DEVELOPMENT OF MUSCULOSKELETAL (MSK) PATHWAY FOR MODERATE KNEE OSTEOARTHRITIS PATIENTS POST-INTRAARTICULAR CORTICOSTEROID INJECTION

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ABSTRACT

Osteoarthritis (OA) is a musculoskeletal disorder that affects the quality of life and functional independence of individuals worldwide. It also raises concerns in developed countries due to advancements in healthcare systems. Physiotherapy remains the primary treatment for this condition. In addition to exercise and physical modalities, administering steroid injections to patients with OA is a potential approach that can aid in managing symptoms such as stiffness, swelling, and joint pain. This study aimed to design a pathway for patients who have received joint injections and continue to experience symptoms, allowing them to adhere to a comprehensive management plan before knee replacement becomes necessary. This research utilised a developmental-descriptive design based on interviews with experts in the field of Musculoskeletal (MSK) physiotherapy. Additionally, a survey of 42 MSK practitioners was conducted to evaluate the suitability of an MSK Pathway for patients with Moderate Knee OA after an intra-articular injection, assessed across four categories: Feasibility, relevance, completeness, and applicability, in the localities of Redditch, Kidderminster, and Bromsgrove in England. This research developed a pathway for this population to trial various options: a knee exercise programme, hydrotherapy, Pilates, a pain management clinic, or a secondary steroid injection. The research aims to propose potential enhancements to the existing National Institute for Health and Care Excellence (NICE) guidelines for the treatment of osteoarthritis.

Keywords: Knee OA, Intra-articular corticosteroid injection, NICE Guidelines, MSK Pathway, Suitability.

INTRODUCTION

Osteoarthritis (OA) is one of the most prevalent musculoskeletal (MSK) disorders globally, significantly impacting the quality of life, mobility, and functional independence of affected individuals. OA is one of the diseases of progressive countries due to their advancements in healthcare, and therefore, people are living longer (Saltychev 2020). OA is not a singular entity but a spectrum, classified into mild, moderate, and severe stages, each necessitating distinct approaches to management. Among these, physiotherapy plays a crucial role in addressing the symptoms and functional impairments associated with all stages of OA. Knee osteoarthritis, in particular, is one of the leading causes of disability among older adults, with moderate stages of the disease often associated with chronic pain, stiffness, and decreased physical function. Recent estimates suggest that knee OA affects approximately 10-15% of people over the age of 60 worldwide (Joseph Humberto Cueva, 2020), making it a critical area of research in musculoskeletal health care. The progression of knee OA involves complex interactions between biomechanical, inflammatory, and structural changes within

the joint. The associated disability not only compromises individuals' physical health but also imposes substantial socioeconomic burdens, including increased healthcare costs and lost productivity. Consequently, optimising the management of knee OA, particularly in its moderate stages, is a vital area of focus. Management of knee OA generally involves a blend of non-pharmacological, pharmacological, and surgical strategies, depending on the severity of the condition. Physical therapy serves as a cornerstone of non-pharmacological management, focusing on pain reduction, joint mobility, and muscle strengthening. Pharmacological interventions typically include analgesics and anti-inflammatory medications, while surgical options, such as joint replacement, are considered in advanced cases.

Among non-surgical treatments, intra-articular corticosteroid injections are commonly used to provide temporary relief from pain and inflammation in moderate knee OA. These injections are well-recognised for their efficacy in reducing acute symptoms, enabling patients to engage in rehabilitation and daily activities with less discomfort. However, the benefits of corticosteroid injections are primarily short-term, and their long-term impact on disease progression and functional outcomes remains uncertain.

However, while corticosteroid injections can provide short-term pain relief, a gap persists in clinical practice regarding standardised post-injection care pathways to optimise long-term outcomes, especially concerning functional recovery and symptom management. Developing a structured MSK pathway for patients following intra-articular corticosteroid injections could ensure more consistent, evidence-based follow-up care and enhance patient outcomes.
Despite the widespread use of intra-articular corticosteroid injections, there is a lack of consensus on post-injection rehabilitation protocols specifically tailored for patients with moderate knee OA. Most current approaches to post-injection care are ad hoc, relying on general MSK guidelines without considering the unique clinical needs of patients after this specific intervention. This absence of a structured MSK pathway leads to variability in patient management and may undermine the potential benefits of corticosteroid injections by failing to integrate timely rehabilitation measures.

Moreover, while corticosteroid injections reduce pain and inflammation temporarily (L. Beggs 2020), they do not address the underlying biomechanical and functional impairments caused by knee OA. Evidence suggests that early rehabilitation post-injection can facilitate better functional recovery and may even prolong the effects of the injection by strengthening surrounding musculature and improving joint mobility. However, few studies have investigated the development of a comprehensive MSK pathway specifically for this patient population.

To address this gap, there is a pressing need to develop and evaluate a comprehensive MSK pathway specifically designed for patients with moderate knee OA who have received intraarticular corticosteroid injections. Such a pathway should integrate immediate pain management strategies with longer-term interventions aimed at enhancing joint function, muscle strength, and overall mobility. By aligning treatment goals with the unique clinical needs of this population, a structured MSK pathway could ensure more consistent and effective care. Through an initial quantitative evaluation, this study assessed the feasibility, relevance, completeness, and applicability of the proposed MSK pathway. By identifying key components and potential areas for improvement, this study laid the groundwork for further research and the development of a comprehensive, standardized post-injection care protocol. The findings from this research contributed to the development of standardised post-injection

care protocols, enhancing the quality and consistency of care for individuals with moderate knee OA. By bridging the gap between pain relief and functional rehabilitation, the MSK pathway has the potential to improve long-term outcomes, reduce disability, and enhance the overall quality of life for patients.

This work represents a significant step toward advancing the management of knee OA and addressing the unmet needs of this growing patient population.

LITERATURE REVIEW

Osteoarthritis and osteoarthritis of the knee

Osteoarthritis (OA) is one of the diseases of developed countries due to their advancement in healthcare, and therefore people are living longer (Saltychev 2020). However, it also affects the conditions of joints as the population ages. OA is classified as Mild, Moderate and Severe and the treatment approach to any classification necessitates physiotherapy.

OA pathology, due to its high economic impact, disability and severe pain, impacts patients' lifestyle. OA goes beyond anatomical and physiological alterations (joint degeneration with gradual loss of joint cartilage, bone hypertrophy, changes in the synovial membrane, and loss of joint function) since cellular stress and degradation of the extracellular cartilage matrix begin with micro- and macro-injuries. Generally, OA is associated with ageing. However, other risk factors include obesity, lack of exercise, genetic predisposition, bone density, occupational injury, trauma, and gender (Leifer, 2022).

Osteoarthritis (OA) affects nearly 595 million people worldwide (JD Steinmetz, 2021). Knee OA is the most common type of arthritis, especially in older adults. Physicians measure the severity of knee OA according to the Kellgren and Lawrence (KL) scale through visual inspection of X-ray or MR images (Joseph Humberto Cueva, 2020).

As mentioned, age, sex, physical activity, and overall health of the population are perceived differently by OA sufferers. Women over 60 are, however, more prone to the disease's early onset than the male population (Charlesworth 2019). Moreover, high levels of vitamin E and a higher body mass index (BMI) in women contribute to the preponderance of the female sex, while high physical activity, soft drink consumption, and abdominal obesity are strong risk factors for the male sex (Szilagyi, 2023).

Role of physiotherapy in OA – traditional role and emerging role

Physiotherapy remains the primary non-surgical treatment for knee OA. Dantas, in 2021, discussed core knee OA treatments aimed at optimising patient outcomes, including thermal modalities, laser therapy, therapeutic ultrasound, taping, and manual therapy techniques. Conservative measures that address joint stiffness, pain, and limitations in range of motion are key components of physiotherapy training. Shamsi et al. (2019) emphasised the significance of physiotherapy in treating knee OA across all stages, yielding promising results.

In the UK, physiotherapists who have received additional training can adopt injection therapy for the treatment of MSK disorders (Livadas, 2024). Joint injections for arthritis in the UK are performed collaboratively by doctors and highly trained physiotherapists known as Advanced Physiotherapy Practitioners (APPS). Both professionals adhere to the UK's health

guidelines set forth by the governing body, NICE (National Institute for Health and Care Excellence; NICE Guidelines 2022).

Corticosteroids in the management of OA

Corticosteroids have come a long way since their widespread use in treating rheumatoid arthritis and osteoarthritis over the past 70 years. Since then, they have remarkably advanced in their treatment, with trials for spinal radiculopathy, tendinopathies, and degenerative diseases (Stone, 2021).

Intraarticular cortico-steroid injections are efficient in reducing pain through their anti-inflammatory component and improving function in the early phase (<= 6 weeks) of symptomatic knee OA (Aurelie Najm et al, 2021). It provides temporary relief and based on a study in 2020 by L. Beggs et al., their findings on its efficacy have been recorded for up to 24 weeks, allowing it to be managed without pain. However, symptoms can sometimes be persistent (Orchard, 2020) and therefore are not prescribed for long-term use (Najm, 2021).

Current UK Practice for Management of Osteoarthritis

The National Institute for Health and Care Excellence (NICE) recognised the need for public awareness regarding the core management and additional treatments available for OA; consequently, in 2008, it summarised the most recent recommendations for its treatment (BMJ 2008). The treatment of knee osteoarthritis is strongly mandated by NICE's guidance under its general management guidelines for osteoarthritis. It instructs practitioners to incorporate two domains: Non-pharmacologic and Pharmacologic Management.

Non-pharmacologic management

NICE suggests managing OA non-pharmacologically through exercises, weight management, and information and support (Pain Clinic). It also indicates that manual therapy can be considered for managing knee OA.

Pharmacological

The pharmacological approach advises trialling the use of non-steroidal anti-inflammatory drugs (NSAIDS) unless contraindications exist for their use in patients. It encourages considering intra-articular corticosteroid injections for short-term relief when other pharmacological treatments are ineffective or unsuitable, or to support therapeutic exercise. Ultimately, if both approaches fail to manage symptoms conservatively, it is recommended to refer for joint replacement. In addition to treating OA in developing countries, there is a consensus to establish their own guidelines, resources, and educational materials, as well as to increase access to healthcare services (Yaser Mohammed Al-Worafi, 2024).

Orthopaedic Stage

In the planning stage for orthopaedic replacement, quality of life is closely examined. One measurement tool is the Oxford Knee Score (https://goravdatta.com/oxford-knee-score/), and understanding the severity begins with a radiographic image of the knee joint, which is categorised as Mild, Moderate, or Severe. Various adaptations of the Kellgren and Lawrence classification system have been utilised in research. The original description is as follows:

Grade 0 (none): definite absence of x-ray changes of osteoarthritis; **Grade 1 (doubtful)**: doubtful joint space narrowing and possible osteophytic lipping; **Grade 2 (minimal)**: definite osteophytes and possible joint space narrowing; **Grade 3 (moderate)**: moderate multiple osteophytes, definite narrowing of joint space, some sclerosis, and possible deformity of bone ends; and **Grade 4 (severe)**: large osteophytes, marked narrowing of joint space, severe sclerosis, and definite deformity of bone ends. Osteoarthritis is deemed present at grade 2, although of minimal severity.

Kyle Gress et al. recommend a comprehensive treatment plan for chronic knee OA, suggesting that treatment should start at the early diagnosis stage and continue through to the terminal stage when knee joint replacement may be necessary.

This led to a grey area regarding the care that can be provided to patients who are not suitable for knee surgery and continue to present symptoms even after receiving a corticosteroid injection, as symptoms can persist for as long as 30 years (John W Orchard,2020).

Patients suffering from OA can be offered a maximum of three courses of steroid injections (Khaled M. Yaghmour, 2021). However, Najm emphasises in 2021 that safety issues have been highlighted in various recent studies, describing adverse structural outcomes, including accelerated OA progression and rapid joint destruction (including bone loss), which may worsen pre-existing osteonecrosis.

In the study by O. Bruyére, 2019 suggests that clinical experts in OA, informed by available evidence regarding the benefits and harms of various treatments, provide practical, current guidance that enables clinicians to deliver patient-centric care in OA practice. Moreover, Roanna Burgess, 2022, recommended “To enable MSK benchmarking services need to collect consistent, standardised outcomes and, therefore, we have developed a recommendation on a minimum MSK ‘core outcome set’ of Patient Reported Outcome Measures (PROMs) and Patient Reported Experience Measures (PREMs) (PROMs: MSK-HQ, NPRS, WPAI; PREMs: National MSK PREM). In addition, we make recommendations on the use of a standardised evidence-based method for case-mix adjustment and outlier identification (using the following baseline demographics and clinical factors; age, sex, ethnicity, pain site, comorbidities, duration of symptoms, previous surgery, previous pain episodes), alongside considerations on how this data should be integrated and reported within NHS systems, and therefore my research would like to consider their utmost recommendation.

METHODOLOGY

This study utilised a descriptive-developmental research design. Through this research design, it compiled relevant information from expert professionals via interviews to propose a pathway. Based on the experts' advice and proposal, the suggested pathway was tested through a survey of other practicing MSK physiotherapists for the treatment of moderate knee OA post-corticosteroid injection. The study employed a mixed-method approach, integrating both quantitative and qualitative designs by merging numerical data and narrative data. Using the Raosoft Calculator, the desired study sample consisted of 58 practicing MSK physiotherapists; however, only 42 voluntarily responded to participate in the study in the localities of Bromsgrove, Redditch, and Kidderminster in England. To ensure the study’s validity, a structured questionnaire employing a 5-point Likert scale was utilised, enabling respondents to assess their level of agreement from strongly agree to strongly disagree

regarding the proposed pathway development for treating moderate knee OA. The questionnaire was subjected to frequency distribution and mean analysis for the data results.

RESULTS

In this section please present the results including tables, figures, numbers and graphs (if any). Font Size 12, Times New Roman, single spaced. All the subheadings in this section should be in font size 12 Bold, Times New Roman, single spaced. The first letter of each word in subheading should be capital. For tables please use font size 10. Tables/graphs or figures should be named as Table 1/ Figure 1/ Graph 1 and be given in center of the page.

This section discusses the analysis and interpretation of the data collected in this study. There are five key points that the MSK experts advised patients with moderate knee osteoarthritis to trial after an intra-articular corticosteroid injection: Specific exercises, Hydrotherapy, Pilates, Pain management through a Pain clinic, and Another Round of joint Steroid Injection (Figure 1). After gathering the key points from the expert data, it was then surveyed to the 42 MSK physiotherapists to assess the pathway's suitability in terms of its Feasibility, Relevance, Completeness, and Applicability.

The above key points are summarised in this diagram:

Figure 1. The designed MSK Pathway for Patients with Moderate Knee OA post corticosteroid Intra-articular Injection.

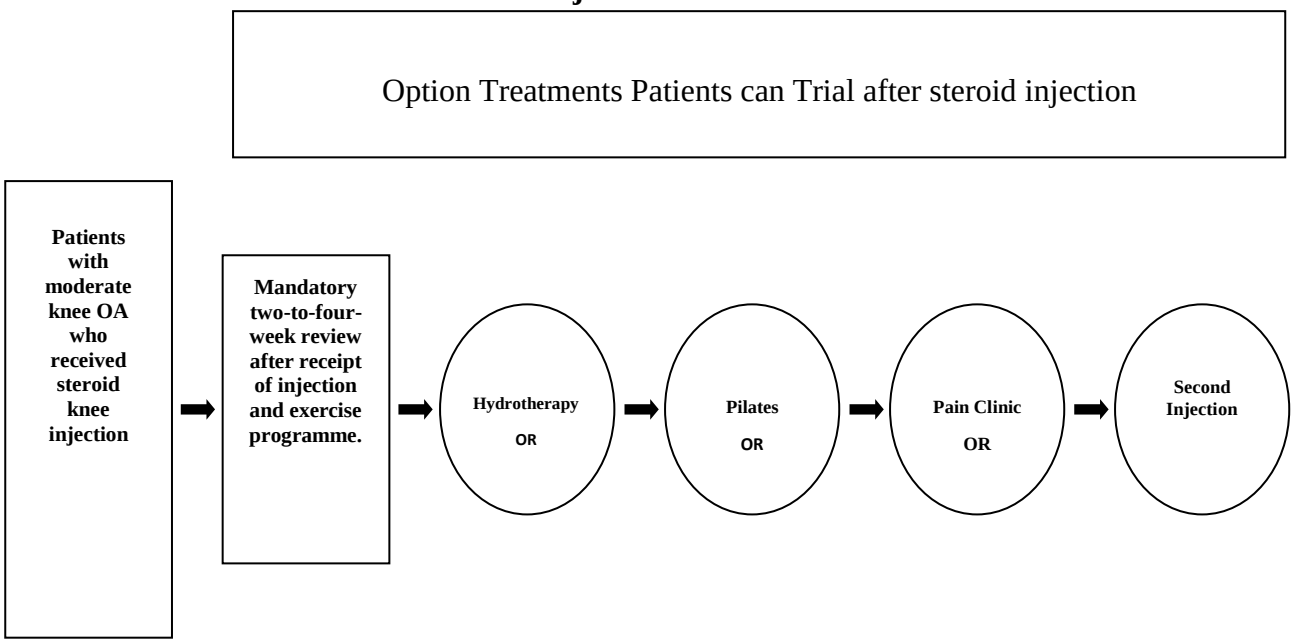

Table 1. Level of Suitability of the Developed MSK Pathway in Terms of Feasibility

Evaluation Aspect	Statement	Weighted Mean	Rank	Result Interpretation
Feasibility	Having an MSK Pathway for treatment of Moderate knee OA post intra-articular corticosteroid injection is practical and realistic for routine implementation in clinical settings.	4.26	1	Strongly Agree
	The timeline recommended of two to four weeks post steroid injection to a Moderate knee OA is achievable and supported by current evidence on patient recovery and clinical outcomes.	4.21	2	Agree
	The necessary resources, including skilled personnel, equipment, and facilities, are reasonably accessible in most healthcare environments.	4	3	Agree
Overall Feasibility		**4.16**	**Feasible**	

As shown in Table 1, the suitability level of the developed MSK pathway is Feasible, with an average weighted mean of 4.16. This indicates that implementing the MSK pathway for treating knee OA after steroid injection can be accomplished within a realistic timeline and with a sufficient allocation of resources.

The results support the study conducted by Najm in 2021, which ranked second in the table, highlighting the importance of reviewing patients who received joint steroid injections within six weeks or less for their ongoing rehabilitation.

Table 2. Level of Suitability of the Developed MSK Pathway in Terms of Relevance

Evaluation Aspect	Statement	Weighted Mean	Rank	Result Interpretation
Relevance	The pathway should reflect the latest evidence-based practices for managing moderate knee osteoarthritis, ensuring alignment with current clinical guidelines.	4.24	3	Strongly Agree
	Having a pathway can thoroughly address essential aspects of post-injection care, such as patient monitoring, follow-up strategies, and education.	4.45	1	Strongly Agree
	The pathway's recommendations should be strongly supported by reliable clinical evidence, including peer-reviewed studies and expert consensus.	4.26	2	Strongly Agree
Overall Relevance		**4.32**	**Highly Relevant**	

As seen in Table 2, it was observed that the suitability level of the developed MSK pathway was Highly Relevant, with an average weighted mean of 4.32. This implies that the pathway aligns with both current and previous literature and is timely with advancements in

physiotherapy. The results support the study conducted by Livadas in 2024, which explains the advancement of physiotherapy through evidence-based practice, ranked third according to this study.

Table 3. Level of Suitability of the Developed MSK Pathway in Terms of Completeness

Evaluation Aspect	Statement	Weighted Mean	Rank	Result Interpretation
Completeness	The pathway should include all critical steps required for comprehensive rehabilitation of patients with moderate knee osteoarthritis, ensuring no key areas are overlooked.	4.24	3	Strongly Agree
	Having a pathway can thoroughly address essential aspects of post-injection care, such as patient monitoring, follow-up strategies, and education.	4.45	1	Strongly Agree
	The pathway's recommendations should be strongly supported by reliable clinical evidence, including peer-reviewed studies and expert consensus.	4.26	2	Strongly Agree
Overall Relevance		**4.32**	**Highly Complete**	

As shown in Table 3, the suitability level of the developed MSK pathway was found to be Highly Complete, with an average weighted mean of 4.32. This indicates that the pathway adheres to current guidelines while also providing additional steps beyond these guidelines. The result supports the guidelines promulgated by the NICE Guidelines for Osteoarthritis 2022, bridging the gap in the ongoing rehabilitation of knee OA patients after they receive joint corticosteroid injections, which are ranked as level 3 in this study.

Table 4. Level of Suitability of the Developed MSK Pathway in Terms of Applicability

Evaluation Aspect	Statement	Weighted Mean	Rank	Result Interpretation
Applicability	The pathway should be broadly applicable across a diverse range of patient demographics with moderate knee osteoarthritis, including variations in age, activity level, and co-morbid conditions.	4.38	1	Strongly Agree
	The pathway should consider common co-morbidities and complications associated with moderate knee osteoarthritis, ensuring its recommendations remain relevant.	4.36	2	Strongly Agree
	The pathway should demonstrate sufficient flexibility to be adapted to the unique needs and goals of individual patients within the scope of moderate knee osteoarthritis.	4.29	3	Strongly Agree
Overall Applicability		4.34	Highly Applicable	

As shown in Table 4, the developed MSK pathway was considered Highly Applicable, with an average weighted mean of 4.34. This suggests that the pathway can be adopted and implemented in an MSK Clinic in the UK for the treatment of knee OA.

The results support Burgess's study (2022), which explains that benchmarking services need to collect consistent and standardised outcomes, which is ranked first in this study.

DISCUSSION

Exercises and a two-to-four-week review post receiving steroid injection

Almost all respondents strongly advised that it is crucial for these patients to continue exercising to maintain the health of their knee joints and mitigate the progression of OA. All nine experts state that this is a window of opportunity for patients to exercise to strengthen the quadriceps and hamstrings, the main muscles supporting the knee.

Continuing the exercise regimen for patients who have recently received a steroid injection can promote and maintain the strength and condition of the knee joint through gentle range-of-motion and isometric exercises as primary recommendations. It is also advised that patients ideally be reviewed by physiotherapists two to four weeks after the joint steroid injection treatment to optimise rehabilitation.

Hydrotherapy

One APP suggested considering the patient's choice regarding their treatment and is a strong advocate of hydrotherapy. He noted that hydrotherapy is an effective form of exercise due to the buoyancy in the water, which reduces joint load, provides pain relief, and improves the overall range of motion in the joints. He added that it also serves as a good cardiovascular workout, although he recognises that not all patients can access this service due to hydrophobia or their total inability to swim.

Pilates

Another APP suggested considering clinical Pilates for patients who have just received a knee steroid injection. They explained that it is not only beneficial for knee arthritis but also serves as a whole-body exercise because it can enhance balance and flexibility. However, they admit that it is not part of the mainstream NHS service; rather, it is one service that can be suggested to patients for them to outsource and access privately. Moreover, they want to emphasise that continued exercises should be seen as an essential part of the home programme for this group of patients.

Pain Management Clinic

This was advocated by one of the FCP, as he believes that patients' pain levels encompass not only joint discomfort but also affect patients holistically. Therefore, he recommended this as a potential avenue. He stated that the issue for most patients with OA is not just joint pain, as it significantly impacts their overall demeanor due to the intensity of the pain they experience. That's why he suggested that OA patients could also be referred to this service. He emphasised that the restoration of their overall body function can be evaluated, as this is where patients with chronic pain learn to adapt to their diagnosis. Before making a referral, he recommended that it is essential for physiotherapists to engage in an open discussion with

the patient regarding their experiences, feelings, and treatment preferences. Furthermore, they should ensure that all relevant medical history, diagnostic imaging, and treatment progress notes are provided to the pain clinic for a comprehensive assessment.

Secondary Course of Joint Steroid Injection

One APP apart from the rest advocates for maintaining an exercise routine recommended for patients to consider re-injection at the site or trialling other intra-articular injections, such as hyaluronic acid. She expressed doubts that since the exercise did not yield results the first time, it would be effective the second time, considering whether patients are receptive to the idea or trial of another injection course. In summary, the decision to discourage further physiotherapy following a steroid injection is based on the need for careful management of the patient's condition, optimal recovery, and evaluation of treatment effectiveness. Each case should be approached with a thorough assessment to ensure the best outcomes for the patient.

CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn:
Treatment of osteoarthritis in the United Kingdom is guided by recommendations from the National Institute for Health and Care Excellence (NICE). However, the specific population of patients with Moderate Knee OA is not addressed here. This study can serve as a guiding principle that can be added to the existing guidelines for treating osteoarthritis and for patients who have received knee intra-articular steroid injections to continue rehabilitation while their symptoms are not amenable to any orthopaedic surgical intervention.

Based on this study approved by a panel of MSK Physiotherapy experts, it is recommended that patients with moderate knee OA who have recently received an intra-articular corticosteroid injection for managing their joint pain should undergo an immediate review within four weeks after the procedure. It is also important to emphasise the significance of exercising the vital muscles surrounding the knee, especially the quadriceps and hamstrings, whether through hydrotherapy or Pilates. Furthermore, a Pain Clinic can be offered as a continuing pathway, along with a potential re-trial of intra-articular injection therapy. This study suggests that considering the results can provide extensive options for this patient population and can serve as a basis for future studies on knee osteoarthritis.

The developed pathway of this research can primarily benefit patients with knee osteoarthritis by providing clear additional options for their ongoing treatment while their knee pain persists, even after receiving a joint steroid injection procedure. Additionally, it is equally beneficial for all MSK physiotherapy clinicians, aiding them in decision-making regarding the management of knee osteoarthritis.

This research is highly suitable for introduction and implementation in MSK practices, as all four aspects—Feasibility, Relevance, Completeness, and Applicability—received positive ratings from all participants in this study. This demonstrates that the developed pathway for knee OA patients can provide additional guidance for treating this condition.

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