Role of rehabilitation in the management of lower back pain in young adults and in the elderly

- 1. Title: Dr
- 2. Your Name: GBOLAHAN A AFOLABI
- 3. Student Number:
- 4. Date of Submission: 18TH OF JANUARY, 2022
- 5. E-mail (optional): <u>GQGB1881@YAHOO.CO.UK</u>
- 6. Course Name (optional): DOCTOR OF PHILOSOPHY IN PHYSICAL MEDICINE
- & REHABILITATION, PHD PMR.
- 7. Couse Code (optional)
- 8. Course Professor / Instructor (optional)

Abstract:

Lower back pain is one the most common physical ailments found in the adult population with various causes and different management modalities in the diverse age groups. The various management differ from medical and surgical to physical medicine and rehabilitation. This paper would focus on the different forms of rehabilitation in young adults and elderly. With emphasis on the how rehabilitation practices affect the severity of the ongoing pathologies. The use of physical therapy in various forms plays a significant role in reducing the severity of the pathology and improving the quality of life of the patient. With surgical intervention used as a last resort physical therapy and other forms of rehabilitation is playing a vital role in the present management of lower back pain (LBP).

Key words: Lower back pain, rehabilitation, management of lower back pain, acute back pain, subacute back pain, chronic back pain.

Introduction

Lower back pain (LBP) is any discomfort that occurs in the posterior aspect of the trunk between the inferior border of the 12th rib and the proximal aspect of the thighs (*S. Kinkade, 2007*). Lower back pain is one of the most common causes of hospital visits in adults, In the United States a large amount of the population complains of low back pain for one day in the past 3 months. With a substantial increase in the prevalence of lower back pain from the young adult population into an elderly population and a burgeoning cost of healthcare and a loss in revenue from lost income as much as 100 billion in 2006. (*Manchikanti, et al, 2014*). The back is composed of muscles and aspects of the skeletal systems comprised of the Vertebrae and ribs. The muscles in the back are divided into the Superficial (Extrinsic) and Deep (Intrinsic) muscles of the back. With muscles divided into superficial and deep muscles, The superficial muscles such as Trapezius, Latissimus dorsi, Rhomboid major, minor, Serratus posterior superior and inferior which plays a role in the support of the back and movement of the muscles of the upper limb, however the deep muscles such as paraspinal muscles: lumbar and thoracic erector spinae, intertranvesi, rotatorer and multifidus play a more relevant role in the support of the back (*D'hoogea et al, 2013*).

Epidemiology

LBP is a major social and economic problem with a point prevalence of 13.1% in the United States of adults between 20–69 years old. With a significant increase in the prevalence of acute and Chronic LBP in adults in the last decade with dramatic rise in the aging population. LBP in patients plays a significant role on the quality of life of the patients, as the pain constricts the occupational and personal life activities of the patient (*Allegri et all 2016*) The burden of this disease can be seen in the high costs of health care spending in the United States (exceed \$100 billion per year), most of which are a due to lost wages and decreased productivity (*Allegri et all 2016*).

Management of Lower back pain

Treatment for LBP does not only target the symptomatic pain but the underlying cause as well. The management of acute and chronic LBP differs with the use of patient education, spinal manipulation therapy, it is known that increasing BMI and fat mass greatly contributes to the development of LBP prior to any surgical intervention with greater severity in android fat distribution than gynoid (*Brady et all 2019*). Management that is focused on reduction of truncal obesity has the added benefit of reducing or altogether eliminating LBP (*Hussain et. al, 2019*). In majority of cases the specific source of the pain (e.g., musculoskeletal, radiculopathy, referred etc.) is not definitive. The minority of definitive cases stem from vertebral fracture, malignancy, or infection (*Hartvigsen, et. al, 2018*).

Management guidelines favor Noninvasive nonpharmacologic treatments such as acupuncture, psychological therapies, massage, physical therapies (superficial heat, traction, transcutaneous electrical nerve stimulation, interferential therapy, low-level laser therapy, lumbar supports, shortwave diathermy, and ultrasonography), spinal manipulation, exercise therapy (Tai chi) and yoga (*Chou et all 2007*).) as first line, then pharmacologic intervention if LBP does not resolve. Drugs such as acetaminophen and nonsteroidal anti-inflammatory drugs for acute LBP and back exercises, behavioral therapy, and short-term opioid analgesics for chronic LBP, with epidural steroid injections or decompression surgery for patients with neurological deficits who may require such.

In younger adults, there is a progressive increase in the incidence of back pain, this symptom presents with reoccurrence without any underlying stated pathology and resolves spontaneously without treatment (*Burton et all 1996*). Physical activities play a role in the occurrence of low back pain in young adults as seen in athletes, who have persistent, chronic, or recurrent symptoms associated with self-limited sprains or strains and degenerative lumbar disc disease or spondylolytic stress lesions. Expected clinical outcomes in the management of low back pain includes a reduction or elimination of pain, improvement in in the quality of life for the patient, back specific and global function, a reduced incidence of back pain flares and reoccurrences of such episodes with patient satisfaction (*Chou et all 2007*).

The American College of Physicians outlines Clinical Practice Guidelines for the management of low back pain. Rehabilitation of LBP can be divided into 3 phases.

In Phase 1, the acute phase, the goal is to establish a diagnosis and to establish an appropriate treatment plan. Diagnosis is established via a comprehensive look at the patient's medical history, physical examination findings and diagnostic imaging results. Diagnostic tools that such as X-ray, Computed Tomography scan (CT scan), Magnetic Resonance Imaging (MRI), Radionuclide bone scan and electromyogram (EMG) (Columbia University).

In Phase 2, the recovery phase focuses on re-establishing the patient's functionality, so that the patient can return to their regular activities of daily living while continuing to implement the treatment plan designed to treat the underlying etiology.

In Phase 3, the maintenance phase, the aim is to continue to provide education and strategies for the patient to prevent additional injury (Columbia University). Most patients living with LBP which affects their quality of Life will have recurrences and therefore rehabilitation is important in the prevention of further functional loss and disability which is integral to clinical and occupational management (*Pergolizzi et all 2020*). Through rehabilitation there is the potential for a 30-50% reduction in LBP associated workplace absences and long-term incapacity (*Waddell,Burton 2005*). To understand the benefits, this paper aims to assess the various rehabilitation protocols in various age groups and chronicity of back pain. The suggested first line treatment should be use of superficial heat, massage, acupuncture, or spinal manipulation. Next step is regimented exercise programs and mindfulness-based stress reduction. And if the patient is unresponsive to non-pharmacological treatments nonsteroidal anti-inflammatory drugs as first-line pharmacological intervention with tramadol or duloxetine as second-line therapy (*Qaseem et all 2017*).

Surgery

Unresolved LBP despite such intervention would require surgery. The yearly number of surgical interventions for management of lower back pain in the United States has increased more than two-fold between 1998-2008 from 77, 682 procedures to 210, 407 procedures (*Daniell, Osti 2018*). Despite this increase, 10-46% of these cases resulted in Failed Back Surgery Syndrome and increasing rates of undesired outcomes of surgical intervention for LBP has placed more emphasis on non-surgical management and preventative measures.

While early intervention for LBP involves reducing truncal obesity, later surgical interventions require postoperative management that reduces pain and targets the restoration of independent ambulation for the patient. When considering patients that have undergone lumbar fusion spinal surgery, it is shown that following the enhanced recovery after surgery (ERAS) protocol yields the most benefit in the patient's rehabilitation (*Smith et all 2019*). This protocol requires preoperative oral acetaminophen and gabapentin, postoperative early mobilization and physical therapy, and postoperative antiemetic to reduce risk of nausea and vomiting (*Smith et all 2019*). A cohort study comparing the recovery of 97 patients after lumbar fusion surgery using ERAS protocol vs control cohort (using only PT/OT) showed significantly decreased use of narcotics (POD 0, p= 0.0004; POD 1, p= 0.04; POD 3, p= 0.03), decreased use of antiemetics (p= 0.02), increased ambulation post op (p=0.002) and lower pain scores (p=0.02) (*Brusko et all 2019*).

Role and efficacy of physical therapy in management of acute, subacute, and chronic lower back pain in young and middle-aged adults.

Acute

Nonspecific back pain is a common problem. Most young and middle-aged adults will have episodes of acute back pain in their life. The vast majority spontaneously resolves. A Cohort Study following 103 patients, 90% of patients recovered from low back pain in less than two weeks with limited intervention (*Coste et all 1994*). Lower back pain with the absence of red flags (trauma,

malignancy, neurological deficits) should be treated conservatively. There is evidence supporting the clinical significance of superficial heat and spinal manipulation. Individual studies have shown some value in regimented exercise and physical therapy, but clinical reviews and meta-analyses have not shown significant efficacy to physical therapy in the acute phase (*Chou et all 2007*). Once an episode of acute lower back pain has resolved, exercise programs do have a role in decreasing the risk of recurring lower back pain (*Steffens et all 2016*).

Subacute

As patients move from the acute to subacute phase there is stronger evidence for the value of physical therapy. The meta-analysis of nine RCTs of participants between 18 and 65 years supports those multidisciplinary treatments with management methods which includes physical therapy having a better outcome in patients with LBP for a duration of six to twelve weeks (*Marin et all 2017*). Clinical guidelines do not change between the young, middle, and elderly adults; however, physical therapy is tailored to the age of the individual and the safety of the exercises for that person. Young adults are more likely to be able to participate in more aggressive physical therapy, whereas patients greater than 65 are more likely to be deconditioned and have comorbidities that may limit PT.

Chronic

As patients move from the subacute to chronic phase, there is a role for physical therapy. Studies looking at the clinical course of chronic back pain in young adults show no significant difference between young/ middle aged adults and the elderly in their clinical course (Manogharan et all 2017). According to a survey of 35,446 patients, chronic pain in the young is more neuropathic in nature, compared to elderly who more commonly have nociceptive pain (Hüllemann et all 2018). Here we aim to look at the clinical course particularly pertaining to physical therapy. Most treatment plans proceed in a stepwise manner. The reasons and risk factors for chronic low back pain are diverse and play a role in guiding treatment. A Cross sectional study in India of 1355 participants found a significant link between chronic low back pain (mean age: 24.9) and marital status, history of spine issues, strenuous exercise, job satisfaction, monotony, stress, and other activities of daily life (Ganesan et all 2018). Looking at the risk factors and causes for chronic back pain guides' therapy. For example, a patient with traumatic injury from strenuous sports is more likely to need imaging and pain management than a sedentary person with a higher BMI and screens positive for depression. Many studies support the efficacy of Physical Therapy in chronic back pain (Qaseem et all 2017), however at this time, there is limited research on the remission and improvement of chronic back pain following physical therapy in the young/middle aged compared to the elderly.

Data on Rehabilitation of elderly adults (<65)

Management of lower back pain (LBP) in elderly patients is dependent on the etiology and prognosis of the lower back pain. In the elderly adult population, etiologies of LBP tend to include osteoprotic fractures, spinal stenosis, tumor, physical inactivity, and/or age-related spinal

degeneration (*Wong et all 2018*). It is also important to consider predisposing factors such as genetics, gender and ethnicity when considering the short- and long-term risk of developing LBP (*Wong et all 2018*).). A study by *Pahor* and associates has shown that a preventative exercise program consisting of aerobics, resistance and flexibility training will significantly reduce the occurrence of major mobility deficits in the elderly (*Pahor et all 2018*). In doing so, the risk of developing LBP because of inactivity is decreased.

Typically, young adults tend to move from nociceptive pain to neuropathic pain as the LBP progresses from acute to chronic respectively. Interestingly, the opposite is true in the elderly population as the most common possible cause is due to the degenerative aging process (*Hüllemann et all 2018*)

Acute

In the current COVID-19 pandemic climate, elderly individuals with new onset lower back pain obtained from fall and fractures do not have ready access to physical therapy as in the recent past due to social restrictions. Telehealth exercise programs are a new avenue for the elderly to obtain rehabilitation services (*Middleton et all 2020*).

Subacute

As mentioned previously, LBP in the elderly becomes more nociceptive as they progress to chronic LBP. In the subacute phase, pharmacologic intervention becomes more necessary as an adjuvant to physical therapy. Drug therapy for pain control in the elderly must be approached delicately using a "step ladder" approach that starts with NSAIDs and builds to opioids (*Ali et all 2018*). Even with careful escalation there is a greater risk of adverse events in the elderly than in the young adult population (*Ali et all 2018*). Risks include functional impairment leading to falls, cognitive impairment and addictions *Ali*. In the near future we will see novel opioids such as TRV130, that target the analgesic pathway of the mu opioid receptor but minimizes the addictive potential (Murphy).

Chronic

Elderly patients that progress to chronic non-specific lower back pain (CNS-LBP) are likely to benefit from an isokinetic exercises and/or core stabilization exercise regimen for successful reduction in pain and overall increase in mobility and quality of life (*Zou et all 2019*). Isokinetic exercises such as pilates, yoga and tai chi are first line rehabilitation methods for CNS-LBP. In particular, the main goal of each of these rehabilitation methods is to strengthen the muscles that maintainposture and increase proprioception thereby decreasing pain stimuli. In a randomized controlled study comparing the use of isokinetic exercise tai chi vs core stabilizing training in treating CNS-LBP, both exercises improved the severity of the patients' pain but did not significantly change their lower limb proprioception (*Zou et all 2019*). In conjunction, tai chi has been shown to slow thedecline of bone mineral density in regions of the lumbar spine (*Zou et all 2019*).

Author's opinion

As medicine becomes more patient centered and individualized so must treatment and management options. This article is clinically significant because it highlights the importance of tailoring treatment for NS-LBP to maximize the most effective reduction of pain or return to baseline. This implies that a one size fits all model for treatment of NS-LBP must be re-evaluated and further researched. Limitations of this study are the exclusion of psychological interventions as management of NS-LBP as mental state may play a role in pain threshold of the population groups being considered.

Conclusion

With the advent of different modalities in the management of LBP, rehabilitation in young adults and elderly are closely related with certain modifications based on the severity and cause of the LBP. The use of noninvasive pharmacologic and nonpharmacologic treatments with an increase in physical activity in the rehabilitation of patient aids in reducing the severity of the pain and reduces the length of immobilization seen in both set of patients. With increased movement in rehabilitation, less severe LBP can be managed adequately without surgery or pharmacological intervention.

References:

Allegri M, Montella S, Salici F, Valente A, Marchesini M, Compagnone C, Baciarello M, Manferdini ME. and Fanelli G. Mechanisms of low back pain: a guide for diagnosis and therapy 2016 Oct 11. doi: <u>10.12688/f1000research.8105.2</u> Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4926733/

Ali A, Arif A, Bhan C et al. Managing Chronic Pain in the Elderly: An Overview of the Recent Therapeutic Advancements. Cureus. 2018. doi:10.7759/cureus.3293.

Brady S, Urquhart D, Hussain S et al. High baseline fat mass, but not lean tissue mass, is associated with high intensity low back pain and disability in community-based adults. Arthritis Res Ther. 2019;21(1). doi:10.1186/s13075-019-1953-4.

Burton A. K, Clarke R. D, McClune T. D, Tillotson K. M The natural history of low back pain in adolescents Spine (Phila Pa 1976)1996 Oct 15;21(20):2323-8. PMID: 8915066 DOI: 10.1097/00007632-199610150-00004

Brusko G, Kolcun J, Heger J et al; Reductions in length of stay, narcotics use, and pain following implementation of an enhanced recovery after surgery program for 1- to 3-level lumbar fusion surgery. Neurosurg Focus. 2019;46(4):E4. doi:10.3171/2019.1.focus18692.

Chou R, Huffman LH; American Pain Society; American College of Physicians. Nonpharmacologic therapies for acute and chronic low back pain: a review of the evidence for an American Pain Society/American College of Physicians clinical practice guideline. Ann Intern Med. 2007 Oct 2;147(7):492-504. doi: 10.7326/0003-4819-147-7-200710020-00007

Coste J, Delecoeuillerie G, Cohen de Lara A, Le Parc JM, Paolaggi JB. Clinical course and prognostic factors in acute low back pain: an inception cohort study in primary care practice. BMJ. 1994 Feb 26;308(6928):577-80. doi: 10.1136/bmj.308.6928.577

Columbia University Medical Center's Department of Rehabilitation and Regenerative Medicine Retrieved: <u>https://www.cuimc.columbia.edu/rehab/staywell/low-back-pain</u>

Daniell J, Osti O. Failed Back Surgery Syndrome: A Review Article. Asian Spine J. 2018;12(2):372-379. doi:10.4184/asj.2018.12.2.372

Deyo RA , Mirza SK , Martin BI . Back pain prevalence and visit rates: estimates from U.S. **national surveys**, **2002. Spine (Phila Pa 1976)**. 2006;31:2724-7. [PMID: 17077742.

D'hoogea R, Hodges P,Tsaob H, Hall L, MacDonald D, Danneels L. Altered trunk muscle coordination during rapid trunk flexion in people in remission of recurrent low back pain Journal of Electromyography and Kinesiology Volume 23, Issue 1, February 2013, Pages 173-181 Retrieved from: https://www.sciencedirect.com/science/article/pii/S1050641112001630.

Ganesan S, Acharya AS, Chauhan R, Acharya S. Prevalence and Risk Factors for Low Back Pain in 1,355 Young Adults: A Cross-Sectional Study. *Asian Spine J*. 2017;11(4):610-617. doi:10.4184/asj.2017.11.4.610

-

Hartvigsen J, Hancock M, Kongsted A et al. What low back pain is and why we need to pay attention. The Lancet. 2018;391(10137):2356-2367. doi:10.1016/s0140-6736(18)30480-x

Hüllemann P, Keller T, Kabelitz M et al. Clinical Manifestation of Acute, Subacute, and Chronic Low Back Pain in Different Age Groups: Low Back Pain in 35,446 Patients. Pain Practice. 2018;18(8):1011-1023. doi:10.1111/papr.12704.

Humphrey LL, Vijan S. Noninvasive Treatments for Acute, Subacute, and Chronic Low Back Pain: A Clinical Practice Guideline From the American College of Physicians. Ann Intern Med. 2017 Apr 4;166(7):514-530. doi: 10.7326/M16-2367.

Hussain S, Urquhart D, Wang Y et al. Fat mass and fat distribution are associated with low back pain intensity and disability: results from a cohort study. Arthritis Res Ther. 2017;19(1). doi:10.1186/s13075-017-1242-z.

Kinkade S. Evaluation and Treatment of Acute Low Back Pain . American family physician journal 2007 Apr 15;75(8):1181-1188.

Liu J, Yeung A, Xiao T et al. Chen-Style Tai Chi for Individuals (Aged 50 Years Old or Above) with Chronic Non-Specific Low Back Pain: A Randomized Controlled Trial. Int J Environ Res Public Health. 2019;16(3):517. doi:10.3390/ijerph16030517.

Manchikan L, Singh V, Falco F. J. E., Benyamin R. M, Hirsch J. A; *Epidemiology of Low Back Pain in Adults Science direct Neuromodulation: Technology at the Neural Interface:Volume 17, Supplement 2, October 2014, Pages 3-10* Retrieved from: <u>https://onlinelibrary.wiley.com/doi/epdf/10.1111/ner.12018.</u>

Marin TJ, Van Eerd D, Irvin E, Couban R, Koes BW, Malmivaara A, van Tulder MW, Kamper SJ. Multidisciplinary biopsychosocial rehabilitation for subacute low back pain. Cochrane Database Syst Rev. 2017 Jun 28;6(6):CD002193. doi: 10.1002/14651858.CD002193.pub2

Manogharan S, Kongsted A, Ferreira ML, Hancock MJ. Do older adults with chronic low back pain differ from younger adults in regards to baseline characteristics and prognosis? Eur J Pain. 2017 May;21(5):866-873. doi: 10.1002/ejp.989. Epub 2017 Mar 14. PMID: 28295893.

Middleton A, Simpson K, Bettger J, Bowden M. COVID-19 Pandemic and Beyond: Considerations and Costs of Telehealth Exercise Programs for Older Adults With Functional Impairments Living at Home—Lessons Learned From a Pilot Case Study. Phys Ther. 2020;100(8):1278-1288. doi:10.1093/ptj/pzaa089.

Pahor M, Guralnik J, Ambrosius W et al. Effect of Structured Physical Activity on Prevention of Major Mobility Disability in Older Adults. JAMA. 2014;311(23):2387. doi:10.1001/jama.2014.5616.

Park S, Park S, Min S, Kim C, Jee Y. A Randomized Controlled Trial Investigating the Effects of Equine Simulator Riding on Low Back Pain, Morphological Changes, and Trunk Musculature in Elderly Women. Medicina (B Aires). 2020;56(11):610. doi:10.3390/medicina56110610.

Smith J, Probst S, Calandra C et al. Enhanced recovery after surgery (ERAS) program for lumbar spine fusion. Perioperative Medicine. 2019;8(1). doi:10.1186/s13741-019-0114-2.

Steffens D, Maher CG, Pereira LS, Stevens ML, Oliveira VC, Chapple M, Teixeira-Salmela LF, Hancock MJ. Prevention of Low Back Pain: A Systematic Review and Meta-analysis. JAMA Intern Med. 2016 Feb;176(2):199-208. doi: 10.1001/jamainternmed.2015.7431. PMID: 26752509.

Qaseem A, Wilt TJ, McLean RM, Forciea MA; Clinical Guidelines Committee of the American College of Physicians, Denberg TD, Barry MJ, Boyd C, Chow RD, Fitterman N, Harris RP, Humphrey LL, Vijan S. Noninvasive Treatments for Acute, Subacute, and Chronic Low Back Pain: A Clinical Practice Guideline From the American College of Physicians. Ann Intern Med. 2017 Apr 4;166(7):514-530. doi: 10.7326/M16-2367.,

Waddell G, Burton K. Concepts of rehabilitation for the management of low back pain Best Practice & Research Clinical Rheumatology Science direct Volume 19, Issue 4, August 2005, Pages 655-670

Wong A, Karppinen J, Samartzis D. Low back pain in older adults: risk factors, management options and future directions. Scoliosis Spinal Disord. 2017;12(1). doi:10.1186/s13013-017-0121

Zou L, Zhang Y, Liu Y et al. The Effects of Tai Chi Chuan Versus Core Stability Training on Lower-Limb Neuromuscular Function in Aging Individuals with Non-Specific Chronic Lower Back Pain. Medicina (B Aires). 2019;55(3):60. doi:10.3390/medicina55030060