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# IS IT REASONABLE TO USE AN INDIVIDUAL PATIENT'S PROGRESS AFTER TREATMENT AS A GUIDE TO ONGOING CLINICAL REASONING?

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## **Abstract**

Systematic assessment of a patient's progress following an intervention is frequently used to inform decision making in ongoing conservative management of patients with musculoskeletal symptoms. Although reassessment of impairments immediately following treatment is commonplace in clinical practice, relatively little research has considered whether this method is reasonable. The history of, rationale behind, and evidence for the use of patient responses to inform clinical reasoning are explored. Although the evidence is not conclusive, an argument is presented suggesting it is more reasonable to use a patient's response to treatment to inform ongoing clinical reasoning than to follow predetermined protocols. A methodical approach that considers change in parameters such as patient impairments is likely to be a useful guide for decision making during ongoing patient management, but only when the change being reassessed can be directly linked to functional goals. Changes in active range of movement or centralization of pain appear to be better indicators of treatment effectiveness than changes in either pain intensity or assessment of joint position. There is limited evidence to support the use of changes in segmental stiffness to guide ongoing management. Although reassessment of some impairments has been found to be useful, the author suggests that care is required in the selection of reassessments used to guide ongoing management. The usefulness of any reassessment is considered to rely on how well a change in the selected impairment predicts that individual patient's ability to achieve their goals.

## Background

Whereas early manual therapy was largely technique-driven, modern manual therapy relies as much on evidenced based practice as on the application of techniques. One of the three pillars of evidence based practice is the application of published research findings to clinical practice. There is extensive evidence in the literature on manual therapy for musculoskeletal conditions including a large number of blinded randomized controlled trials (RCTs). Although RCTs are necessary for the highest levels of evidence, they are a research design that is best suited to assessing the effectiveness of repeatable interventions on homogeneous conditions. In relation to physical treatments for musculoskeletal conditions RCTs have a number of limitations including: 1) a difficulty in blinding either the patients receiving or the clinicians applying a treatment, 2) a lack of repeatability in the treatments being applied, and 3) a lack of homogeneity within groups of patients with the same condition or diagnosis (1, 2).

Far less research has been concerned with the other two pillars of evidence based practice, clinical reasoning and patient preference. The research that has occurred into clinical reasoning has focussed on diagnosis and initial treatment selection. To improve the accuracy of clinical reasoning, some authors have identified subgroups among patients with a single condition (3, 4) while other authors developed clinical prediction rules to determine subgroups that are more likely to respond to specific interventions (5-10). To date little research has considered the reasoning processes that occur after the initial selection of treatment and thereby address the far larger area of clinical reasoning that occurs during ongoing patient management (11).

There are perhaps three main approaches that clinicians use to guide decision making in ongoing management. First is a protocol-based approach where the treatment is determined from the initial assessment and subsequent treatments do not deviate from the predetermined protocol. When the initial treatment selection is supported by experimental evidence this protocol-based approach is considered by some to constitute evidenced based practice. Herbert, et al., (12) for example suggest that the clinician should continue with a selected evidenced based intervention regardless of a patient's response unless that individual patient's outcomes are "very poor". A second approach considers each day as a 'clean slate'. Decisions on treatment are made on how the patient presents on that day and are not influenced by responses to previous treatments. Although little is written about this approach, it occurs commonly in clinical practice and appears to have been advocated by some early authors (13-15). It could be argued that neither a protocol-based or clean slate approach should be considered as ongoing clinical reasoning since each employs the same process of diagnosis and treatment selection used during the initial assessment.

Most authors suggest a third approach which includes reasoning that is specific to ongoing management. In this approach, a patient's progress is systematically reassessed and their management plan is modified accordingly (16). In its simplest form if a patient improves following an intervention the intervention is continued and refined whereas if the patient is worse, the intervention is changed or discarded. One of the difficulties with a responsive approach is determining what parameters to reassess as indicators of patient progress. Measures of disability or functional outcomes (Patient Specific Functional Scale, various disability scales or the patient's ability to perform activities such as work or sport) are generally considered the best

indicators of a patient's progress. Changes in measures of disability or functional outcomes however may not occur for weeks or months so are of limited use in monitoring day to day progress. As a result, reassessment of patient impairments, signs or symptoms (joint dysfunction, pain, strength or range of movement) are more commonly used as day to day indicators of patient progress.

On the surface, it would seem reasonable that an improvement in a patient's signs or symptoms would correspond to a change in their functional ability and would therefore provide a useful guide to ongoing decision making. Similarly application of a simple biomedical model would suggest that a change in a patient's impairments would correspond with a change in their functional abilities. In real patients however there is only a limited correlation between functional abilities and impairments (17). A biopsychosocial model would suggest that impairments are only one of many factors that contribute to a patient's functional ability (18). With the shift to a biopsychosocial model, clinical reasoning moves from a fairly simple realm of measurable cause and effect to become a complex system that also includes less predictable factors such as context and social constructs (19).

The usefulness of immediate reassessments guiding treatment application therefore remains problematic. On one hand, direct measures of functional ability are of limited use in assessing within session or day-to-day changes due to the time required for detectable changes to occur. On the other hand, changes in impairments suffer from an uncertain relationship with changes in the functional limitations that are ultimately of interest as patient outcomes.

This article will consider whether it is reasonable to use structured reassessment of impairments to inform decision-making in manual therapy. A historical perspective will be presented followed by the evidence for specific methodologies and suggestions as to when changes in impairments are likely to be able to be a useful guide for decision making on ongoing clinical management.

### **Historical perspective**

The earliest references found by the author on reasoning in ongoing patient management are in the Chiropractic and Osteopathic literature. Palmer (20), Still (14) and other osteopathic writers (13, 15) suggest a clean slate approach where the criteria for decision making need not extend beyond reassessment of misaligned/subluxed joints or related tissue on that day because such deviations were considered to be the source not only of the patient's pain and functional limitations, but also of all other disease processes. Early medical texts suggest that changes in a patient's symptoms must also be considered, but do little to suggest a methodical approach specifically relating to reassessment beyond "We try [the methods] until we find the most suitable for that particular case, and during the course of the treatment we may have to ring the changes on all the methods available" (21). Cyriax was perhaps the first to use a patient's diagnosis or pathology to direct decision making in musculoskeletal conditions. When considering ongoing management however, a lack of efficacy of the treatment frequently implied an error of diagnosis as much as a failure of the particular treatment (22).

Little appears to have been added to reasoning related to ongoing management until Maitland (23) suggested that reasoning should be informed by structured assessment and reassessment and was more important than technique. The method

taught by Maitland involves reassessing preselected aspects of the patient's signs, symptoms or functional limitations and using changes occurring in these parameters during or following treatment to guide future treatment application. The best known component of the Maitland method is to predetermine one or two "asterisk" signs to be reassessed immediately following a single application of a treatment technique to gauge the effectiveness of that technique. Ideally asterisk signs would be active movements or functional activities. He considered passive assessments such as joint position, joint mobility or soft tissue texture that had been advocated in earlier texts to be potentially open to clinician bias. This method of structured reassessment is now widespread, being taught in all physiotherapy schools in Australia (24) and used in a variety of therapeutic approaches including animal physiotherapy (25).

Reassessment of signs and symptoms is also referred to in the chiropractic literature, but does not appear to be advocated at every treatment (26), (27).

A number of other levels of reassessment have been advocated (28-30) including the immediate response of the patient on application of a treatment technique, the ongoing changes in pain or mobility during the application of a treatment, the pattern of response between treatments and the relation between each of these levels of reassessment and changes in the patient's functional abilities. Regardless of the timing of reassessment, aspects of a patient's response may be assigned weightings if, for example different aspects change in different directions (e.g. pain has centralized, but the patient's neurological condition has worsened) (31). An example from highest to lowest weighting might be changes in: 1) neurological symptoms (changes in strength or reflexes), 2) centralization of anaesthesia or paraesthesia, 3) centralization of pain, 4) range of active movement, 5), pain location on active



movement, 6) pain intensity on active movement, 7) resting pain and 8) the clinician's impression of passive mobility.

Reassessment of a parameter thought to be indicative of the patient's limitations immediately following a provisional or real intervention is often used to guide ongoing management. In order for it to be reasonable to use reassessment of a parameter to guide ongoing management, it is necessary that three conditions are met: 1) the parameter can be reliably assessed, 2) changes in the parameter occur within the interval between assessments, and 3) immediate changes in the parameter predict longer term meaningful outcomes for that patient.

### **Provisional treatment tests**

Although not strictly reassessments of the patient's response to treatment, provisional treatment tests are similar as they refer to an additional step that is sometimes interposed between the clinician deciding on an intervention and its therapeutic application. Perhaps the best known and researched trial treatments are in the McKenzie method where a patient's response to repeated active movements is used to determine the 'direction preference' which is then used as subsequent treatment for that patient. Classification of patients using this method has been shown to be repeatable (4) and to accurately determine which patients will respond to conservative treatment (32). Since the conservative treatment used in these studies was limited to the same movements used in the provisional treatment tests, it has been suggested that perhaps the only conclusions that can be drawn from the study is that patients whose symptoms improve immediately with repeated active movements will continue to improve with the same intervention (33).

Mulligan techniques of mobilization with movement (MWM) consist of a passive, typically accessory, movement superimposed on an active movement. A technique is initially performed as a provisional treatment test and is continued as a treatment technique if the patient's active movement is significantly improved during the application of the technique. This concept has been developed further by Vincenzino (34) who uses the term 'treatment direction tests' to describe perturbing the patient's system using, for example, tape or supports to determine an appropriate direction for subsequent treatment. Several studies have demonstrated that Mulligan techniques following on from trial treatments produce immediate improvement in patient impairments or longer term outcomes (35). The effectiveness of trial treatment tests was supported by a study of patients with lateral epicondylgia where a reduction in pain of greater than 25% with a provisional treatment of MWM was one of four factors contributing to effective prediction of a positive outcome (36).

Trial treatments are also described in the literature when using a 'dummy run' prior to applying lumbar traction (29, 37). It is suggested that the first application of lumbar traction be applied at a lower strength than would be expected to have a therapeutic effect and traction not be used as a treatment if the patient's symptoms are aggravated. Another trial treatment for lumbar traction that is used clinically, but does not appear in the literature, is to reassess the patient's straight leg raise immediately when a low force of lumbar traction is applied.

Although largely ignored in the literature trial treatments are also used when applying manual therapy techniques. For example if the patient's symptoms in the proposed treatment position, during setup or an initial application of the treatment technique produce an unacceptable quantity, quality or location of symptoms, many clinicians

will not continue with their original plan. No studies have been done to determine whether such trial treatments for traction or manual therapy techniques predict either the patient's immediate or longer term response to the treatment.

### **Reassessment following treatment**

Assessments of impairments such as active range of movement (ROM) and/or pain are commonly used by clinicians and can be reliably assessed. Changes in these impairments are known to occur immediately after many interventions including superficial heat (38), long wave ultrasound (38), Short wave diathermy (39) mobilization (40, 41), mobilization with movement (35) manipulation (42, 43), specific exercises (44) and even changes in the patient's knowledge and attitude without any physical intervention (45).

There is not necessarily a relationship between immediate changes in impairments and longer term outcomes. Furthermore if a change in impairment following one intervention predicts longer term outcomes, it is not possible to generalize that ability to predict to include other interventions. For example, following mobilization one might expect some portion of improvement in active ROM gained to be maintained. Alternatively following oral analgesics, one might expect temporary pain relief but not expect any improvement to be maintained.

#### *Pain and active range of motion*

For patients with lumbar spine pain receiving physiotherapy treatment, changes in pain and active ROM within a treatment session were found to predict improvement in the same impairment between treatment sessions (24). For patients with neck pain who received predominantly manual therapy treatment, within session changes in

pain location, pain intensity and active ROM all predicted between session changes in the same impairment (46). Although pain with movement was assessed in the lumbar spine study and pain at rest in the cervical spine, in both studies changes in active ROM was a better predictor than changes in pain. For patients with neck pain, changes in pain location and active ROM also predicted end of treatment changes in the same parameter and again active ROM was the better predictor (47). Changes in active ROM and, to a lesser extent, pain have been found to be predictive of longer term changes but each is only predictive of changes in the same parameter. It is not possible, however with any certainty to generalize these findings beyond patients with sub-acute neck or low back pain receiving physiotherapy or manual therapy treatment.

### *Muscle testing*

Applied Kinesiology is a method of assessment/reassessment used by practitioners from a variety of professions that differs from classical manual muscle testing in both application and intention. Applied Kinesiology tests a muscle's response rather than its maximal or 'break' strength and is intended to diagnose both musculoskeletal and non-neuromusculoskeletal disorders (48). On reviewing the evidence for the use of Applied Kinesiology for musculoskeletal problems, Hass et al. (49) concluded that "the clinician could be fooled by a statistically random phenomenon associated with a worthless test, a test with results unrelated to provocative procedure and insensitive to spinal manipulation." It would not appear that manual muscle testing as used in Applied Kinesiology can be reliably assessed or that changes in this type of muscle testing occur following treatment nor is there any evidence to suggest a relationship between this type of manual muscle testing and longer term outcomes.

*Passive movement testing*

Spinal palpation is another parameter that is often considered to be indicative of a patient's condition. Early texts conceptualized spinal palpation as an assessment of vertebral position which was related to symptoms or disease states and palpation was used as the primary means of reassessing a patient's condition. Most recent authors conceptualize spinal palpation as a means of evaluating segmental stiffness or mobility which in turn is thought to be related to patient impairments. Of the wide variety of techniques used in spinal palpation, applying posteroanterior force to a vertebra (producing a PA movement) has been most extensively investigated. PA movements were once thought to produce a localized translational movement of one vertebra on another (28). It is now clear, however that the movements produced are neither localized to one intervertebral motion segment, nor predominantly translational (50, 51). Regardless of what movement is being produced or how accurately the clinician's interpretation reflects that movement, the usefulness of spinal palpation as a guide ongoing patient management rests on the three conditions described above.

The first necessary condition is that motion palpation is reliable. Studies of PA movements have demonstrated only limited repeatability (Hollerwoger, 2006; Pool, Hoving, de Vet, van Mameren, & Bouter, 2004; Smedmark, Wallin, & Arvidsson, 2000) and the ability of clinicians to agree on ranking or grading stiffness of PA movements *in vivo* has not been conclusively demonstrated. When only tactile information is available to the therapist the repeatability has been found to be poor to fair (52, 53). When the practitioners receive common training or when additional information is available to the therapist (such as the production of discomfort or information about the patient's symptoms), the results improve significantly (54). The

limited repeatability of assessment by PA movements may be due to methodological weaknesses (55, 56) to manual palpation lacking the sensitivity necessary to detect relevant differences (55), or it being unclear what characteristics of the movement are relevant to the patient's symptoms (53, 57-59).

Notwithstanding the limited repeatability, manual assessment of passive movements has been shown to have clinical utility. For example symptomatic locations (60), the location of reduced segmental movement (61) and the location of congenital fusion (62, 63) have been reliably detected by manual motion palpation. In a clinical study, the lumbar spines of patients were classified by findings on manual palpation and patients who received treatment that corresponded to the palpation findings had better outcomes following treatment than those receiving randomly allocated treatment (64).

A limited amount of information is available in relation to the second condition of changes (in either pain or stiffness) of PA movements occurring within the interval between reassessments. In the lumbar spine at least some practitioners were able to reliably detect differences on manual motion palpation following manipulative treatment (65). When the stiffness of the thoracic (66) or lumbar (67) spines were measured mechanically, no differences were detected between before and after mobilisation. The single stiffness values used in these studies may, however have been unable to assess the aspects of PA stiffness that are relevant to patient symptoms (68, 69). In the cervical spine, changes in stiffness (but only at some levels of force) were found following two minutes of mobilization, when the mobilization was applied to the same location. Changes in stiffness of PA movements have been found to occur following mobilization, but the changes may only occur at

some levels of force. Furthermore, the magnitude of differences in PA stiffness that occur with changes in active ROM are greater than just noticeable differences in stiffness detectable by manual palpation (70) so are likely to be detectable by clinicians.

There is even less experimental evidence related to the third condition of changes in PA stiffness being able to predict longer term outcomes. In the lumbar spine, one study demonstrated a reduction in PA stiffness over the course of treatment when the patient's symptoms improved by over 80% (71). In the cervical spine differences have been found between tender and less tender sides of the same intervertebral level (69) but it is not certain whether the stiffness would change when the tenderness improved. In a group of patients with sub acute neck pain following two minutes of passive mobilization, a correlation was found between changes in PA stiffness at some force levels and changes in active ROM (41). Changes in PA stiffness are thus related to changes in active ROM. The author's previous studies of a similar symptomatic population demonstrated that changes in active ROM are related to longer term patient outcomes. Specifically, immediate changes in active ROM predicted between session changes (46) and between session changes in turn predicted end of treatment outcomes (47) but in both studies each axis of movement only predicted changes in the same axis of movement. It is tempting to think that if changes in PA stiffness demonstrate a correlation with immediate changes in active ROM and immediate changes in active ROM are related to end of treatment outcomes, then immediate changes in PA stiffness would be related to end of treatment changes in active ROM. Unfortunately, a transitive property does not apply to correlations and although the possibility is suggested, the existence of a

relationship between PA stiffness and end of treatment outcomes can not be firmly established.

## **Discussion**

In spite of being used extensively in the clinical setting for patients with musculoskeletal disorders, there is a limited amount of research into patient's progress being used as a guide to ongoing patient management. The ability of provisional treatment tests to reduce symptoms appears to be a good indicator of future treatment effectiveness - at least for repeated active movements or mobilization with movement when the ongoing treatment uses similar techniques to the provisional test. Reassessment of active ROM and to a lesser extent pain following treatment application appears to be a good predictor of between treatment and/or end of treatment outcomes in the same parameter - at least for the lumbar and cervical spines and when treatment consists of physiotherapy or manual therapy. Support for reassessing passive spinal mobility is less clear but for patients with sub acute neck pain receiving manual therapy treatment, a reduction in PA stiffness is related to immediate and possibly longer term increased active ROM. It is also possible, but by no means proven that the changes in PA stiffness occurring during the application of a treatment are large enough to be detectable by the clinician.

To date the evidence supporting the use of a methodical system of reassessment is limited and there are significant gaps in the evidence that is available. A lack of evidence for the efficacy of a responsive approach is however not the same as evidence for a lack of efficacy. Furthermore there is no known experimental evidence that supports using either predetermined treatment protocols or a clean slate approach for musculoskeletal conditions over a responsive approach. On balance, a



case can therefore be made to support the use of immediate changes in impairments to guide ongoing patient management.

One of the limitations of using a responsive approach is the specificity with which change occurring during or after an intervention only predicts future changes in the same parameter. As discussed earlier, the third pillar of evidence based practice is patient values and preference. For change in an impairment following treatment to be a useful guide, changes in the particular parameter being assessed must be related to what is important for that patient. For example reassessing cervical rotation may be relevant for a patient whose main concern is looking behind them while backing the car. On the other hand, cervical rotation might not be an appropriate reassessment for a patient who only complains of neck pain after performing hours of computer work. In clinical practice it is important that the impairment selected for reassessment is related to the patient's functional goals. Impairments and functional outcomes are not necessarily related, so it is not sufficient for the clinician to presume a relationship between an impairment and a functional outcome. Rather the clinician first hypothesizes a link between an impairment and a patient's goals, but must then also challenge and test their hypothesis. In the first example above, if PA stiffness at a specific level improves following treatment, but cervical rotation (and ability to back the car) does not, then PA stiffness at that location is not likely to be an appropriate reassessment. Similarly if cervical rotation improved, but the patient's ability to back the car did not, then a reassessment other than cervical rotation may need to be considered.

It is possible that a single intervention could affect different factors contributing to a patient's disability in opposing ways. For example a painful passive mobilization

technique may worsen a patient's condition by increasing a patient's disease conviction or central nervous system sensitivity, but improve their condition through an effect on local pathology. Assessing the patient's response after the treatment may provide a preliminary way of summing the effects of such opposing factors and indicating whether there is a net gain or loss from the intervention.

Initially the idea of using changes in reassessments to guide ongoing management was implicitly based on a biomedical model. A structural limitation (e.g. intervertebral stiffness) was seen to result in impairments (pain, loss of ROM) which in turn produced loss of functional ability. I would suggest that the ability of changes in a parameter to be useful as a guide to ongoing patient management is also quite consistent with a biopsychosocial model. That is, the usefulness of reassessing a particular impairment may not be dependent on a causal link between the treatment, changes in the impairment, and changes in the patient's functional outcomes. Rather the usefulness of a parameter, whether it is pain, active ROM, motor control or patient attitude, may simply rely on the ability of change in that parameter to predict achievement of the patient's goals. In other words, for clinical reasoning it may not be important whether a technique directly caused a change in a particular structure. Rather the question may be whether the totality of what occurred during the therapeutic interaction resulted in the patient more closely approaching their goals.

One further aspect of a responsive approach to ongoing management that does not appear to have been discussed in the literature is the potential for the process of reassessment itself to have a therapeutic effect. Consider for example the effect on a patient's disease conviction, fear of movement, self efficacy and faith in their clinician

when, after weeks of constant debilitating back pain, a reassessment immediately following an intervention demonstrates a reduction in pain and increase in mobility.

### **Conclusion and recommendations**

The paper discusses the reasonableness of using an individual patient's progress to guide conservative management of that patient's musculoskeletal condition. Changes in active range of movement or centralization of pain appear to be better indicators of treatment effectiveness than changes in either pain intensity or assessment of joint position. There is limited evidence to support the use of changes in segmental stiffness to guide ongoing management. The author suggests that it is reasonable for a clinician to use impairments as an indicator of an individual patient's progress, but only if the impairments being considered can be directly linked to the patient's goals.

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