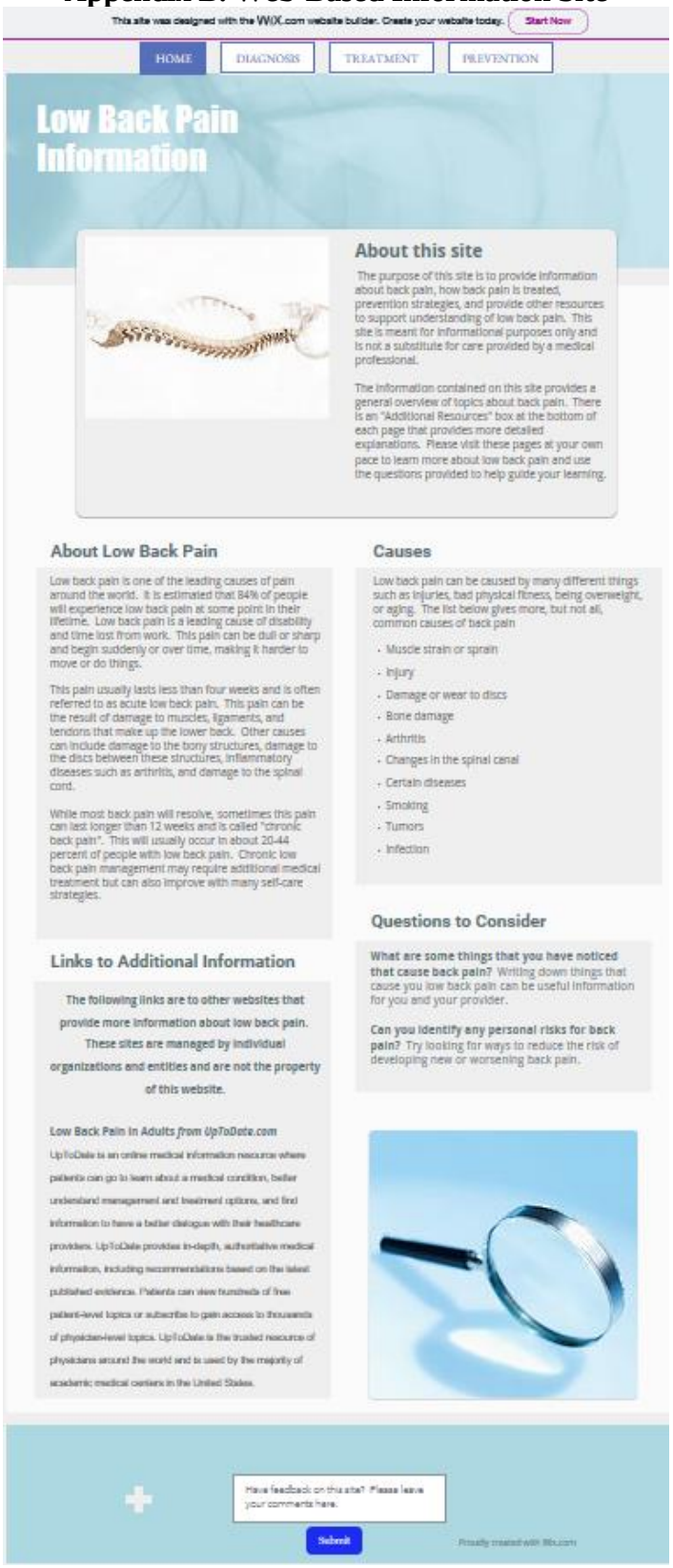
No changes were made to the protocol, the data security plan or to the consent

The IRB-HSR official noted below certifies that the information provided above is correct and that, as required, future reviews will be performed and certification will be provided.

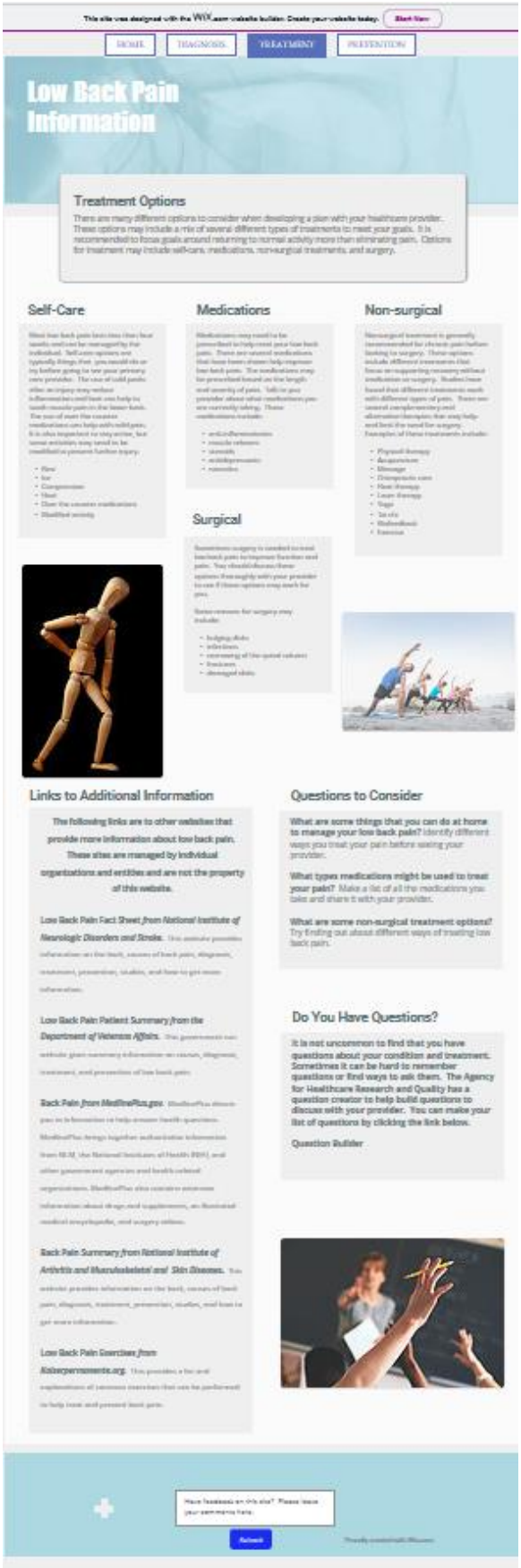
| Name: | Name and Address of Institution: |
|---|---|
| Andrea L. Rubsam, BA, BS, CCRC | IRB for Health Sciences Research |
| Title: Member, Institutional Review Board for Health Sciences Research | University of Virginia, PO Box 800455 |
| Phone: 434-924-9634 Fax: 434-924-2932 | Charlottesville, VA 22908 |
| | **OR** |
| | IRB for Health Sciences Research |
| | One Morton Drive, Suite 400 |
| | Charlottesville, VA 22903 |

| Approval | Date: |
|---|---|
| Approved by: Andrea L. Rubsam, BA, BS, CCRC From IP Address: 128.143.2.53 | 01/15/19 at 03:34 PM |

# Appendix B. Web-Based Information Site




This site was designed with the WIX.com website builder. Create your website today.
Start Now
HOME
DIAGNOSIS
TREATMENT
PREVENTION
Low Back Pain Information
Diagnosis
Any treatment options for low back pain need to be discussed with your healthcare provider.
You will need visit your healthcare provider to help determine the cause of your low back pain. Diagnosing low back pain can typically be made based on a health history and a physical exam. During the history and exam, your provider may ask many questions about your back pain like when you first noticed the pain, if there was an injury, and what makes it better or worse. The exam will check how you sit or stand, your strength, and if there are changes in feeling. Your provider may perform other exams to help find the cause of your pain. Other tests, such as x-rays and bloodwork, may be needed based on your history and exam. However, most back pain will not require any further testing.
There are some symptoms that need to be immediately reported to your provider. The following are symptoms that your provider needs to know about:
Fevers
Loss of bowel or bladder control
Severe, unrelenting pain
Changes in feeling in your hips and legs
Major injuries
Sudden unexplained weight loss
Links to Additional Information
The following links are to other websites that provide more information about low back pain. These sites are managed by individual organizations and entities and are not the property of this website.
Low Back Pain Fact Sheet from National Institute of Neurologic Disorders and Stroke. This website provides information on the back, causes of back pain, diagnosis, treatment, prevention, studies, and how to get more information.
Questions to Consider
What are some symptoms that you should tell you provider about immediately? Try making a list of these symptoms and let your provider know immediately if they occur.
What are some additional tests that might be necessary? Sharing information about your health is important and allows your provider to make better decisions about what tests might be needed.
Have feedback on this site? Please leave your comments here.
Submit
Proudly created with Wix.com


HOME
DIAGNOSIS
TREATMENT
PREVENTION
Low Back Pain Information
Treatment Options
There are many different options to consider when developing a plan with your healthcare provider. These options may include a mix of several different types of treatments to meet your goals. It is recommended to focus goals around returning to normal activity more than eliminating pain. Options for treatment may include self-care, medications, non-surgical treatments, and surgery.
Self-Care
Medications
Non-surgical
Surgical
Links to Additional Information
The following links are to other websites that provide more information about low back pain. These sites are managed by individual organizations and entities and are not the property of this website.
Low Back Pain Fact Sheet from National Institute of Neurologic Disorders and Stroke.
Low Back Pain Patient Summary from the Department of Veterans Affairs.
Back Pain from MedlinePlus.gov.
Back Pain Summary from National Institute of Arthritis and Musculoskeletal and Skin Diseases.
Low Back Pain Exercises from Kaiserpermanente.org.
Questions to Consider
What are some things that you can do at home to manage your low back pain? Identify different ways you treat your pain before seeing your provider.
What types medications might be used to treat your pain? Make a list of all the medications you take and share it with your provider.
What are some non-surgical treatment options? Try finding out about different ways of treating low back pain.
Do You Have Questions?
It is not uncommon to find that you have questions about your condition and treatment. Sometimes it can be hard to remember questions or find ways to ask them. The Agency for Healthcare Research and Quality has a question creator to help build questions to discuss with your provider. You can make your list of questions by clicking the link below.
Question Builder


HOME
DIAGNOSIS
TREATMENT
PREVENTION
Low Back Pain Information
Prevention
Risk Reduction Strategies
Questions to Consider
Are there any habits that you can change to prevent low back pain?
What are some prevention strategies you can use at home?
Can you identify workplace ergonomic practices?
Links to Additional Information
The following links are to other websites that provide more information about low back pain. These sites are managed by individual organizations and entities and are not the property of this website.
Activity Guide from Health.gov.
Back Injury Prevention from OSHA.gov.
Computer Workstation Ergonomics from OSHA.gov.
Exercises and Stretches from National Institutes of Health.
Video Links
"V For Spine" from the North American Spine Society
"Exercise: The Backbone of Spine Treatment" from the North American Spine Society
Back Pain Tips video from the American Physical Therapy Association
Workplace: Office Ergonomics from the American Physical Therapy Association
Yoga Advice from a Physical Therapist from the American Physical Therapy Association

## Appendix C. Demographic Questionnaire

### Demographic Questionnaire

Instructions: Please complete this questionnaire to the best of your ability by circling and/or filling in your answers as indicated.

1. Are you male or female?
    a. 1 Male
    b. 2 Female
2. What is your age? _____years
3. What is the highest level of school you have completed or the highest degree you have received?
    a. High school incomplete or less
    b. High school graduate or GED (includes technical/vocational training that doesn't count towards college credit)
    c. Some college (some community college, associate's degree)
    d. Four-year college degree/bachelor's degree
    e. Some postgraduate or professional schooling, no postgraduate degree
    f. Postgraduate or professional degree, including master's, doctorate, medical or law degree
4. Which of the following describes your race?
    a. White
    b. Black of African-American
    c. Asian or Asian-American
    d. Native American/American Indian/Alaska Native
    e. Native Hawaiian/Other Pacific Islanders
    f. Some other race, specify: _____
5. Which of these bests describes you?
    a. Married
    b. Living with a partner
    c. Divorced
    d. Separated
    e. Widowed
    f. Never been married
6. Last year, what was your total family income from all sources, before taxes?
    a. Prefer not to state
    b. Less than $24,999
    c. $25,000 to less than $49,999
    d. $50,000 to less than $74,999
    e. $75,000 to less than $99,999

f. $100,000 or more

7. Employment status

    a. Unemployed
    b. Full-time
    c. Part-time
    d. Retired
    e. Disabled

8. How long have you been experiencing low back pain?
    a. Less than 4 weeks
    b. 4-8 weeks
    c. More than 8 weeks

# Appendix D. Oswestry Disability Index



## Oswestry Low Back Pain Disability Questionnaire

### Instructions

This questionnaire has been designed to give us information as to how your back or leg pain is affecting your ability to manage in everyday life. Please answer by checking ONE box in each section for the statement which best applies to you. We realise you may consider that two or more statements in any one section apply but please just shade out the spot that indicates the statement which most clearly describes your problem.

**Section 1 – Pain intensity**

- ☐ I have no pain at the moment
- ☐ The pain is very mild at the moment
- ☐ The pain is moderate at the moment
- ☐ The pain is fairly severe at the moment
- ☐ The pain is very severe at the moment
- ☐ The pain is the worst imaginable at the moment

**Section 2 – Personal care (washing, dressing etc)**

- ☐ I can look after myself normally without causing extra pain
- ☐ I can look after myself normally but it causes extra pain
- ☐ It is painful to look after myself and I am slow and careful
- ☐ I need some help but manage most of my personal care
- ☐ I need help every day in most aspects of self-care
- ☐ I do not get dressed, I wash with difficulty and stay in bed

**Section 3 – Lifting**

- ☐ I can lift heavy weights without extra pain
- ☐ I can lift heavy weights but it gives extra pain
- ☐ Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently placed eg. on a table
- ☐ Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned
- ☐ I can lift very light weights
- ☐ I cannot lift or carry anything at all

**Section 4 – Walking***

- ☐ Pain does not prevent me walking any distance
- ☐ Pain prevents me from walking more than 1 mile
- ☐ Pain prevents me from walking more than 1/2 mile
- ☐ Pain prevents me from walking more than 100 yards
- ☐ I can only walk using a stick or crutches
- ☐ I am in bed most of the time

**Section 5 – Sitting**

- ☐ I can sit in any chair as long as I like
- ☐ I can only sit in my favourite chair as long as I like
- ☐ Pain prevents me sitting more than one hour
- ☐ Pain prevents me from sitting more than 30 minutes
- ☐ Pain prevents me from sitting more than 10 minutes
- ☐ Pain prevents me from sitting at all

**Section 6 – Standing**

- ☐ I can stand as long as I want without extra pain
- ☐ I can stand as long as I want but it gives me extra pain
- ☐ Pain prevents me from standing for more than 1 hour
- ☐ Pain prevents me from standing for more than 30 minutes
- ☐ Pain prevents me from standing for more than 10 minutes
- ☐ Pain prevents me from standing at all

**Section 7 – Sleeping**

- ☐ My sleep is never disturbed by pain
- ☐ My sleep is occasionally disturbed by pain
- ☐ Because of pain I have less than 6 hours sleep
- ☐ Because of pain I have less than 4 hours sleep
- ☐ Because of pain I have less than 2 hours sleep
- ☐ Pain prevents me from sleeping at all

**Section 8 – Sex life (if applicable)**

- ☐ My sex life is normal and causes no extra pain
- ☐ My sex life is normal but causes some extra pain
- ☐ My sex life is nearly normal but is very painful
- ☐ My sex life is severely restricted by pain
- ☐ My sex life is nearly absent because of pain
- ☐ Pain prevents any sex life at all

**Section 9 – Social life**

- ☐ My social life is normal and gives me no extra pain
- ☐ My social life is normal but increases the degree of pain
- ☐ Pain has no significant effect on my social life apart from limiting my more energetic interests eg, sport
- ☐ Pain has restricted my social life and I do not go out as often
- ☐ Pain has restricted my social life to my home
- ☐ I have no social life because of pain

**Section 10 – Travelling**

- ☐ I can travel anywhere without pain
- ☐ I can travel anywhere but it gives me extra pain
- ☐ Pain is bad but I manage journeys over two hours
- ☐ Pain restricts me to journeys of less than one hour
- ☐ Pain restricts me to short necessary journeys under 30 minutes
- ☐ Pain prevents me from travelling except to receive treatment

## References

1. Fairbank JC, Pynsent PB. The Oswestry Disability Index. Spine 2000 Nov 15;25(22):2940-52; discussion 52.

# Appendix E. License for Use of ODI

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## Appendix F. Pain Numeric Rating Scale

### Pain Numeric Rating Scale

**1. On a scale of 0 to 10, with 0 being no pain at all and 10 being the worst pain imaginable, how would you rate your pain RIGHT NOW.**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| No Pain | | | | | | | | | | Worst Pain Imaginable |

**2. On the same scale, how would you rate your USUAL level of pain during the last week.**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| No Pain | | | | | | | | | | Worst Pain Imaginable |

**3. On the same scale, how would you rate your BEST level of pain during the last week.**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| No Pain | | | | | | | | | | Worst Pain Imaginable |

**4. On the same scale, how would you rate your WORST level of pain during the last week.**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| No Pain | | | | | | | | | | Worst Pain Imaginable |

# Appendix G. Pain Self-Efficacy Questionnaire

## PAIN S-E QUESTIONNAIRE (PSEQ)

M.K.Nicholas, 1989

NAME: _____ DATE: _____

Please rate how **confident** you are that you can do the following things at present, **despite the pain**. To indicate your answer circle **one** of the numbers on the scale under each item, where 0 = not at all confident and 6 = completely confident.

For example:

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| **Not at all Confident** | | | | | | | **Completely confident** |

Remember, this questionnaire is **not** asking whether of not you have been doing these things, but rather **how confident you are that you can do them at present, despite the pain.**

---

**1.** **I can enjoy things, despite the pain.**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| **Not at all Confident** | | | | | | | **Completely confident** |

**2.** **I can do most of the household chores (e.g., tidying-up, washing dishes, etc.), despite the pain.**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| **Not at all Confident** | | | | | | | **Completely confident** |

**3.** **I can socialise with my friends or family members as often as I used to do, despite the pain.**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| **Not at all Confident** | | | | | | | **Completely confident** |

**4.** **I can cope with my pain in most situations.**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| **Not at all Confident** | | | | | | | **Completely confident** |

**5.** **I can do some form of work, despite the pain. ("work" includes housework, paid and unpaid work).**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| **Not at all Confident** | | | | | | | **Completely confident** |

**6.** **I can still do many of the things I enjoy doing, such as hobbies or leisure activity, despite pain.**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| **Not at all Confident** | | | | | | | **Completely confident** |

**7.** **I can cope with my pain without medication.**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| **Not at all Confident** | | | | | | | **Completely confident** |

**8.** **I can still accomplish most of my goals in life, despite the pain.**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| **Not at all Confident** | | | | | | | **Completely confident** |

**9.** **I can live a normal lifestyle, despite the pain.**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| **Not at all Confident** | | | | | | | **Completely confident** |

**10.** **I can gradually become more active, despite the pain.**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| **Not at all Confident** | | | | | | | **Completely confident** |

## Appendix H. Participant Satisfaction Survey

### Low Back Pain Web-based Education Satisfaction Survey

Thank you for participating in this web-based low back pain education project. We would like to know your thoughts about the methods for providing this education. Your answers will tell us what works well in teaching people about managing low back pain. Your answers are private.

Instructions: Please circle/click whether you agree or disagree with each statement below. Then please answer the questions. Your feedback is greatly appreciated.

1. I would recommend this web page to another patient with low back pain
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

2. The education was meaningful to me
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

3. I learned something new about managing low back pain
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

4. I am satisfied with the information provided through the web page.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

5. I accessed the information contained in the web page
    a. Daily
    b. 4-6 times a week
    c. 2-3 times a week
    d. Once a week
    e. Less than once a week

7. What do you consider the most help part of this web page?

8. What would you like to see improved in this web page?

9. Do you have any comments about using the web page for education needs?

## Appendix I. Journal Submission Guidance

# Preparation of Manuscript

Manuscripts that do not adhere to the following instructions WILL BE RETURNED to the corresponding author for technical revision before undergoing peer review.

**General format.** All manuscripts should be submitted in English, and formatted for standard $8^1/_2$ x 11-inch (21 x 28-cm) paper with at least a 1-inch (2.5 cm) margin on all sides and double spaced. **Manuscripts should be no longer than 2700 words of text, excluding the abstract and references. Case Reports should be no more than 750 words of text.** All Case Reports must have a Structured Abstract and will be published online only. All papers published online only will be completely referenced and indexed.

**Style**. Pattern manuscript style after the *American Medical Association Manual of Style* (10th edition). *Stedman's Medical Dictionary* (27th edition) and *Merriam Webster's Collegiate Dictionary* (10th edition) should be used as standard references. Refer to drugs and therapeutic agents by their accepted generic or chemical names, and do not abbreviate them. Use code numbers only when a generic name is not yet available. In that case, supply the chemical name and a figure giving the chemical structure of the drug. Capitalize the trade names of drugs and place them in parentheses after the generic names. To comply with trademark law, include the name and location (city and state in USA; city and country outside USA) of the manufacturer of any drug, supply, or equipment mentioned in the manuscript. Use the metric system to express the units of measure and degrees Celsius to express temperatures, and SI units rather than conventional units.

**Submit manuscript electronically via Editorial Manager: http://spine.edmgr.com/ in the following order:**

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The title page must also include disclosure of funding received for this work from any of the following organizations: National Institutes of Health (NIH); Wellcome Trust; Howard Hughes Medical Institute (HHMI); and other(s).

**2) Structured Abstract and Key Words.** The following subheads must be included in the Structured Abstract: **Study Design, Objective, Summary of Background Data, Methods, Results, Conclusions**. Do not cite references in the abstract, and limit the use of abbreviations and acronyms. The structured abstract must **be no more than 300 words**. List ten to fifteen **Key Words**. Authors are instructed to select the Level of Evidence of their study using the Oxford Centre for Evidence Based Medicine Table (http://www.cebm.net/wp-content/uploads/2014/06/CEBM-Levels-of-Evidence-2.1.pdf)

**3) Key Points**. Please provide 3-5 Key Points of the main points of the article, in full sentences.

**4) Mini Abstract/Précis.** Submit a short description of the manuscript to appear in the Table of Contents, consisting of approximately three sentences and of **no more that 50 words**. Place on a separate page, following the structured abstract and key points/ words.

**5) Text.** Organize the manuscript into four main headings: **Introduction, Materials and Methods, Results, and Discussion**. For Clinical Trials and similar study designs, please adhere to the **CONSORT** statement (www.consort-statement.org/). For manuscripts describing quality improvement studies, please follow the Standards for QUality Improvement Reporting Excellence (SQUIRE) guidelines at http://www.squire-statement.org/guidelines. Define abbreviations at first mention in text and in each table and figure. If a brand name is cited, supply the manufacturer's name and address (city and state/country).

A **Running Head** should appear in the top right hand corner of every page. The running head should be no more than three to five words from the title, and should NOT include the authors' names.

**Terms**. Do not use the term *hardware*. Acceptable substitutions include implants and instrumentation. Constructs or montage may be used if the reference is to a particular pattern of fixation points for the instrumentation.

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*Journal article*

1. Guiot BH, Khoo LT, Fessler RG. A minimally invasive technique for decompression of the lumber spine. *Spine* 2002;27:432-8.

*Book chapter*

2. Sweitzer S, Arruda J, DeLeo J. The cytokine challenge: Methods for the detection of central cytokines in rodent models of persistent pain. In: Kruger L, ed. *Methods in Pain Research*. Boca Raton, FL: CRC Press; 2001:109-32.

*Entire book*

3. Atlas SW. *Magnetic Resonance Imaging of the Brain and Spine*. Philadelphia: Lippincott Williams & Wilkins; 2001.

*Software*

4. *Epi Info* [computer program]. Version 6. Atlanta: Centers for Disease Control and Prevention; 1994.

*Online journals*

5. Friedman SA. Preeclampsia: A review of the role of prostaglandins. Obstet Gynecol [serial online]. January 1988;71:22-37. Available from: BRS Information Technologies; McLean, VA. Accessed December 15, 1990.

*Database*

6. CANCERNET-PDQ [database online]. Bethesda, MD: National Cancer Institute; 1996. Updated March 29, 1996.

*World Wide Web*

7. Gostin LO. Drug use and HIV/AIDS [*JAMA* HIV/AIDS web site]. June 1, 1996. Available at: http://www.ama-assn.org/special/hiv/ethics. Accessed June 26, 1997.

**7) Tables and Figures:**

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**Digital Figures**. All electronic art can be submitted through the Web-based tracking system http://spine.edmgr.com/

**A) Creating Digital Artwork**

1. Learn about the publication requirements for Digital Artwork: http://links.lww.com/ES/A42
2. Create, Scan and Save your artwork and compare your final figure to the Digital Artwork Guideline Checklist (below).
3. Upload each figure to Editorial Manager in conjunction with your manuscript text and tables.

### B) Digital Artwork Guideline Checklist

Here are the basics to have in place before submitting your digital artwork:

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- Photographs and radiographs with text must be saved as postscript or at a resolution of at least 600 dpi.
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### Remember:

- Cite figures consecutively in your manuscript.
- Number figures in the figure legend in the order in which they are discussed.
- Upload figures consecutively to the Editorial Manager web site and enter figure numbers consecutively in the Description field when uploading the files.

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3. 3-5 Key Points

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6. References double-spaced and cited in the order of appearance

7. Tables (word, word perfect)

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*Coordinating Editor: Peter D. Blanck, PhD, JD*

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preferably no more than 10. (limit to **500 words**)
*Coordinating Editor: Robert D. Fraser, MD*

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**Appendix J. Draft Manuscript for Publication**

Web-Based Education to Support Treatment of Low Back Pain

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## Abstract

**Study Design:** Quasi-experimental pre- and post-intervention design

**Objective:** The purpose of this study was to evaluate the feasibility of implementing web-based education to support low back pain treatment for working-aged patients with low back pain when integrated with standard care. Secondary aims of this study are to examine the impact on reported pain levels, self-efficacy, and satisfaction with the web-based intervention in managing low back pain.

**Summary of Background Data:** Low back pain is one of the most common causes for seeking medical care in the United States. It is estimated that nearly 85% of individuals will experience back pain in their lifetimes with 23% of them progressing to chronic low back pain. The use of technology has been documented as a potential method for improving outcomes associated with musculoskeletal complaints such as function, pain, quality of life, and self-efficacy.

**Methods:** A convenience sample of 17 participants was recruited from a sub-specialty spinal clinic and pre- and post-intervention comparisons were completed using validated questionnaires to evaluate function, pain, and self-efficacy. All participants were encouraged to complete questionnaires online and then to access web-based intervention throughout study period. Descriptive statistics and inferential statistics were completed on participants completing pre-intervention questionnaires (n=15) and post-intervention questionnaires (n=6).

**Results:** Overall response rate for intervention was 35%. Demographics showed the majority of the sample to be female, white, and over the age of 40. There was no statistical significance in changes in function, pain, self-efficacy, or within group differences of pre- and post-intervention

groups. Qualitative data suggests participants find this intervention acceptable and of value for obtaining education and information.

**Conclusions:** The use of web-based education is to support treatment of low back pain and further research is needed to determine impact to function, pain, and self-efficacy.

**Key words:** low back pain, web-based, education, function, self-efficacy

Key Points

1. The use of web-based education to improve outcomes related to low back pain has shown mixed results previously.
2. A group of low back pain patients (n=6) from a specialty orthopedic spine clinic were evaluated using pre- and post-intervention methods.
3. While not statistically significant, there was improvement in perceived function, pain, and self-efficacy in managing pain.
4. Due to lack of evidence and participation, it does not seem effective to implement a web-based education program in this setting.

Mini-Abstract

The use of web-based education for individuals with low back pain is not a novel approach. However, there is mixed evidence about the effectiveness of this approach in improving outcomes such as function, pain, and self-efficacy.

## Introduction

Low back pain (LBP) is one of the most common complaints that causes individuals to seek care in the United States and around the world.(Casazza, 2012) LBP has been identified as the leading cause for disability worldwide and has been shown to be more prevalent in countries with higher life-expectancies.(Hoy et al., 2014) LBP is also the highest ranked cause of years lived with disability in the United States and the burden of this disorder expected to rise as populations age.(of Disease Collaborators et al., 2018) The prevalence and potential for disability related to LBP necessitates the implementation of effective strategies to treat this condition. Evidence shows that there is a high risk of relapse of LBP, making it imperative to provide quality education and support to those who present with this condition.(Hestbaek, Leboeuf-yde, & Leboeuf-yde, 2003)

The use of web-based interventions as a method for addressing health concerns has been growing as technology has become more readily available. The Center for Connected Health Policy defines telehealth as the use of a variety of technologies to provide education and services that contribute to the management of health. There has been effectiveness shown in telephonic, web-based, and mobile application interventions in treatment of musculoskeletal disorders including LBP.(Elander, Robinson, & Morris, 2011; Gusi et al., 2012) These methods provide education and resources that can improve outcomes associated with pain, function, and beliefs

about self-efficacy.(Bhattarai & Phillips, 2017) These options for the delivery of education is generally accepted as a supplement to face-to-face interactions and not as a stand-alone replacement for traditional therapy.(Cranen, Groothuis-Oudshoorn, Vollenbroek-Hutten, & IJzerman, 2017) While several studies have shown the positive impacts in the management of back pain, there appears to be little standardization of implementation and content with mixed results in measurements.(Dario et al., 2017; Tenforde, Hefner, Kodish-Wachs, Iaccarino, & Paganoni, 2017)

LBP is a prevalent and costly condition affecting individuals all around the world. The need to develop and implement efficient and cost-effective methods for providing care to reduce the burden to patients and organizations is evident. There may be opportunities for application of technology to support patient education, self-management, and adherence to prescribed treatment plans for LBP to improve function. The purpose of this project was to determine the effectiveness of implementing a web-based educational self-management program to support management and treatment of LBP.

**Design**

This project used a quasi-experimental approach with pre- and post-evaluations to examine the effectiveness of and satisfaction with a web-based education intervention for participants with LBP. Study approval was obtained through the University of Virginia Institutional Review Board for Health Sciences Research.

**Recruitment**

Participants were recruited from an orthopedic spine clinic within an academic healthcare system. Inclusion criteria consisted of: ages 18-65, presence of LBP, access to the internet, and working e-mail account. Patients were excluded if comorbid conditions or red flag symptoms existed such as: history of malignancy or cancer, spinal surgery, autoimmune disorders, recent spinal fracture, bowel or bladder dysfunction, perineal or saddle anesthesia, weakness or loss of sensation in lower extremities, recent history of fever or chills. Patients could not have pre-existing disability, no functional limitations to required treatment, or be enrolled in another program from management of LBP.

**Procedure**

After participants were consented, baseline survey questionnaires related to function, pain, and self-efficacy along with a demographic information survey were given. Surveys were administered online utilizing secured survey software. Participants were educated on how to access the web-based program and understanding was verified. Participants received weekly follow-up e-mails throughout the course of the study to serve as reminders to access the web-based program, encourage adherence, reinforce understanding, identify any questions, and address any technical difficulties with using the website.

The intervention consisted of web-based educational text, video, and other resources addressing treatment and management of LBP. The text-based materials were obtained from reputable patient education resources such as UpToDate, nationally recognized healthcare organizations, and government run health agencies. These resources provided information on common causes of LBP, back anatomy, medical and self-care treatment options, and recommended prevention activities. Video links served to educate patients on activities that can aid in the management and prevention of LBP, such as stretching and strengthening exercises

along with ergonomic movements. Participants were asked to access the information as often as they needed over an eight-week period.

After the intervention phase, participants were asked to repeat the online questionnaires. Participants were contacted via e-mail with instructions and a link to access the questionnaires. A reminder email was generated one week out from the end of the intervention period and sent to all participants who had not completed the questionnaires. A final reminder email was sent two weeks after the initial e-mail request to complete the final surveys.

**Data Analysis**

Data analysis was conducted utilizing IBM SPSS Statistics for Windows, Version 24. Descriptive statistics on demographic variables were performed. Fisher's exact test was used to evaluate for significant differences in participants who completed the survey and those who did not (Table 1). Oswestry Disability Index (ODI) and Pain Self-Efficacy Questionnaire (PSEQ) scores were compared using the nonparametric Wilcoxon matched pairs test as presented on Table 2. A Mann Whitney U test was performed to determine the significance of differences between the pre-intervention and post-intervention scores and demographic variables and is presented in Table 3.

**Results**

The attrition rate for consented participants was 65% and 60% for participants completing initial questionnaires. Fifteen participants completed the initial pre-intervention questionnaires. The majority of participants were female (60%), white (60%), had collegiate level education (60%), made less than $24,999 per year (53.3%), were employed (66.7%), and had been experiencing LBP for more than three months (73.3%). Analysis showed between group similarity with the majority of returning participants being white (66.7%), having a college degree (83.3%), and being employed (66.7%). The other demographic variables were evenly split or had equal values in multiple categories. Fisher's exact test was performed and found no statistically significant difference in the demographics of the participants who completed the study and those who did not (see Table 2).

**Function**

There was little difference in ODI scores for those who completed the post-intervention questionnaire. Wilcoxon matched pair analysis (Table 4) found no statistical significance ($p$=.344) between pre- and post-intervention ODI scores. Mann-Whitney U testing was performed to identify if significant differences could be found in the distribution of demographic variables with regards to the ODI score differences. The results found no significance when comparing demographic differences between pre- and post-survey participants

**Pain**

Pain scores from all four categories had little variance with the most improvement found in usual and best pain. Wilcoxon matched pair analysis found no statistically significant difference in current pain scores. Mann-Whitney U testing found no statistically significant differences in pre- and post-intervention pain scores by demographic.

**Self-Efficacy**

PSEQ scores showed improvement in average self-efficacy ratings but no statistically significant difference ($p$ = .916) between pre- and post-intervention scores. Mann-Whitney U analysis found no statistically significant results by demographic.

**Satisfaction**

The majority (83.3%) of participants indicated agreement that the information was easy to access, they would recommend this resource to a friend, the information obtained through the intervention was meaningful, they learned something new, and were satisfied with the intervention. Participants indicated that accessing the intervention once a week was most common (83.3%) with only one participant accessing it two to three times per week.

**Discussion**

**Attrition**

Poor compliance may be impacted by relationship status, location, time, or engagement.(Polm et al., 2011) The setting was a sub-specialty clinic and there was no established relationship with the participants, resulting in decreased buy-in to complete the required surveys. Many participants were not located near the clinic and had considerable drive times to be seen potentially impacting participants' willingness to continue care at this location and reducing compliance with this study. Time burden may be associated with completing the intervention and questionnaires. Time was considered in the selection of measurement tools with an estimated completion of questionnaires being less than ten minutes. Incentive in the form of entry into a gift card drawing was offered. A modification was approved and a second drawing was announced to encourage more participant completion. However, no additional surveys were submitted after this announcement. A final consideration on attrition rate was the amount of attention given to participants during the course of the study. Regular follow-up with participants while creating a caring relationship has improved retention rates in studies.(Loftin, Barnett, Bunn, & Sullivan, 2005) Weekly communication with participants was conducted via e-mail with updates on progress through the intervention, encouragement, and expressions of gratitude for being involved in the study.

**Demographic**

Allowing the participants an opportunity to complete surveys at the point of initial contact positively impacted the likelihood of completion. A total of 15 out of 17 consented participants completed the initial questionnaires despite weekly reminders concerning initial survey completion and intervention instructions. The demographic findings from the initial surveys were congruent with epidemiologic literature showing that the majority of the participants were white, female, and over the age of 40.(Manchikanti, Singh, Falco, Benyamin, & Hirsch, 2014) Collection of demographic data revealed that the sample was heterogenous in all variables. Due to the limited number of responses it cannot be assumed that results could be applicable to the general population despite the similarity of sample characteristics to epidemiologic findings. Comparison of variables between pre- and post-intervention groups were evaluated and no significant differences were found, indicating that there were no major differences in the groups' demographics. Due to the fact that chronic low back pain may require the use of multimodal approaches in management, the chronicity of LBP in participants may

have impacted the effectiveness of the intervention.(Webster & Markman, 2014) Chronicity may also explain improvements identified in the pain sections since acute and subacute low back pain will typically improve despite the intervention.(Qaseem, Wilt, McLean, Forciea, & Phys, 2017)

**Function**

Functional assessment was found to have no statistical significance in improvement. Similar to other findings in this study, there was no statistically significant difference in the two groups.(Carpenter, Stoner, Mundt, & Stoelb, 2012; Chiauzzi et al., 2010) Despite finding that there was no statistical significance in improvement of function, five out of six participants did report at least some improvement in function. The scores for these five decreased by a range of one to five points out of possible fifty while the one participant who did not improve reported a score increase of six points. It can be argued that the small sample size is impacting the ability of this study to show improvement in function. The decrease in functional limitation is encouraging but may be impacted by other confounders or treatments.

**Pain**

Pain was assessed across four dimensions with numeric pain scales ranging from zero to ten. The results of the Wilcoxon matched pairs test did not find statistical significance in the differences in reported pain between the pre- and post-intervention surveys. However, two of the dimensions, "Usual Pain" and "Worst Pain", were found to be very close to meeting significance with $p$=.059 for both items. It is possible that these findings could reach statistical significance if a large sample size was obtained in future research. Chronicity of LBP may have played a role in the improvement of pain instead of the intervention. Half of the participants reported chronicity of either acute or subacute LBP, each of which have a high rate of resolution with or without intervention.(Qaseem et al., 2017) This fact could provide the rationale of near significance in light of the rest of the measures showing no significant differences.

**Self-Efficacy**

No statistical difference was found between the two groups based on inferential testing. Six participants completed the study with half of the group reporting improved feelings of self-efficacy and the other half reporting reduced feelings of self-efficacy. Despite the lack of statistical significance, it was expected that more participants would experience an improvement in self-efficacy scores similar to the positive trends of function measured by the ODI. The range of scores for the PSEQ did increase making an argument for a net improvement. Previous systematic reviews have shown that the use of web-based interventions can have positive impacts on participants' self-efficacy, but that these results are often mixed.(Garg, Garg, Turin, & Chowdhury, 2016) The conclusion is that the results for the PSEQ are consistent with the findings reported in the literature.

**Satisfaction**

The majority of participants (83%) reported that they found the information easy to access, would recommend this information to a friend, found the information meaningful, learned something new about their condition, and were satisfied with the information provided. These findings support the assumption that the intervention was appropriately designed and met the goal of providing useful information to the participants. Items that were found most helpful

were the links to resources that highlighted exercises and additional LBP information. One comment in particular highlighted the need for this type of intervention: "I hope this site will find an audience with other hospitals, and doctors' offices since it has been a great resource for information." One comment that was meant as a recommendation for improvement that, in reality, reinforced the desired outcome of understandability. It is recommended that patient education and information materials be easily understood and written at a 5th grade reading level or below.(Commission, n.d.) The comment stated that "the info was very basic", which was the intended outcome of the information.

**Strengths and Limitations of Design**

The design of this study utilizes many components of the Social Cognitive Theory by addressing the individual self-efficacy, knowledge and skill, and self-control as well as environmental factors such as vicarious learning, situations, and reciprocal determinism. The use of a theoretical framework is a strength of study in that it helps to guide the project interventions and outcomes. Availability of the intervention is another strength of the design, allowing participants to access the intervention at a time and place that is convenient. This had the potential to impact adherence to the intervention and increase the quality of the data obtained from the study.

Several limitations have been identified in the project. There was a small recruitment window of only eight weeks that limited the number of participants that could be recruited for the study. Recruiting methods failed to meet desired participants resulting in a small sample size. A long intervention assessment period that possibly captured subsequent episodes of low back pain might have impacted participants views on self-efficacy in LBP management. While the SCT was determined to be the best framework to base this study, it is a complex model that can lack the ability to accurately identify the role of individual factors on outcomes.(Edberg, 2015) Inability to control for these individual factors or variables can cause inconsistencies in analysis of outcomes related to LBP.

The use of the intervention itself may be considered a limitation as it may have lacked interactiveness with the participants. Use of web-based platforms to provide static information may have reached a saturation point with participants and decreased the view of the novelty of the intervention. This may have made the intervention seem less worthwhile and more of a "same old, same old" education program despite the validity of the information and sites delivered. Providing a more robustly interactive intervention may encourage participants to be more involved by making the intervention more engaging and increasing interest and buy-in from participants.

A final limitation of the project was in the selection of the recruitment site. This site is a sub-specialty clinic that focuses on spine and spine-related complaints. Due to the specialized nature of this clinic, it may not be the first point of care for LBP. While this facility is well-equipped to manage initial complaints of LBP, the majority of evaluations were for those who had been experiencing LBP chronically. A potential solution for future iterations of this study would be to change the setting location to a facility or clinic serves as the initial point of care. This would allow early intervention on lifestyle modification and back health maintenance techniques to reduce the chronicity of LBP.

**Conclusion**

Web-based education may be a viable option to support patients with LBP by providing an easily accessible means of information. However, there needs to be further investigation into how this information is delivered to encourage participant engagement in the activities. While the use of this intervention was not shown to be significantly effective in improving pain, function, or self-efficacy it did show the acceptability of accessing healthcare information through a web-based method. The availability of information and creating a robust network for patients is seen as a benefit for and by patients. Further research is needed with larger sample sizes and better randomization and controls to help identify if there is potential for impact on the measures discussed in this study. The use of web-based education for low back pain should be evaluated at the point of primary care or initial evaluation to fully leverage existing relationships for study completion and subsequent analysis.

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