Improving Compliance with Home Exercise Programs in Patients with Osteoarthritis of the Knee: An Evidence-Based Practice Project

Raena Barnes
University of Cincinnati

Osteoarthritis (OA) of the knee is a debilitating condition, leading to a significant decrease in the quality of life and a considerable burden on healthcare systems. A comprehensive literature review was completed, and the evidence identifies OA as the most common degenerative joint disease in the US, risks related to age, gender, and race, and exercise as the most effective nonpharmacological treatment for OA This evidence-based practice project aims to implement home exercise programs for patients with OA of the knee who are not currently enrolled in physical therapy programs to enhance compliance, patient education, and patient outcomes and promote self-management. This project will be conducted in a medical clinic treating patients with OA of the knee. Those included will be over 50 and have no comorbidities or cognitive or physical limitations preventing them from performing exercises safely. They will be given pre- and post-intervention surveys, with data collected over three months and analyzed via the Chi-Square test to determine clinical significance. This project can improve patient outcomes, including reduced pain, enhanced function, increased self-efficacy, and offer OA patients a cost-effective, sustainable alternative to physical therapy.

Osteoarthritis (OA) of the knee is a prevalent and debilitating condition affecting over 14 million people in the U.S. (Deshpande et al., 2016). One key aspect of managing the knee is the implementation of home exercise programs, which have been shown to alleviate pain, improve function, and enhance the overall quality of life. Chen (2019) noted that exercise is the most successful approach to reducing pain and improving mobility without medication. While home exercise programs can be time efficient and convenient without requiring professional equipment, low compliance rates have been reported, posing a significant challenge in achieving optimal outcomes for individuals with OA of the knee. Studies have reported suboptimal adherence rates to home exercise programs (Chen, 2019), and this lack of adherence limits the potential benefits of

home exercise programs, resulting in increased pain, reduced functional abilities, and diminished quality of life. Barriers to compliance can include pain, lack of motivation, understanding, forgetfulness, and lack of social support. However, the evidence overwhelmingly supports that adopting a home exercise program has demonstrated substantial advantages in improving the well-being of individuals afflicted with knee osteoarthritis. In patients with OA of the knee, engaging in regular exercise can help maintain muscle strength and flexibility and prevent further joint damage and disability. Chen (2019) found that at the end of a 12-week exercise program, most participants noted decreased pain intensity, increased muscle strength, improved balance and mobility, and better quality of life. Educating patients about the benefits of a home exercise program and providing clear, easy-to-understand instructions enhances the willingness to engage in physical activity, thereby increasing the potential for long-term health benefits (Sasaki, et al 2022).

Current evidence indicates that enhancing compliance with home exercise programs is crucial to optimizing knee OA management. Successful interventions have been identified, including education, goal setting, and the use of technology. However, implementing these interventions in real-world clinical settings still needs to be improved, and there needs to be more available knowledge and its application leading to the development of this evidence-based practice project. This evidence-based practice project aims to develop an education program and interventions to increase compliance with home exercise programs in knee OA patients, improve patient outcomes, reduce pain and disability, and enhance overall quality of life. The project will incorporate home exercises, education sessions, clear and concise instruction, and ongoing monitoring and support. It will also utilize technology such as telehealth to enhance engagement and adherence.

Methods

The project intervention includes providing educational sessions to all patients and developing a tailored home exercise program for those unable to attend physical therapy. The population of interest consists of adult patients with unilateral or bilateral knee OA seeking treatment at private medical practice and not currently participating in a physical therapy program. Exclusion criteria include those presently receiving physical therapy or having cognitive or physical limitations, including but not limited

to dementia, Parkinson's disease, balance issues, or chronic pain issues that prevent them from safely participating in a home exercise program.

Patients with knee OA may benefit from viscosupplementation injections, which involve injecting a gel-like substance into the knee joint to improve lubrication and reduce pain. However, in addition to these injections, home exercise programs are crucial in managing symptoms and maintaining joint function. To address the challenges of limited access to physical therapy, the project intervention involves the Nurse Practitioner (NP) providing education sessions to all patients and a home exercise program specific to improving knee mobility (see Appendix C). These sessions aim to educate patients about OA, how it affects their knees, and the importance of regular exercise, proper technique, and specific exercises tailored to their needs and physical abilities, including stretches and range-of-motion exercises. Those able are also encouraged to include walking or swimming in their regimen. The NP will conduct weekly follow-up phone calls to ensure compliance with the home exercise program. Together, these interventions allow for a comprehensive and holistic approach to patient care, addressing knee OA management's medical and rehabilitation aspects. Patient enrollment was voluntary, with patients giving verbal permission before their education session. Data collection includes pre-intervention surveys obtained during the education sessions and post-intervention surveys collected at the end of three months. These questionnaires use a Likert scale developed in-house (see Appendices A and B) to assess if they understood the educational materials, how frequently they exercised pre- and post-intervention, their perceived benefits, any barriers encountered, satisfaction with the home exercise program and education session, and compliance with prescribed exercises post-intervention. The data collected will then be analyzed using the Chi-Square test. Compliance is a categorical variable, and the chi-square test will determine if there is a significant association between education and follow-up versus education alone in increasing compliance rates with the home exercise program among participants (see Appendix D).

Results

Over three months, the 20 participants who met the criteria for inclusion in this evidence-based practice project self-reported their home exercise participation and their OA symptoms, and it was found that the

percentage of those who were compliant with a home exercise program increased from 40% to 70%.

In Phase 1 of the project, a team led by an NP analyzed barriers to patient compliance with home exercise programs for patients with knee osteoarthritis (OA). Critical interventions that were tested and implemented included developing an educational curriculum to impart a thorough understanding of OA, its progression, and its impact on mobility, as well as a tailored home exercise program consisting of six stretching exercises that could improve OA symptoms and increase knee mobility.

In Phase II, strategies were developed to improve participant compliance. These included providing pre- and post-intervention questionnaires to patients to assess their understanding of education programs and exercises and follow up with the provider to evaluate individual performance and compliance reports.

In Phase III, the project began by implementing critical elements. A new patient education and home exercise program was developed based on the steps, weaknesses, and challenges identified in the process. The Nurse Practitioner collected data through patient interviews and reported it during the sustainability phase to monitor compliance and identify decreases, obstacles, and challenges.

Among the 20 participants in the project, before attending the education session, 40% understood that exercise was beneficial for managing symptoms associated with osteoarthritis, and 40% participated in some form of regular exercise. After attending the education session, 100% stated they understood the benefit of exercises for symptom management, and the percentage of participation in exercise increased to 70% at the end of three months. This is seen in Chart 1 (Table 1).

Table 1: *Education and Exercise Awareness Pre- and Post- Intervention*

	pre-intervention yes	Pre-intervention no	Post intervention yes	Post-intervention no
Benefit aware	8	12	20	0
Active exercise	8	12	14	6

Note: N=20

When the two groups were compared, the participants who attended the education session and regularly interacted with the NP were noted to participate at some level with their home exercise program more often than those who only participated in the education sessions. This indicates that provider intervention is beneficial but unnecessary for successful implementation (Table 2).

Table 2*: Exercise Program Compliance Based on Intervention*

	Education and follow up	Education only
Performed all exercises	2	1
Performed >50%	3	2
Performed <50%	4	2
No exercise	1	5

Note: N=20

All 20 participants were contacted at the end of the three months, with one reporting a hospital stay that affected their compliance. As a result of contacting all participants, no patient information was excluded from the project. While not a marker, during post-intervention patient interviews, 60% of participants noted decreased pain and increased knee mobility with prescribed exercises.

Limitations

One limitation of this project is the small sample size of 20 participants, which reduces the statistical power and generalizability of the findings. With a small group, the results may not accurately reflect broader trends or be representative of a larger population. Additionally, individual differences, such as motivational levels, baseline knowledge, or personal barriers, may have a greater impact on compliance rates in a small sample. Other limitations include potential self-reporting bias, as participants may overestimate their adherence to home exercise programs, and the lack of control over external factors (e.g., support systems, physical ability) that could influence compliance. Future studies with larger, more diverse samples and objective adherence measures could strengthen the validity of the findings.

Discussion

Over three months, this project yielded two key findings. The first is the increased understanding of the benefit of exercise in managing knee

osteoarthritis (OA) among the participants in the project after attending education sessions. Pre-intervention surveys revealed that only 40% of the participants fully comprehended the importance of exercise, while post-intervention surveys showed a substantial increase to 100%. The second is that the intervention led to an improvement in compliance rates among patients. The compliance rate increased from 40% to 70% among all participants, demonstrating the effectiveness of the educational sessions.

Most participants in the project noted improved mobility when discussing the benefits of exercise in follow-up visits with the NP at the end of three months. The benefit of improved mobility can lead to improved quality of life and increased adherence to the home exercise program due to this positive outcome. The project transformed individuals, increasing resource utilization and reducing reliance on pharmacological interventions. While the project's outcomes were largely positive, some discrepancies between the observed and anticipated results were noted. These discrepancies can be attributed to individual variation. Although all patients reacted favorably to the educational sessions, compliance differed based on co-morbidities, OA severity, and personal motivation. Two participants (n=20) from the group of twenty were briefly hospitalized, which affected their ability to complete the prescribed exercises during the three months. Other factors, including social support, may have influenced patient compliance. It is important to note that factors such as patient self-reporting of compliance and the potential for information bias may introduce limitations to internal validity. Additionally, the project has relatively small group sizes, which may impact the generalizability of the findings. To reduce the influence of small group sizes and enhance the generalizability of the findings, future studies may involve a more extensive and diverse patient population, allowing for further exploration of factors influencing compliance and refinement of interventions.

The findings of this project have practical implications for clinical practice. Healthcare providers can use education sessions and follow-up to enhance compliance with home exercise programs and improve OA management and patient outcomes. These interventions can also be modified for more diverse or rural patient populations with limited access to healthcare providers, and technology can be utilized to monitor patient outcomes and symptom management.

The sustainability of the project's interventions largely depends on healthcare providers' commitment and integration of educational

components into routine care. Additionally, the project's success makes it a strong candidate for implementation in other clinical settings, promoting the potential for benefit spread to a broader range of patients with knee osteoarthritis. This evidence-based practice project underscores the importance of patient education and provider follow-up in improving compliance with home exercise programs for patients with knee osteoarthritis. Healthcare providers should consider integrating these interventions to improve patient outcomes.

To build on the success of this project, future research should investigate the long-term sustainability of improved compliance and its impact on disease progression as well as healthcare costs for osteoarthritis patients. Also included should be the exploration of digital tools and telemedicine for education and follow-up interventions to increase patient access and convenience. The cost-effectiveness of the interventions to inform healthcare resource allocation should also be examined.

In conclusion, this evidence-based practice project demonstrates a path toward transformative change in managing knee osteoarthritis (OA). Through comprehensive education and provider intervention, there is a noted shift in the paradigm of patient compliance and overall health and well-being. Emphasizing the significance of these interventions, the investigators enhanced the quality of life for those affected by OA and implemented a program that can reduce healthcare costs. This project emphasizes the importance of patient education and provider engagement in managing chronic conditions. Moving forward, the care of patients with OA can be redefined, and similar programs can be encouraged across medical disciplines, creating a healthier, more informed, and empowered population that reaps the benefits of improved quality of life.

References

Anwer, S., Alghadir, A., & Brismee, J.M. (2016). Effect of Home Exercise Program in Patients with Knee Osteoarthritis: A Systematic Review and Meta-Analysis. *Journal of Geriatric Physical Therapy* (2001) 39(1): p38-48. https://doi.org/10.1519/JPT00000000000045

Argent, R., Daly, A., & Caufield, B. (2018). Patient Involvement with Home-Based Exercise Programs: Can Connected Health Interventions Influence Adherence? *JMIR mHealth and uHealth*,6(3): e47. https://doi.org/10.2196.mhealth.8518

https://www.cdc.gov/arthritis/basics/osteoarthritis.htm

Chen, H., Zheng, X., Huang, H., Liu, C., Wan, Q., & Shang, S. (2019). The effects of a home-based exercise intervention on elderly patients with knee osteoarthritis: a quasi-experimental study. BMC Musculoskeletal Disorders, 20(1), 160. https://doi.org/10.1186/s12891-019-2521.4

Deshpande, B., Katz, J., Solomon, D., Yelin, E., Hunter, D., Messier, S., Sutter, L., & Losina, E. (2016). Number of persons with symptomatic Osteoarthritis in the U.S.: Impact of Race and Ethnicity, Age, Sex, and Obesity. *Arthritis Care and Research,* 68(12)1743-1750. https://doi.org/10.002/acr.22897

Gold, D., & McClung, B. (2006). Approaches to patient education: emphasizing the long-term value of compliance and persistence. *The American Journal of Medicine*, 119(4 suppl 1): *s 32-7. https://doi.org/10.1016/j.amjmed.2005.12.021*

Golightly, Y., Allen, K., &Caine, D. (2012). A comprehensive review of different exercise programs for patients with osteoarthritis. *The Physician and Sports Medicine*, 40(4): 52-65. http://doi.org/10.3810.psm.2012.11.1988

Iowa Model Collaborative (2017). Iowa Model of evidence-based practice: Revisions and validation. *Worldviews on Evidenced-Based Nursing*, 14(3),175-182. https://doi.org/10.1111.wvn.12223

Markarm, W, Sharaf, D., & Zaghlol, R. (2021). Impact of home exercise program on self-efficacy and quality of life among primary knee osteoarthritis patients: a randomized controlled clinic study. *Egyptian Rheumatology and Rehabilitation*, 48(1) 28. https://doi.org/10.1186/s43166-021-00073-2

McHugh, C., Kostic, A., Katz, J., & Losina, E. (2022). Effectiveness of remote exercise programs in reducing pain for patients with knee osteoarthritis: A systematic review of randomized trials. *Osteoarthritis and Cartilage Open,* May 14; 4(3):1000264. https://doi.org/10.1016/j.orcarto.2022.100264

Nascimento de Santana, G., Dibai-Filho, A., DaSilva, J., DaSilva, A., DeJesus, S., Dos Santos, P., and Fidelis-de-Paula-Gomes, C. (2022). Association between adherence to a home exercise program and central sensitization, pain intensity, and functionality in individuals with knee osteoarthritis. *BMC Musculoskeletal Disorders,* 17;23 (1).989. https://doi.org.10.1186/s12891-022-05959-6

Nicolson, P., Hinman, R., Kasza, J., & Bennell, K. (2018). Trajectories of Adherence to Home-Based Exercise Programs Among People with Osteoarthritis of the Knee. *Osteoarthritis and Cartilage,* 26(4),513-521. https://doi.org/10.1016/j.joca.2018.01.009

Ogrinc, G., Davies, L., Goodman, D., Batalden, PB., Davidoff, F., Stevens, D. Squire 2.0 (*Standards for Quality Improvement Reporting Excellence):* Revised publication guidelines from a detailed consensus process. *BMJ Quality and Safety.* 2016,25:986-92

Sasaki, R., Honda, Y., Oga,S., Fukushima, T., Tanaka, N., Kajiwara, Y., Nakagawa, K, Takahashi, A., Sakomoto, Y., Morirta, H, Kondo, Y., Okita, S., Goto, K, Kataoka, H., Sakamoto, J., & Okita, M. (2022) Effect of exercise and/or educational interventions on physical activity and pain in patients with hip/knee osteoarthritis: A systematic review with a meta-analysis. *PloS one*, 17(11), e0275591. https://doi.org/10.1371/journal.pone.0275591

Silva, C., Amaro, A., Pinho, A., Goncalves, R., Rodrigues, M., & Ribiero, F. (2018). Feasibility of a home-based therapeutic exercise program in individuals with knee osteoarthritis. *Archives of Rheumatology,* 33(3), 295–301. https://doi.org/10.5606/ArchRheumatol.2018.663

Tennant, M. (2006). An Evaluation of Knowles' Theory of Adult Learning. *International Journal of Lifelong Education,* 5:2,113-122. https://doi.org/10.1080/02601378600050203

Appendices

Appendix A

Data Collection Tool Pre-Survey

1) Where is your osteoarthritis located?

Right knee [ ] Left knee [ ] Bilateral (both) [ ]

2) Do you currently exercise?

Yes [ ] No [ ]

3) Do you understand that exercise could help manage your osteoarthritis symptoms?

Yes [ ] No [ ]

Appendix B

Data Collection Tool Post-Survey

1) I attended a home exercise education session

Yes[ ] No [ ]

2) I understood the exercises and how to perform them correctly

Yes [ ] No [ ]

3) I did the exercises exactly as described in my home exercise plan

Yes [ ] No [ ]

4) I did more than half of the exercises in my home plan

Yes [ ] No [ ]

5) I did less than half of the exercises in my home plan

Yes [ ] No [ ]

6) I did not exercise

Yes [ ] No [ ]

Please explain factors that limited your ability to exercise (e.g., time, illness)

Appendix C

Education Session

1) Provide an explanation of OA of the knee, including causes and symptoms. Show the participant their x-ray and explain how OA has impacted their knee joint.
2) Explain the benefit of exercise and the importance of compliance and consistency to improve symptoms of OA and pain management
3) Explain and demonstrate safe and effective exercises for OA, including stretches (quadricep stretch, straight leg raises, hip abduction, hip flexion, hamstring curl and stretch), gentle ROM of affected knee(s), aerobic exercise, weight bearing (walking) as tolerated, and non-weight bearing (swimming or water aerobics, chair aerobics). Proper form and technique will be demonstrated with repeated action performed by the patient and printed materials provided.
4) Safety discussed to include avoiding overexertion and seeking medical evaluation (e.g., increased pain).
5) Realistic and attainable goals set based on patient ability to include times per week and repetition.
6) A follow-up schedule will be set to monitor progress and adjust the program as needed.

Appendix D

Chi-square results

	Phone call/Education	Education only	Row totals
All	2 (1.50) (0.17)	1 (1.50) (0.17)	3
➢ Half	3 (2.50) (0.10)	2 (2.50) (0.10)	5
< Half	4 (3.0) (0.33)	2 (3.0) (0.33)	6
None	1 (3.00) (1.33)	5 (3.0)(1.33)	6

From the data set, I compared the frequency using a Chi-Square Test with 95% confidence. From this test, the resulting p-value was 0.21.