Clinical decision-making in the management of cervical spine derangement: a case study survey using a patient vignette

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Background: Neck pain is one of the most common, potentially disabling, and costly musculoskeletal conditions seen in outpatient physical therapy (PT). Clinical decision-making involves referral or the selection of intervention based on the results of the PT examination. Despite evidence that suggests that treatment based classification is most efficacious, it is hypothesized that examination and intervention may be heavily influenced by post-graduate training experiences.

Purpose: The purpose of this study was to analyze which tests, measures, and interventions are most commonly selected by physical therapists (PTs) holding a credential from the McKenzie Institute and those holding the McKenzie credential plus the credential of Fellow of the American Academy of Orthopaedic Manual Physical Therapy (FAAOMPT). Their responses were based on a simulated case vignette involving a patient with a presentation of cervical spine disk derangement.

Methods: A survey administered through Survey Monkey was sent to 714 members of the McKenzie Institute who are certified or hold a diploma in mechanical diagnosis and therapy (MDT) or these credentials with the addition of Fellowship credentialing (MDT + FAAOMPT). Of the 714 surveyed PTs, 83 completed the survey for a response rate of 11.6%. As the PTs were given further information regarding the patient, they were asked to progress through a clinical decision-making process by indicating their sequence of examination techniques, and then indicating which interventions would be performed based on the results of the examination.

Results: A descriptive analysis was conducted to determine the most common sequences chosen by the PTs based on their training. To perform the analysis, only respondents who completed the survey were included: clinicians with MDT credentials, ($n=77$), and clinicians with both the MDT and FAAOMPT credentials (MDT+FAAOMPT), ($n=6$). Initially, the most common examination chosen regardless of credential was postural analysis. After receiving additional information regarding the patient's posture, the majority of clinicians in each of the three groups then chose active range of motion (AROM). However, after additional information was given, the majority of the MDT group chose repeated end range cervical movements as their next examination measure, and the FAAOMPT group varied. The majority of the FAAOMPT group continued to assess the patient through an entire examination sequence, while the majority of the MDT group discontinued testing. A descriptive analysis of the intervention sequences depicted a trend toward direction of preference (DP) exercises for the MDT group (80.3%), and passive movements or mobilization exercises for the FAAOMPT group.

Conclusion: The results of this study suggest that PTs with post-graduate training through the McKenzie Institute or through Orthopaedic Manual Physical Therapy (OMPT) Fellowship training may demonstrate an inherent bias toward their advanced training in the assessment and treatment of acute cervical derangement. Although no significant findings can be reported secondary to sample size limitations, future studies may be performed to further explore this topic.

Keywords: Cervical spine, McKenzie, Manual physical therapy

Introduction

Neck pain is one of the most common, potentially disabling, and costly musculoskeletal conditions seen

in outpatient physical therapy (PT).¹ Mechanical neck pain is a common condition that affects an estimated 70% of individuals at some point in their lives,² and approximately 54% have experienced neck pain within the last 6 months.³ The costs associated with the management of patients with neck pain is

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high, second only to low back pain in annual workers compensation costs in the United States.³ The causes of neck pain can vary, and may include muscle strains, joint surface changes, nerve compressions, and traumatic injuries.⁴ Patients may present to PT with many different signs and symptoms, including decreased range of motion (ROM), paresthesia, upper extremity weakness, and headaches.⁴ To account for these varying presentations, physical therapists (PTs) may develop evaluation algorithms or use classification systems to help identify the cause and develop an appropriate treatment plan. Ideally, examinations should be thorough, with inclusion of tests and measures, which may determine a treatment based classification.⁵ However, the authors hypothesize that the tests, measures, and interventions selected by clinicians may be heavily influenced by post-graduate training rather than the patient presentation.

Previously referred to as the McKenzie Method, mechanical diagnosis and therapy (MDT) emphasizes self-treatment strategies based on the determination of a direction of preference (DP) derived from testing repeated end range movements or static postures.⁶ The MDT system is comprised of the following three syndromes: derangement, dysfunction, and postural.⁶ Unlike some philosophical approaches, MDT does not attempt to arrive at a pathoanatomical diagnosis once the physical examination is complete.⁷ Clinicians versed in the system assign patients to one of the three syndromes based on symptomatic and mechanical responses noted during repeated movement testing. A patient's response to repeated end range movement testing is the ultimate guide for the practitioner on how the impairment should be managed.^{8,9} Classification into one of the above categories then directly guides the PT to interventions. In the event a patient does not fit in to one of the three syndromes, a number of other options are considered.⁷

The McKenzie Institute offers continuing education in MDT, which may result in two credentials, certification and diploma. To earn certification, clinicians must be licensed with 2 years of clinical experience, complete four courses detailing application of the system to the spine and extremities, and pass a written and practical examination.¹⁰ To earn a diploma in MDT, a clinician must attend the Institute's educational courses and successfully pass the McKenzie Institute International Diploma Examination.¹⁰ The diploma candidate must also be engaged in active clinical practice, and hold registration in their respective country of residence.

Orthopedic manual physical therapy (OMPT) is an approach characterized by the PT's assessment of tissue stiffness or abnormal motion at a spinal segment.¹¹ The PT may seek to find out the severity,

irritability, nature, and stage of the patient's symptoms and disorder.¹² As with most approaches to OMPT examination and evaluation, the nature of the subjective report, acuity, and irritability of the condition should guide the PT to contraindications and indications regarding the vigor of the physical examination.¹³ Often this process of evaluation is subject to a philosophical basis.¹⁴ Depending on a clinician's OMPT training, selection of tests (i.e. joint play testing or tissue tension testing) will lead to a tissue specific pathoanatomical diagnosis. Once the tissue is identified, interventions addressing the dysfunctional tissue are selected. The Cyriax method to examination and intervention is one example of this type of evaluative system that utilizes select tissue tension tests to identify the dysfunctional lesion.^{15,16} Utilizing a combination of active, passive, and resisted movements, the clinician can determine whether the structure responsible for the pain is contractile or inert.¹⁶ In the case of spinal conditions, Dr Cyriax maintained the disk was the primary source of common back and neck pain, thus treatments were directed toward a 'hard' or 'soft' disk.¹⁵

Post professional training in musculoskeletal management of neck pain may also involve fellowship training in OMPT. This training involves didactic instruction and 440 hours of clinical mentorship conducted under mentorship provided by a Fellow of the American Academy of Orthopaedic Manual Physical Therapy (FAAOMPT).¹⁷ This training includes the study and application of tests and measures such as tests for structural symmetry, passive intervertebral motion testing, accessory motion testing, tests for neural tension, as well as other standardized measures such as neurological tests, palpation, and special tests. The knowledge gained through didactic coursework and clinical experiences prepares the practitioner for a more focused subspecialty in clinical practice.¹⁷

While similarities between MDT and OMPT training exist, education in one particular approach can lead to significant variation in clinical decision-making. Adopting a philosophical approach may dictate how a clinician approaches a patient with musculoskeletal pain, biasing both the examination and intervention selections.¹⁸ Previous research has not described the clinical decision-making in PTs with post-graduate training in MDT and among those with MDT certification and diploma credentialing who also pursue fellowship training in OMPT. The purpose of this study was to determine the clinical decision-making among these MDT clinicians through the analysis of the tests, measures, and interventions selected in a simulated case vignette.

Methods

Participants

A letter requesting participants for a survey investigating examination and treatment preferences in the management of a simulated case of a person who presented with acute cervical spine symptoms was sent to members of the McKenzie Institute who are certified or hold a diploma in MDT (MDT) or these credentials with the addition of Fellowship credentialing (MDT+FAAOMPT). Following approval by the Daemen College Human Subjects Research Review Committee (HSRRC), the survey was distributed via email. In total, the survey was distributed to 714 clinicians with post professional credentials in MDT and Fellowship.

Procedure

A 15 question case survey was developed and administered through Survey Monkey. The patient vignette was developed to describe a simulated patient who presented with acute cervical spine pain. Examination findings were sequentially delivered to the reader after each question following a sequence of diagnostic movement tests first described by James Cyriax.¹⁹

Cyriax's system of selective tension testing is designed to identify the pathoanatomical structure causing the patient's symptoms. This physical examination process involves using active motion, passive motion, resisted contractions, and palpation to identify soft tissue lesions in inert or contractile tissue by reproducing the patient's chief complaint. After selecting an answer, additional information regarding the patient in the case was provided to determine further selection of tests and measures and intervention resulting from the examination findings. Information provided to the clinicians included the following tests and measures typically utilized in a musculoskeletal examination: active, repeated, passive, resistive, and those typically associated with OMPT such as passive intervertebral motion testing and accessory motion testing.²⁰ Standard assessments such as strength measures, neurological assessment, and special tests were also offered as potential choices. Subsequent to the examination, clinicians were also asked to sequentially identify which interventions would be implemented. The survey was sent to all potential participants and 5 weeks were allowed for completion of the case which is described as follows.

Case study

The following information was gained from the history derived from a simulated patient interview:

A 47 years old male patient was referred to the PT clinic for treatment of acute left cervical spine pain. The patient reported that symptoms began insidiously at work 2 days ago and progressively

worsened. His pain remained constant since onset and ranged between 2 and 6 on an 11 point numeric pain rating scale (VAS); with the symptoms being rated as 5/10 at the time of examination. In addition, the patient described intermittent pain in the left scapular region that was worse when sitting. He denied experiencing any symptoms in the left arm below the elbow.

The patient worked in an office where he was required to sit at his desk, read documents, and type at his computer. He stated that work had been difficult secondary to the increase in pain when sitting for longer than 15 minutes. He reported no prior history of neck pain and no surgical history. He stated that looking overhead aggravated his neck pain and lying supine decreased his symptoms in the neck and scapular region. He had not undergone diagnostic imaging. His goal for PT was to be able to complete his workday free of pain.

Physical Examination

1. How would you begin the examination?

Additional information provided:

Structural: upon observation, patient presented with a forward head posture characterized by flexion in the mid-lower cervical spine and extension of the upper cervical spine. He had a normal kyphosis in the thoracic spine.

2. What test/measure would you proceed with in the examination?

Additional information provided:

Active range of motion (AROM) measured using a standard goniometer in sitting (pretest pain 5/10 on VAS) – flexion: 0–60°, painful in the left (L) cervical region with pain during movement (PDM) and end range pain (ERP); extension: 0–45°, peripheralized symptoms to L scapula at end range; right (R) lateral flexion: 0–50°, pain free; L lateral flexion: 0–40°, peripheralized symptoms to L scapular region at end range; R rotation: 0–80°, pain free; L rotation: 0–75°, L mid-lower cervical ERP.

3. What test/measure would you proceed with in the examination?

Additional information provided:

Repeated end range cervical movements:

protrusion – one repetition: increased mid-lower left cervical pain; repeated movements: increased left cervical pain and peripheralized symptoms to left scapula, worse.

retraction – one repetition: no effect; repeated movements: decreased mid-lower cervical pain, not worse.

retraction with extension – one repetition: decreased mid-lower cervical pain; repeated movements: decreased pain and centralized symptoms to mid-cervical spine, better.

flexion – one repetition: increased mid-lower cervical; repeated movements: worse mid-lower cervical; produced left scapular pain.

4. What test/measure would you proceed with in the examination?

Additional information provided:

passive range of motion (PROM) – limitations in flexion, left side bending, and left rotation; all ends feel firm; ERP in mid-lower cervical produced with cervical flexion.

5. What test/measure would you proceed with in the examination?

Additional information provided:

passive intervertebral motion testing – joint play testing revealed hypomobility in side bending left at C5–C6; patient complains of slight discomfort.

6. What test/measure would you proceed with in the examination?

Additional information provided:

Neurologic testing:

dermatomes – intact to touch localization and sharp/dull touch discrimination.

muscle stretch reflexes – normal, equal, and reactive.

7. What test/measure would you proceed with in the examination?

Additional information provided:

Special tests:

manual muscle test (MMT) of deep neck flexor strength as measured with stabilizer cuff – poor.

8. What special test would you proceed with in the examination?

Additional information provided:

Special tests:

Spurling's test – positive, increased mid-lower cervical symptoms.

9. What special test would you proceed with in the examination?

Additional information provided:

Special tests:

compression – increased mid-lower cervical symptoms.

10. What special test would you proceed with in the examination?

Additional information provided:

Special tests:

distraction – decreased mid-lower cervical symptoms.

11. What test/measure would you proceed with in the examination?

Additional information provided:

Neural tension testing – mild neural tension in the median neural tension test, 15° elbow extension (from full extension) and radial (0–30° glenohumeral abduction) with the radial test reproducing the patient's scapular pain.

12. What test/measure would you proceed with in the examination?

Additional information provided:

palpation – increased tone of cervical extensor musculature and left upper trapezius muscle; increased tone in left musculature.

13. Based on the results of the exam, what would be your initial intervention?

14. If the patient's pain decreases and/or function improves with this initial intervention, what is your next intervention?

15. If the patient states there is no change in pain or function, what is your next intervention?

Responses provided

The following were the responses provided:

active range of motion (AROM) assessment
compression test
diagnostic imaging
distraction test
intersegmental motion tests
muscle endurance assessment
manual muscle test (MMT)
neural tension tests
neurological testing
palpation
postural exam
passive range of motion (PROM)
repeated end range cervical movements
Spurling's test
structural alignment exam
vertebral pressure tests
none of the above
no further testing warranted

Data analysis

The survey respondents were clinicians who were certified or hold a diploma in MDT (MDT), or had these credentials with the addition of fellowship training (MDT+FAAOMPT). As the data collected were nominal, contingency tables and chi-square analysis were used as descriptive measures. The percentage of clinicians who chose a specific examination or intervention for each question was calculated. In addition, for respondents from the McKenzie Institute, both the credential earned and the number of years of clinical experience were compared with the intervention measures selected using contingency tables and chi-square analysis.

Results

Examination

Of the 714 surveyed PTs, 83 completed the survey for a response rate of 11.6%. Data were analyzed from the responses from clinicians with MDT credentials ($n=77$), and clinicians with both the MDT and FAAOMPT credentials (MDT+FAAOMPT) ($n=6$) (Table 1). For analysis, the clinicians with MDT

Table 1 MDT Examination

Question	Test and Measure	Most common response(s) ¹
1	Posture	69% (53/77)
2	AROM	66% (51/77)
3	Repeated End Range Cervical Movements	92% (71/77)
4	No Further Testing Warranted	74% (57/77)

¹Percent calculated using SPSS contingency tables

Institute credentialing (either Cert. MDT or Dip. MDT) were collapsed into one category (MDT). The structural examination was the most common initial test selected; 69% of the MDT group (53/77) selected that test, as well as 67% (4/6) of the MDT+FAAOMPT group.

After receiving additional case information regarding the patient's structural examination, the majority of clinicians in each of the two groups MDT=66% (51/77), MDT+FAAOMPT=67% (4/6) chose active range of motion (AROM) assessment as the next test and measure they would implement. The clinicians were then provided with an AROM measurement for cervical flexion taken in sitting, along with symptom response. Based on the information, the majority of clinicians in the MDT (92% (71/77) group and MDT+FAAOMPT group (100% (6/6) chose repeated end range cervical movements as their next test.

Additional case information was then provided, describing the patient's symptom response to one repetition and to multiple repetitions of cervical retraction. Based on these findings, 74% of the clinicians in the MDT group (57/77) indicated that no further testing was warranted. However, in the MDT+FAAOMPT group, 50% of the clinicians selected assessment of either passive intervertebral motion (PIVM) assessment (3/6) or PROM (33%, 2/6) as the next step in their examination. As more case information was provided, a majority of the MDT+FAAOMPT responses indicated that they would include neurological and muscle strength assessments, as well as various special tests, including compression, distraction, Spurling's, and adverse neural tension testing.

Intervention

Among clinicians with MDT credentials ($n=77$) or those holding MDT+FAAOMPT credentials ($n=6$), the most frequently selected initial intervention was exercise according to the DP. Those with MDT credentials selected these exercises 79% of the time (61/77), while those with MDT+FAAOMPT credentials selected these exercises 66% of the time (4/6). The second most selected intervention for PTs with MDT training only was postural correction, with 16% (12/77) of MDT clinicians choosing to implement this intervention first. Upon being informed though that the patient's pain had decreased and level of function had increased from the previous treatment,

the majority of MDT clinicians (73%, 56/77) as well as those with MDT+FAAOMPT credentials (50%, 3/6) again selected McKenzie (DP) exercises as their second intervention.

With information provided that the patient reported no change in symptoms from the previous treatment, MDT clinicians selected to continue proceeding with McKenzie (DP) exercises (57%, 24/77) and grade 1–4 non-thrust manipulation of the cervical spine (37%, 22/59) most frequently. For clinicians with MDT+FAAOMPT credentials, grade 1–4 non-thrust manipulation of cervical vertebrae were selected most often (33%, 2/6).

Discussion

Our results demonstrated that clinicians might be driven to select tests, measures, and interventions that reflect their post-graduate education. As expected, our results suggest that the PTs with OMPT fellowship training were much more likely to assess passive movements, such as PROM and PIVM. In addition, as a group, these PTs chose to perform more tests and measures than the groups exclusively trained in MDT. Owing to the recognition of the centralization of symptoms and classification to the derangement classification,⁶ the clinicians in the MDT group chose to conclude their examination after assessing the patient's response to repeated end range movements.

Although these examination approaches differ greatly, there is evidence that lends support to the use of both repeated end range movement testing and passive movement assessment. Dionne *et al.*²¹ reported clinicians trained in MDT demonstrated inter-rater agreement ($k=0.46$, 86% agreement) for directional preference, and in a subsequent study, moderate agreement ($k=0.55$, $P<0.001$) when classifying patients according to neck pain.²² Conversely, Fjellner *et al.*²³ reported that many of the clinical tests of passive general motion range have acceptable reliability ($k>0.40$) and may be useful in the examination of the cervical spine. Interestingly, DP MDT+FAAOMPT group did not choose to assess joint mobility in their examination, but selected grade 1–4 non-thrust manipulation of the cervical spine as an intervention.

The most frequently selected intervention for the groups with MDT training was McKenzie (DP) exercises, which have been shown to be effective in several studies.

Abdulwahab *et al.*²⁴ reported neck retraction exercises may promote cervical root decompression and reduce radicular pain in patients with cervical radiculopathy. Murphy *et al.*,²⁵ demonstrated similar effects for a case involving a patient with four disk herniations, two of which compressed the spinal cord causing radiculopathy and motor loss. After a regime of manual and self-generated end range movements into extension, the patient's symptoms centralized and then abolished and muscle strength was restored.

Although there is evidence that thrust manipulation is effective in increasing ROM^{26,27} and both thrust^{2,26–28} and non-thrust manipulation^{29,30} are effective in decreasing pain in acute patient populations, the MDT clinicians did not select either as initial intervention. Respondents trained in MDT+FAAOMPT did select grade 1–4 mobilizations of the cervical spine as a follow up intervention. Several studies support manual therapy combined with exercise.^{1,28} In 2007, Falla *et al.*³¹ demonstrated that with an exercise program targeted at training the craniocervical flexor muscles, subjects with neck pain demonstrated an improved ability to maintain a neutral cervical posture during prolonged sitting.

This study was a demonstration of the decision-making of PT specialists. Hypothetical-deductive reasoning and pattern recognition were utilized by clinicians in both groups, with pattern recognition of the derangement classification being most evident. In contrast to this form of diagnostic reasoning, the ability of the clinicians to interpret the subjective history of the simulated patient was also a demonstration of narrative reasoning, which is an attempt to understand the lived experience of the patient.³² As described in the patient history, the factors of loading in flexion being reproductive of symptoms and the centralization of symptoms with repeated end range movements led those clinicians to conclude their tests and measures at that point and move on to intervention. In this limited sample, those clinicians with additional training in manual PT assessment deduced that the passive examination may be utilized as additional tests to detect passive joint motion that may be relevant to the case. In addition, those PTs with fellowship training identified additional tests and measures beyond repeated end range movements and were more likely to use manual PT procedures in intervention.

Limitations

Although this research allows for consideration that clinicians may demonstrate a bias in their selection of tests, measures, and interventions reflective of post-graduate training, there were limitations to the study. The most obvious limitation was the poor

response rate and the sample size of the MDT+FAAOMPT group ($n=6$) in comparison with the MDT group. The small sample is likely attributed to the relatively recent implementation of the MDT OMPT Fellowship program. Despite the limitations in the study, the data were analyzed through a descriptive analysis, which allowed for trends to be observed. Further research is required to determine if there is significant statistic evidence indicating that PTs demonstrate examination and intervention selection bias.

Conclusion

The results of this study suggest that PTs with post-graduate training through the McKenzie Institute and Fellowship training in OMPT may demonstrate an inherent bias toward their training in the assessment and treatment of acute cervical derangement. Although no significant findings can be reported secondary to sample size limitations, future studies may be performed to further explore this topic. While there is evidence to support the tests, measures, and interventions most frequently selected by each group individually, a case may be made for an examination that includes all relevant assessments and avoids making clinical assumptions. In addition, interventions should be selected to address specific impairments identified by a thorough examination to provide efficient care.

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