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Clinical Reasoning in Physical Therapy

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구문요약

물리치료에서의 임상추론

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임상추론은 환자를 평가하고 관리하는데 사용되는 임상가의 필수적인 생각 또는 동적인 인지과정이라고 할 수 있다. 임상추론은 환자의 문제를 인식하고 식별하며 더 나은 환자관리가 이루어지도록 환자의 상태에 대처하며 정보를 해석하고 분석하는 것으로서 이를 위해 임상가는 적절한 지식을 가지고 있어야 하며 임상추론 기술과 관련된 폭넓은 이해가 요구된다. 임상추론은 치료사, 환자, 그리고 환경 간의 상호관계를 가진 복잡한 과정으로 임상추론과정에서 치료사와 환자 간에는 충분한 협조가 이루어져야 한다. 임상추론에서의 해석적 모델로는 진단적 추론, 상호작용의 추론, 이야기적 추론, 협조적 추론, 예언적 추론, 윤리적 추론, 추론의 교육 등이 제시된다. 임상추론과정에서 필수적인 주요 요소는 충분한 지식, 인지와 초인지 기술을 포함하며 이들 요소는 치료사와 환자 간의 관계에서 발달되어야 한다. 이들 기술 중에 어떠한 실수라도 임상추론의 오류를 초래할 수 있다. 추론에서 오류의 원인으로는 암시된 정보의 잘못된 인지, 임상패턴에 대한 지식부족, 특정 상태에 대해 알려진 사실을 잘못 적용하는 경우를 들 수 있다. 오류는 임상추론 과정의 어떤 단계에서도 일어날 수 있으므로 효과적인 학습전략을 통하여 이들 오류를 예방할 수 있을 것이다.

Key Words: Clinical reasoning, dynamic cognitive process, critical thinking, clinical pattern

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Introduction

Clinical reasoning can be defined as the dynamic cognitive processes or critical thinking of clinical practitioner used to evaluate and manage a patient (Jones, 1992). Clinical reasoning is concerned in diagnosis in medical field because it is ability to investigate the particular signs and symptoms from the patient (Mattingly, 1991). However, clinical reasoning is the means to recognize and identify a patient's problem, analyse and interpret information and cope with the patient's condition to facilitate better patient management.

The theoretical process in clinical reasoning

For impeccable clinical reasoning, practicing clinicians must have adequate knowledge. Indeed, physical therapists require a broad scope of understanding associated with clinical reasoning skills. These include knowledge of; basic biomedical science, clinical patterns and psychological factors associated with life style and social interactions (Higgs, 1992a; Higgs and Titchen, 2000; Jones et al, 2000; Patel and Kaufman, 2000). Higgs and Titchen (2000) proposed three classification of knowledge: propositional knowledge, professional craft knowledge and personal knowledge. Propositional knowledge is public and objective knowledge gained in an external environment such as textbook. It is basically derived through any form of research. While professional craft knowledge is the knowledge which can be obtained in a practical and experiential setting. Personal knowledge is the knowledge through life that shapes personal perspectives, beliefs and attitudes. It is united with the individual's reality or experience (Higgs and Titchen, 2000). Therapists need to have a great deal of professional knowledge and skill (Fleming and Mattingly, 2000). Higgs (1992b) suggested 'cognitive mapping' and reviewing knowledge including reflection and

metacognition as the methods used in the development of these types of knowledge in relation to dynamic clinical reasoning. A cognitive map is an illustrated picture or image of ideas of clinical reasoning based on an individual's knowledge. Higgs (1992b) strongly recommended this, as a means of self-evaluating (i.e reflections) or even peer evaluating, to learners to enable to assess and revise their knowledge in terms of accuracy, comprehensiveness and organization. It can be used as a key component in order to promote learning in an educational setting. Cognition is a normal conscious thinking process. In contrast, metacognition is a reflective thinking process and self-awareness over this conscious thinking. In other words, it is contemplation regarding the practitioner's own thinking or cognitive process (Higgs, 1992b; Jones, 1995).

The clinical reasoning process is a critical thinking process to meet the need for collecting and analysing information when generating hypotheses regarding the nature of a patient's problem and examining these hypotheses to determine the best clinical decision (Barrows and Feltovich, 1987; Higgs, 1992a). The clinical reasoning process is characterised by two main categories including hypothetico-deductive reasoning and pattern recognition (Elstein, 2000). The hypothetico-deductive reasoning is the most common approach used by an unexperienced practitioner. This deductive process uses backward reasoning in order to confirm or negate existing hypotheses, via testing or evaluation of treatment sessions. Pattern recognition is another common approach in clinical reasoning, often used by experienced practitioner. It is an efficient and fast process, and quite often the therapist do not need to stop their treatment in order to reason (Fleming and Mattingly, 2000). The presented problem is compared with existing clinical patterns. However, some problems are not always matched with classic disease patterns provided in textbook. Therefore practicing physical therapists need to build up their

own knowledge of clinical patterns through clinical experience, educational programs and the basis of existing knowledge(Barrows and Feltovich, 1987; Jones et al, 2000).

The characteristics of effective clinical reasoning

Clinical reasoning is a complex process having inter-relationship between therapists, patients, and

the environment(Higgs, 1992a; Jones et al, 2000). Therapists and patients should collaborate during clinical reasoning process. Jones et al(2000) provided a model of the clinical reasoning process. It highlights the relationship of knowledge, cognition and metacognition and explains how interaction occurs between therapist and patient in the clinical reasoning process. Higgs and Jones (2000) suggested the following interpretive models of clinical reasoning(Table 1).

Table 1. Interpretive models of clinical reasoning

Model	Characteristic
Diagonstic reasoning	Differentiating patient's impairments, disabilities and handicaps
Interactive reasoning	Dialoguing in the form of social exchange
Narrative reasoning	Use of stories regarding past or present patients
Collaborative reasoning	Attending in decision making process both practitioner and patient
Predictive or conditional reasoning	Thinking for the outcomes of the treatment
Ethical/pragmatic reasoning	To decide regarding moral, political and economic dilemmas
Teaching as reasoning	Guiding the patients thinking and behaviours

The following 'hypothesis categories'(Jones and Rivett, 2004) is a model of knowledge organization for the understanding patients' problems.

- Active and participation capability/restriction
- Physical factors: patients' perspectives on their experience
- Pathobiological mechanisms
- Physical impairments and associated structures/tissue sources
- Contributing factors
- Precautions and contraindications to physical examination and treatment
- Management
- Prognosis

These hypothesis categories can be used as a useful resource for both expert practitioners and physical therapy learners in order to develop clinical reasoning skills.

Clinical reasoning approach with case presentation

A 37-year-old man presented acute low back pain, right posterior thigh and right posterior ankle pain. He also complained of pulling sensation of right posterior thigh and pins and needle's on his four lateral toes. His pain started after lifting heavy

weight and became severe after sleeping in the airplane. He had been treated physical therapy for three weeks. The following list is the information gained from the patient and shows the clinical reasoning process with the information.

Body chart

The following body chart demonstrates the patient's presentation(Fig 1).

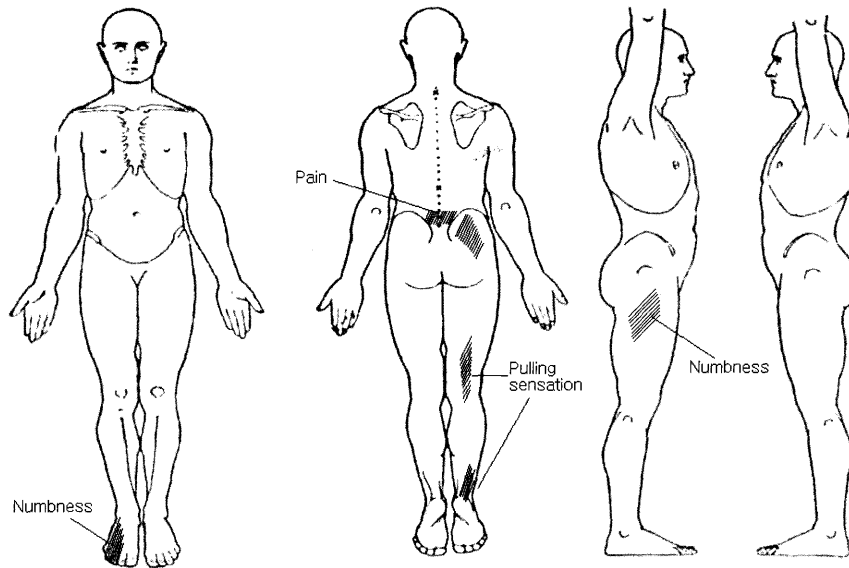


Figure 1. Body chart of the patient

Aggravating factors

- Bending to washing up
- Walking more than 15 minutes
- Sitting more than 30 minutes
- Hopping

Easing factors

- Lying down after 10 min pain relief

Special question

- General health: good
- Medications: painkillers
- Spinal cord: negative
- Cauda equina: negative
- Investigations: negative

History

Past:

- 21 years ago: LBP Nil treatment, continued work, lasted 6 weeks
- 4 years ago: LBP, Rt leg numbness, limping for 15 days

Present:

- 6 weeks ago: moving heavy weight, pain in sit to stand, but did gardening
- 5 weeks ago: sleeping 11 hours in mid-lying position in airplane, feel pain in Rt leg
- Couldn't walk because of severe pain (used wheel chair)
- Can not weight bearing in his Rt side
- Physical therapy for 3 weeks: felt better after physical therapy

Clinical reasoning process is listed below and are listed in Table 2 and 3.
possible sources of symptoms and pain mechanisms

Table 2. Possible sources of symptoms

Symptom	Possible structure
Low Back Pain	<ul style="list-style-type: none"> - disc (low lumbar) - ligaments - muscles/fascia - posterior intervertebral joints (low lumbar/mid referral) - neuromeningeal and local neural (dorsal primary rami) - sacroiliac joints - viscera (eg. kidney)
Buttock -> posterior leg pain	<ul style="list-style-type: none"> - local gluteal, hamstring, calf, hip joint and posterior tissues - referred somatic pain from low lumbar L5/S1 nerve root (vascular)
Numbness/pins & needles	<ul style="list-style-type: none"> - L5/S1 nerve root - Local peripheral nerves - Lateral femoral cutaneous nerve - Common peroneal nerve
Coldness	<ul style="list-style-type: none"> - Autonomic involvement

Table 3. Possible pain mechanisms

Mechanisms	Supportive evidence
Nociceptive	<ul style="list-style-type: none"> - Predictable mechanical pattern of aggravation (sitting, walking, etc) - Symptoms relatively localized into recognizable anatomical pattern - Recognizable easing factor in position change
Out put	<ul style="list-style-type: none"> - Autonomic involvement (cold leg) - Altered movement patterns (antalgic)
Peripheral neurogenic	<ul style="list-style-type: none"> - Overt neurological symptoms (numbness pins and needles) - Aggravated by load, direct compression to peripheral nerves (weight bearing walking, sitting)

Disability

- Work as electrician
- Sitting
- Lying/turning in bed
- Walking
- Gardening

Contributing factors

- Work as electrician
- Tall man
- Heavy work
- Posture/ergonomics
- Muscle strength/motor control for work

Precaution

- Marked disability (unable to work)
- Neurological component
- Severe pain (moderate)
- Irritable pain (high)
- Inflammatory component: pain in the morning and sleeping

Management

- Advice/explanation how can manage his low back
- Mobilization for stiffness (gentle)
- Neural mobilization (gentle)
- Strengthening/motor control for work requirements

Prognosis

Positive

- Nociceptive component
- Good communicate historian
- Recognizable easing factors
- Good general health
- This episode only 3 months
- Physio helped tolerated physical treatment improving fit
- Wants to return to work

Negative

- Marked disability
- Severe
- Irritability
- Neurogenic component
- Inflammatory
- Recurrent episode back pain, now back to leg pain

Errors in clinical reasoning

A correct clinical reasoning process requires a number of skills including knowledge, cognitive skills and metacognitive skills. Any failure of these

skills may result in errors in clinical reasoning. Scott(2000) provided three main causes of errors in reasoning: faulty perception or elicitation of cues, poor knowledge about clinical patterns and misapplication of known facts to a specific condition. Learners and novices in practice tend to perform memorized standard routine types of questioning rather than a problem-related inquiry with critical reasoning. Possible hypotheses are often limited due to insufficient information from patient assessment or by misinterpretation of the information that frequently occur as a result of quick clinical decisions about the nature of the problem. Under- or over-interpretation of cues is another source of errors in clinical reasoning(Scott, 2000). By leading questions, therapists tend to drive patients' thinking or understanding about their problems to suit their clinical reasoning. As mentioned early in this paper, the clinical reasoning process is a collaborative cognitive process occurring between therapists and patients. Data collected by leading questions and overwhelming data collection may elicit neglect of this important concept of reasoning process and result in errors.

A basis of clinical knowledge can be developed by understanding basic biomedical science. Sound knowledge is essential for every clinician in clinical reasoning. Therefore it is clear that poor theoretical and clinical knowledge can lead to errors in clinical reasoning. Although a therapist may possess adequate knowledge or reasoning skills, this can be misapplied resulting in imbalance between reasoning skills and knowledge. Jones(1992) stated that if some features of a hypotheses are extremely favourable, while the negating features are neglected, the clinical decision would be likely to be incorrect. He has also listed eight common features causing errors in clinical reasoning, which include adding pragmatic inferences, considering too few hypotheses, failure to sample enough information, confirmation bias, errors in detecting covariance, confusing covariance with casualty, confusion between deductive and inductive logic

and premise conversion.

Strategies to recognize errors in the reasoning process

Critical thinking skills are the hallmark of expert practitioners. It is always challenging for every educator to assist learners in the development of critical thinking skills. According to research undertaken comparing the comprehension and problem solving ability of experts and novices as well as the spectrum in between, the major differences between the expert and the novice are the ability to relate knowledge from one level of cognition to the other in the clinical reasoning process (Patel and Kaufman, 2000).

The clinical reasoning process includes hypothesis generation, inquiry strategy, data analysis, problem synthesis or diagnosis, and diagnostic and treatment decision making (Boshuizen and Schmidt, 2000). Learning strategies to learners must consider all these clinical thinking processes as an entity of cognitive and metacognitive processes. Sound knowledge is another component that learners must have to develop clinical reasoning skills. The diagram provided by Jensen et al (2000) demonstrates this correlating among each component in effective critical thinking skills. The main objectives when teaching clinical reasoning to physical therapy students should include:

- To develop students' clinical reasoning skills considering every stage of the reasoning process
- To develop students' autonomous, self-directed critical thinking and learning skills
- To develop students' self-awareness and self-monitoring skills
- To promote students' interpersonal skills

Many authors have different methods and strategies to teach reasoning skills. Shepard and Jensen (1990) analysed some curricula used in different physical therapy schools including implicit, explicit and null curriculum. They also suggested that variable use of each component of curriculum can further develop the 'reflective practitioner'. Higgs (1992a) suggested a strategy for fostering the acquisition of clinical reasoning skills, which includes the following elements in sequence: preparation of the patient, discussion of the case, time intervals for discussion on clinical reasoning, reflection on the class, individual reflection, feedback, implementing clinical reasoning and peer teaching and learning. This strategy can help learners to develop reasoning skills and recognize errors in their reasoning.

The hypothesis categories that Jones (1992) suggests are useful guides for learners to draw an overall picture of the clinical reasoning process (eg. hypothetico-deductive clinical reasoning). Documentation of common clinical patterns can be an important method in developing our ability in clinical reasoning. Knowing the normal presentation of human movement is essential to assess and manage patients appropriately. To study about normal human movement as well as techniques for testing musculoskeletal disorders might encourage in effective critical thinking. Role playing is a good way of understanding some typical clinical patterns. In addition to this, visualising clinical pattern and clinical reasoning processes with the use of a videotape can further help ours in appropriate interpretation of clinical reasoning. Learners should be encouraged to draw cognitive maps, as suggested by Higgs (1992b). This learning method enables learners to assess their own knowledge and thus lessen error in their clinical reasoning. All the strategies described above must be reviewed, and feedback concerning accuracy, organisation and interpretations of clinical reasoning must be provided.

Conclusion

Clinical reasoning and critical thinking are activities in which practicing physical therapists and even physical therapy learners should be proficient. The major elements that are essential in the clinical reasoning process include sound knowledge, cognitive and metacognitive skills. These elements should be developed in relationship between therapists and patients. Errors may occur at any stage of the clinical reasoning process, however it is believed that an effective learning strategy may prevent these errors. Currently, many studies have been undertaken to determine the effectiveness of education in promoting sound clinical reasoning for general medical fields. However, the results from these studies are inconclusive and there remains controversy regarding the effectiveness of education for clinical reasoning in physical therapy. Therefore, further research is required to determine the effectiveness of education for clinical reasoning in physical therapy.

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