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Evidence-Based Practice Approach Over Three Visits in the Management of a Patient with Tibio-Femoral Osteoarthritis: A Case Study

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ABSTRACT

Supervised training is essential for developing an evidence-based practice (EBP) approach for future health care clinicians. While the skills associated with asking a research question, accessing databases for best research evidence (BRE), and appraising this evidence can be taught in the classroom, the day-to-day application into patient management needs to be taught, and there is a lack of best practice models for this. This case study of a patient with osteoarthritis of the knee demonstrates over a series of three clinic visits how EBP can be used as a framework for guiding assessment and management from the perspective of a final year physiotherapy student.

INTRODUCTION

Exploring how best to incorporate evidence-based practice (EBP) within the professional clinically-focused undergraduate health courses provides a challenge.¹ While the skills associated with asking a research question, accessing databases for best research evidence (BRE), and appraising this evidence can be taught in the classroom, the day-to-day application into patient management needs to be taught, and there is a lack of best practice models for this.²

In the final, fourth year at the undergraduate outpatient clinic at the University of South Australia, students are academically assessed on their ability to integrate patient values, clinical experience, and clinical reasoning with BRE to justify management over the duration of the patient's attendance. Emphasis is placed on collaboration with the patient, thoroughness of clinical assessment, relevancy of research questions chosen, and demonstration of the skills to access and appraise the evidence. This occurs under the supervision of the clinical educator (CE), and there is provision for ready access to databases within the clinic. With the input of patients, research questions are posed concerning interventions, prognosis, risk, and alternative or additional outcome measures.

This case study demonstrates, over a series of three clinic visits, how EBP can be used as a framework for guiding assessment and management from the perspective of a final year physiotherapy student. Within an EBP framework, each visit describes the patient's clinical presentation, patient values, BRE search and findings, justification for management, and the management itself. The ability to effectively identify and incorporate BRE into a clinical setting can be challenging because of the time constraints and the nature of the available evidence; it is often non-specific, of poor quality, and often presents conflicting findings. In order to manage BRE over the course of three visits in this case study, the author adopted a systematic process to streamline its collection and interpretation of evidence.

Searches were based on a question derived from gaps in knowledge after each visit. Results were limited to English language articles and articles published from 2000 or later. Results returned were sorted by date with the most recent first. Database searches were limited to and conducted in the order of the physiotherapy specific PEDro database and the Cochrane Database of Systematic Reviews, with the most recent systematic review retrieved if available. This was followed by a Medline/EMBASE search for other systematic reviews and for studies published only after the date of any obtained reviews. Returns in Medline/EMBASE were generally the most numerous. Sorting by date and using a hierarchy of evidence, in conjunction with scanning at the title and abstract level, resulted in a time efficient means of managing the high volume of returns.

To maintain the first-hand clinician experience and personalisation of reflection, the patient is referred to as Mrs. Z and first person language (referring to the first author who was the final year student) has been used. Informed consent was gained from the patient prior to submission of this manuscript. The Generic Patient Specific Scale (GPSS) has been used over the 3 visits to quantify improvement in 5 self-reported activities. The patient ranks the difficulty in performing each activity on a scale from 0 (can do with no problems) to 10 (unable to do), resulting in an overall score out of 50, with a higher score indicating higher dysfunction. The GPSS and its reliability and validity in patients with knee dysfunction have been discussed elsewhere in the literature.³ Tests marked with an * indicate main re-assessment points.

VISIT 1

Clinical presentation

The patient, Mrs. Z, is a 62 year-old female self-referred to physiotherapy with unilateral right knee pain and giving way, "clicking," and grabbing (Fig. 1 shows the body chart, describing area and behaviour of pain). Mrs. Z has a history of right-sided knee pain following a fall 20 years ago. Her knee pain had been stable from 1996 to 2007. Mrs. Z described an extensive global past medical history, including lumbar laminectomy for severe left-sided neural pain in early 2007, right knee arthroscopies and meniscectomies in 1994 and 1996, and bilateral shoulder arthroscopies in 1993 and 1994. A sudden increase in knee pain three months ago, impacting on activities of daily living particularly moving from sitting to standing, encouraged her to seek physiotherapy treatment. Prior to attending the student clinic, Mrs. Z had 3 treatments of interferential therapy (IFT) that gave short-term relief, but little overall change in symptoms was noted.

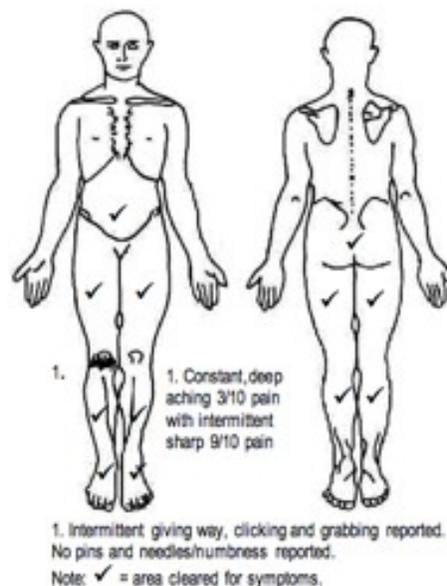


Figure 1. Body chart: Area and behaviour of pain.

On presentation to the student clinic, Mrs. Z obtained a GPSS score of 32/50 for the activities of moving from sitting to standing, going up and down steps, sitting for greater than 15 minutes, sleeping, and driving. She had a typical analgic gait pattern, with reluctance to weight bear through the affected side. Her BMI was estimated at >25. Range of motion flexion and extension were limited and produced sharp pain. Passive accessory tibial shaft rotation movements were stiff, but decreased pain. Muscle testing demonstrated a global decrease in strength in the quadriceps, hamstrings, and calf when compared to her non-affected

side. Ligament and meniscal tests of the knee were negative, and further assessment cleared other joints, including the patellofemoral joint.

Patient Values

Mrs. Z retired early, primarily because of her orthopaedic problems. While she has intended to commence volunteer work, her physical health has continued to limit her ability to participate in a meaningful occupational role; following the 2007 back surgery, her right knee pain has worsened. Mrs. Z is fearful of the prospect of requiring a total knee replacement; this fear originates from being told by an orthopaedic surgeon following surgery in 1996 that her knee was “stuffed.” She wants to avoid surgery for as long as possible by pursuing conservative management options, as she has had 5 surgeries on 4 areas in the past 10 years, the most recent only 7 months ago that was complicated by infection and a protracted period of rehabilitation.

Management and EBP Justification for Management

Using clinical reasoning and clinical pattern knowledge of behaviour, history, and objective findings, the initial diagnostic hypothesis is an acute inflammatory episode of osteoarthritis (OA) of the knee. The area suggests involvement of the tibiofemoral joint globally rather than being isolated to a particular compartment. In a previous clinical placement, passive tibial shaft rotation mobilisations had been used for a similar presentation and provided some immediate pain relief. Because of my lack of knowledge of the BRE for management of knee OA, management on visit 1 was primarily guided by this previous clinical experience, the clinical presentation, and the patient’s poor response to previous application of an electrotherapy modality. A trial of tibial shaft rotation mobilisation was planned, together with education of the likely underlying inflammatory cause of the pain. Mobilisations resulted in an improved ability to move from sit to stand, expressed subjectively, with an increase in knee range of motion and decreased pain. During management of this patient, I decided that it was important to avoid language that was negative and that would increase anxiety, particularly as she is generally positive about the prospect of a trial of conservative management.

Plan for Evidence Search

As knowledge of conservative management options and efficacy of mobilisation for OA of the knee was unknown to me, this formed the basis of a search of the BRE, summarised by its possible application to this patient.

Evidence Search Results

1. What conservative management options for OA of the knee are there and what is the evidence for them?

Using the key terms “osteoarthritis of the knee” returned 279 results in PEDro, 1177 in Cochrane, and 80 in Medline/EMBASE databases. Of the systematic reviews identified using PEDro, Jamtvedt et al., a systematic review of systematic reviews, published in 2008, was particularly recent and relevant.⁴

Jamtvedt et al. was a thorough review identifying over 1,000 reviews published between 2000-2006 from extensive searches of Medline, EMBASE, and PEDro databases.⁴ The review found that there was high quality evidence that exercise (hydrotherapy or land-based) and weight reduction reduced pain and improved physical function. There was moderate quality evidence that acupuncture, transcutaneous electrical nerve stimulations (TENS), and low-level laser therapy reduced pain, and that psycho-educational interventions improve psychological outcomes. There was low quality evidence for the effects of ultrasound, electrical stimulation, braces and orthoses, thermotherapy and balneotherapy, and no evidence was available for massage, traction, magnet bracelets, and tape.

Of the 10 remaining systematic reviews published from 2007, only one was deemed relevant for this search, a systematic review by Pisters et al, published in 2007.⁵ The remaining 9 investigated acupuncture, which was not transferable in the clinic because of my level of expertise, were not specific to OA of the knee, investigated post-surgery, or reviewed articles pre-2007. Pisters et al. reviewed randomised controlled trials (RCTs) investigating the long-term effectiveness of exercise therapy in patients with hip and knee OA.⁵ They found that the positive post-treatment effects were not sustained in the long term (>6 months), and that additional “booster” sessions had a positive influence on pain reduction and improved function in the long term.

An interesting RCT by Deyle et al. compared supervised clinical exercise and manual therapy procedures to a home exercise program (HEP) alone over a 4-week period, which may be applicable to Mrs. Z, although the treatment time would be expected to be longer.⁶ They found that the clinic group improved twice as much as the home exercise group, and that maintenance of improvements at 1 year were partially attributable to the continuation of the HEP. Exercise included quadriceps strengthening,

knee ROM and quadriceps/hamstring stretches. Mobilisations primarily consisted of knee flexion/extension and patellofemoral mobilisations.

Medline or Cochrane returned no new systematic reviews from 2008 or clinical trials from 2007 providing an overview of conservative knee OA management.

2. *What is the efficacy of mobilisations for OA of the knee?*

Using the key terms “osteoarthritis of the knee” AND “mobilisation” returned 0 results in PEDro and Cochrane and 779 results in Medline/EMBASE databases. Most of the recent articles returned in Medline were not relevant to this search, referring to post knee replacement or were not specific to OA, and no articles were returned that investigated mobilisations compared to another treatment or control. Two articles found improvements in pain and function with knee flexion/extension mobilisations included in an overall physiotherapy treatment. They did not include rotation mobilisations.⁶⁻⁷

Application of BRE to patient

In summary, the application of evidence to this patient’s presentation suggests that:

- There is high-level evidence for the benefits of exercise and weight reduction, but exercise needs to be maintained to see sustainable benefits
- A HEP of ROM, stretching, and strengthening assists in maintenance of benefits when combined with clinical treatment
- There is moderate level evidence for education, TENS, low-level laser therapy and acupuncture (not available in the university clinic).
- There was low level evidence for ultrasound, electrical stimulation, braces, and orthoses.

VISIT 2: 5 DAYS LATER

Clinical Presentation

On returning to the student clinic, Mrs. Z expressed that the benefit from the last treatment lasted approximately one hour and she had experienced one episode of giving way in the previous week when she stood suddenly. Her GPSS score dropped from 32 to 23/50 from the previous week. Her resting symptoms, range of motion, and rotation signs were unchanged from her initial presentation. On additional testing with the Timed Up and Go test Mrs. Z obtained a score of 17 seconds.

Patient Values

Mrs. Z was pleased with the decrease in pain after the last treatment. However, she hoped the benefit would be longer-lasting. She was still feeling very motivated toward continuing to pursue conservative treatment, acknowledging that this improvement was from minimal hands-on therapy the previous week. She is concerned about her weight, and considers it to be a major contributor to her knee pain and feels that weight loss would improve both her knee and back pain.

EBP Justification for Management

The evidence found, the patient values, and the response to the last treatment combined well in the formulation of a management plan for this visit. Education regarding the diagnosis was included, as the patient was eager to understand her knee condition. Although there was limited evidence for mobilisations, these were continued in visit 2 as clinical experience, objective findings, the patient’s response to treatment and patient values (belief that they worked well and subjective report of pain relief) justified their use. Based on the BRE, modulated medium frequency (MMF) was used as a clinical application of TENS. Further, based on the high level of evidence supporting exercise and a HEP in conjunction with therapy, quadriceps strengthening and knee flexion/extension range of motion exercises were prescribed. The patient was eager to begin completing the exercises at home, suggesting that compliance to the program could be expected. Lastly, based on the evidence for exercise and weight loss, land or water-based exercise classes were discussed with the patient. Mrs. Z was eager to pursue this idea and reported that she had enjoyed pool classes in the past. Following treatment, there was an increased knee flexion and extension range, with decreased pain.

Plan for Evidence Search

As I was unsure of the BRE for land-based compared to hydrotherapy classes, this formed part of the evidence search for this week. The TUG was used on visit 2 as an outcome measure in conjunction with ROM as it is an objective measure of functional improvement, particularly as sit-to-stand was a concern to the patient. However, the evidence search for this week will also seek to obtain a more specific outcome measure for OA of the knee.

Evidence Search Results

1. *What is the effect of hydrotherapy classes vs. land-based exercise for OA of the knee?*

Using the key terms “hydrotherapy” and “osteoarthritis of the knee” returned 1 result in PEDro and 12 results in Cochrane (2 reviews, 10 clinical trials).

A recent high quality Cochrane review by Bartels et al. investigated aquatic exercise for the treatment of hip and knee OA, finding that there was a lack of high quality evidence in this area.⁸ They found that aquatic exercise appeared to have small-to-moderate effects on function, quality of life, and pain, with most measures taken at 3 months. One included trial investigated hydrotherapy for knee OA alone and reported a large effect on pain immediately post treatment in the hydrotherapy group compared to a land-based group. Overall, the authors concluded that there were beneficial short-term effects but no long-term effects with hydrotherapy. Based on this, the authors recommended that aquatic exercise be considered as the first part of a longer exercise program.

Silva et al. performed a randomised clinical trial to investigate the effects of hydrotherapy versus conventional land-based exercise for the management of patients with OA of the knee.⁹ The subjects participated in an 18-week program (measures taken at baseline, 9 weeks, and 18 weeks), and details of exercises performed in both the land and water-based classes were given. They found that both the water-based and land-based exercises reduced knee pain and improved function; however, they also found that hydrotherapy was superior to land-based exercise in relieving pain before and after walking. Pain reduction was primarily seen in the first 9 weeks of the program.

2. *Is there a more specific outcome measure for OA of the knee?*

Using the key terms “outcome measure” and “osteoarthritis of the knee” returned 27 results in PEDro, 9 results in Cochrane, and 570 results in Medline/EMBASE; however, most returned articles cited the use of an outcome measure rather than reporting the validity of the outcome measure. A measure used in many trials was the Western Ontario and McMaster University Osteoarthritis Index (WOMAC).

Using the key terms “western ontario and mcmaster universities osteoarthritis index” or “WOMAC” returned 1 result in 1 PEDro, 259 result in Cochrane, and 519 results in Medline/EMBASE; however, again most studies were using the WOMAC rather than reporting on its psychometric properties. One article returned in Medline/EMBASE reviewed the WOMAC and its utility and measurement properties.¹⁰

Originally described in 1988 by Bellamy et al, the WOMAC is a widely used measure of symptoms and physical disability for people with OA of the hip or knee.¹⁰ The WOMAC evaluates 3 dimensions, pain, stiffness, and physical function, with 5, 2, and 17 questions respectively, and can be delivered in a Likert or Visual Analogue Scale (VAS) version.¹⁰ Each dimension is summated to a maximum score and a global index is also given by the aggregate score of the 3 dimensions.¹⁰ It is questionnaire based and self-administered and takes 5-10 minutes to complete.⁹ Based on articles discussed by McConnell et al., the English VAS delivered version of the WOMAC has test-retest reliability (Kendall's tau c 0.61-0.72 across the 3 subsections), internal consistency (Cronbach's alpha 0.83-0.96 across the 3 sub sections), responsiveness, and convergent construct validity (when compared to numerous pain and disability measures).¹⁰ However, the WOMAC was not able to be obtained in any published articles and was only able to be purchased and therefore could not be used in the clinic. Therefore, the reliability and validity of the TUG in the knee OA population was investigated.

3. *What is the reliability and validity of the TUG in the OA of the knee population?*

Using the key terms “timed up and go” or “get up and go” and “osteoarthritis of the knee” returned 1 article in PEDro, 0 new articles in Cochrane, and 527 returns in Medline/EMBASE. While most articles returned used the TUG as an outcome measure, the original TUG publication, an article referencing norm values, and 2 articles referring to the TUG in the OA population were retrieved.

As first described in Podsiadlo and Robertson, the TUG is a continuous measure of functional mobility.¹¹ It measures, in seconds, the time taken by an individual to stand up from a standard arm chair (approximate seat height of 46cm), walk a distance of 3 metres, turn, walk back to the chair, and sit down again. It is tested using regular footwear and customary walking

aids.¹¹ No physical assistance is given.¹¹ The TUG has been used as an outcome measure in many recent clinical trials with patients with OA of the knee.¹²⁻¹⁵

Maly, Costigan, and Olney investigated the association between self-report measures and physical performance.¹⁶ They found that physical performance measures, including the TUG, were strongly related to self-efficacy and that the relation between self-report measures (including the WOMAC) and performance measures (including the TUG) was moderate. Piva et al. also investigated the TUG test in patients with knee OA.¹⁷ They found that the TUG had high inter and intra-rater reliability (0.95 and 0.98 respectively), and that the minimal detectable change (MDC) was 1.5 seconds with a single tester. Validity of the TUG was not supported as a single measure of physical function.¹⁷

While normative reference values could not be obtained for the TUG in the OA population, Bohannon et al. performed a meta-analysis of normative reference values of the TUG in healthy older people.¹⁸ They reported the following means:

- 60-69 years of age – 8.1 (7.1-9.0) seconds
- 70-79 years of age – 9.2 (8.2-10.2) seconds
- 80-99 years of age – 11.3 (10.0-12.7) seconds¹⁸

Application of BRE to Patient

In summary, the application of evidence to this patient's presentation suggests that:

- A hydrotherapy program (minimum of 9 weeks) is an appropriate exercise option for patients with OA of the knee, and there are reported improvements in pain and function that may be superior to a land-based program.
- The WOMAC is a reliable and valid disease specific outcome measure for knee OA, but not able to be immediately obtained for use in the clinic.
- The TUG is a reliable measure of physical function in the knee OA population, with moderate correlation to the WOMAC. It has a clinically applicable MDC; however, it is not supported as the sole measure of physical function.

VISIT 3: 7 DAYS LATER

Clinical Presentation

On returning to the student clinic for visit 3, Mrs. Z expressed that she she was feeling much better this week and had been completing the home exercises. The effect of the last treatment had lasted approximately 2 days and her GPSS score had dropped to 16/50 (see Table 1, visit 3). On assessment, her TUG score had dropped to 10 seconds, with a decrease in resting pain. Improvements in knee flexion range had been maintained; however, extension had returned to baseline measurements and pain was still evident on movements.

Table 1. Generic Patient Specific Scale

ACTIVITY	VISIT 1	VISIT 2	VISIT 3
1. Sit to stand	9	5	3
2. Steps (up and down)	9	8	4
3. Sitting >15 minutes	5	4	3
4. Sleeping	6	4	5
5. Driving	3	2	1
Total	32	23	16
% changes from previous visit	N.A.	28%	31%
% change from 1 st visit	N.A.	N.A.	50%

Patient Values

Mrs. Z felt that she improved a lot this week and was pleased with the effects of the last treatment and how long it lasted. She feels that her confidence is improving, particularly using stairs without fear of her knee giving way. Mrs. Z also reported that she feels that the HEP is making her knee "stronger and more flexible" and is eager to start a hydrotherapy exercise class. Although she is pleased with the improvements she has made over the last 2 weeks, Mrs. Z questioned how long she could expect to manage her knee conservatively until a replacement is required.

EBP Justification for Management

The patient reports 31% improvement based on the GPSS supporting the progression of the management to this point. Reassessment of TUG also supported the continued progression of the current management, with the patient's score dropping from 17 seconds (within normal range for an 80-99 year old) to 10 seconds (within 1 second of her age norm), although a possible learning effect with the measure is acknowledged. Mobilisations and MMF were maintained and progressed primarily because of the effect of last week's treatment, including the patient's belief that it was effective.

Her HEP was reviewed and faults corrected, and based on the exercises given in Silva et al., quadriceps exercises were added to her home program.⁶ Although the patient had reported that she would try hydrotherapy classes, the possible benefits of this over a land-based class were discussed. Mrs Z was given the article by Silva et al. to read together with a referral for a local exercise class. The TUG was maintained as an outcome measure due to its reported use in the OA population and its reliability and clinically relevant MDC. Although it was not recommended as the sole measure of physical function, it is being used here in conjunction with the GPSS. Following treatment, Mrs. Z expressed a subjective improvement in pain and ease of movement, and on examination, there was improved knee flexion and extension range.

Plan for Evidence Search

As Mrs. Z was questioning the prognosis of conservative management, this will form the basis of my evidence search for this week.

Evidence Search Results

1. What is the prognosis of progression from conservative management to surgery in knee OA?

Using the key terms "osteoarthritis of the knee" and "prognosis" or "long term outcome" returned 0 results in PEDro and Cochrane and 412 results in Medline/EMBASE. Many articles were not appropriate as they focused on radiological changes and not progression from conservative management to surgery.

A recent systematic review by Belo et al. to determine prognostic factors of progression of knee OA.¹⁹ found that there was:

- Conflicting evidence for associations with body mass index and age
- Limited evidence for an association with alignment (valgus/varus) of the joint
- Limited evidence of no association with previous meniscectomy, several markers of bone and cartilage turnover and clinical diagnosis of localised OA
- No association with knee pain, radiologic severity at baseline, sex, quadriceps strength, knee injury, and regular sport activities.¹⁹

As limited information was gained from databases, a review of texts was pursued. Dandy and Edwards summarised that operative treatment should only be considered if conservative measures have failed,²⁰ and Solomon et al. concluded that the indications for radical surgery are unrelieved pain and progressive disability²¹.

Application of BRE to Patient

In summary, the application of this evidence to Mrs Z's presentation suggests that:

- Progression of her OA may be influenced by her previous meniscectomy, high BMI and age, and her increased genu valgum. It is unlikely that her gender, quadriceps strength or regular exercise will delay progression. Of these factors, Mrs Z could be encouraged to try to reduce her BMI.
- Rate of progression seems to vary and surgery should only be considered when conservative measures have failed and there is unrelieved pain and disability. As Mrs. Z has improved over the last 3 weeks, it is unlikely that surgery will be considered while she has her current level of pain and disability.
- An x-ray may be beneficial to monitor radiographic changes; this will be discussed with the clinical educator prior to my next appointment with that patient.

REFLECTION

Throughout the clinical care of this patient over 3 visits, EBP provided a framework that incorporated the 3 pillars of patient values, BRE, and clinical expertise. To achieve this, a structured approach was followed: identification of knowledge gaps, formulation of answerable questions, locating and critically appraising the evidence, followed by integration of this new knowledge with the patient's beliefs and values, and the clinical presentation. This process of practising EBP has been

previously described in the literature.¹ Each component of EBP provides valuable input into the guidance and progression of ongoing, effective management. The development of skills to integrate the components can be facilitated at an undergraduate level. A student is in a unique position to practice EBP, with clinical experience developing in parallel with the skills and knowledge of BRE. While there has been a misconception and the criticism that EBP may diminish the patient's role in their management,¹ this case study demonstrates how patient values can provide direction and a context in which the evidence is evaluated and applied. Patient values are an intrinsic component of EBP.² While this case study demonstrates one strategy of managing the high volume of evidence returned in evidence searches, it could be further refined by using MESH terms and by restricting by date of published articles.

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