

## CASE STUDY

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## MANAGEMENT OF AN ATYPICAL ANKLE SPRAIN PATIENT THROUGH HYPOTHETICO DEDUCTIVE REASONING MODEL OF CLINICAL REASONING IMPLEMENTED BY INTERNATIONAL CLASSIFICATION OF FUNCTIONING, DISABILITY AND HEALTH: A CASE STUDY

<sup>\*1</sup>Mohammad Habibur Rahman<sup>1</sup>Md. Shofiqul Islam<sup>1</sup>Ehsanur Rahman<sup>2</sup>Samena Akter Kakuli<sup>2</sup>Shamima Islam Nipa<sup>3</sup>Md. Obaidul Haque

## ABSTRACT

**Background:** Clinical reasoning is a process by which physiotherapists interacted with patients, their family and other health-care professionals. It is the thinking process that professionals tend to apply in clinical practice. Given that novice as well as expert practitioners prefer to go through some steps while they were dealing with unfamiliar cases. This process is known as hypothetico deductive reasoning. This reasoning approach involved the generation of hypothesis based on clinical data and knowledge and testing of hypothesis through further inquiry. We are expert in musculoskeletal physiotherapy treatment and favoring the atypical history of patient we went through step by step from assessment to discharge

**Methods:** A case based study through hypothetico deductive reasoning model of clinical reasoning. The objective of the study was to investigate the physiotherapy management strategies of an atypical ankle sprain patient through hypothetico deductive reasoning which comprised of cue acquisition, hypothesis generation, cue interpretation and hypothesis evaluation by implementing International Classification of Functioning, Disability and Health (ICF).

**Results:** The patient responded well to treatment as patient reported that 100% swelling decreased, could bear more weight (95%) on foot, decrease pain (1 cm on 10 cm VAS scale), improved muscle strength by manual muscle testing by grade V in ankle planter flexors (PF) as well as dorsiflexors (DF), invertors as well as evertors and the functional status of patient was improved by 80% according to lower extremity functional scale.

**Conclusion:** Clinical reasoning is an important approach in physiotherapy. It helps the practitioners in decision making and choosing the best alternative options for the well being of patients. We think it is necessary for all practitioners to have sound propositional and non-propositional knowledge in order to provide effective management protocol for patients focusing ICF. Even though we have been treating patients with musculoskeletal problems on regular basis, the atypical pattern of this patient give us the impression not to use pattern recognition all time for all patients rather using hypothetico deductive reasoning (HDR) where appropriate.

**Keywords:** Clinical reasoning, ankle sprain, hypothetico deductive reasoning, cue acquisition, hypothesis evaluation and ICF.

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<sup>1</sup>Assistant Professor, Department of Physiotherapy, Bangladesh Health Professions Institute, The academic institute of the Centre for the Rehabilitation of the Paralyzed, Savar, Dhaka, Bangladesh.

<sup>2</sup>Senior Clinical Physiotherapist, Department of Physiotherapy, Centre for the Rehabilitation of the Paralyzed, Savar, Dhaka, Bangladesh.

<sup>3</sup>Associate Professor & Head, Department of Physiotherapy, Bangladesh Health Professions Institute, The academic institute of the Centre for the Rehabilitation of the Paralyzed, Savar, Dhaka, Bangladesh.

## CORRESPONDING AUTHOR

<sup>\*1</sup>Mohammad Habibur Rahman

Assistant Professor  
Department of Physiotherapy  
Bangladesh Health Professions Institute  
The academic institute of the Centre for the  
Rehabilitation of the Paralyzed  
Savar, Dhaka, Bangladesh.

## INTRODUCTION

Clinical reasoning was a process by which therapists interacted with patients, their family and other health-care professionals [1]. Clinical reasoning was the groundwork of professional's clinical practice. It was the thinking process that professionals tend to apply in clinical practice [2]. Moreover, clinical reasoning was not only focuses on finding associations between theory and practice but also to evaluate patient's assessment, treatment and management. It was an ongoing process and it did not stop at completion of patient management. Therefore, it helped practitioners in extenuating reasons behind the patient's management protocol. In addition with, patient management plan could be gained through theory as propositional and professional experience as non-propositional knowledge. It helped the practitioners to determine the best possible management guideline for patients with logic [3]. As Physiotherapists are health professionals, it was the utmost need for each professional to maintain the standard of reasoning process in physiotherapy practice [4]. This type of reasoning was totally dependent on the diagnostic process [5]. Edwards, et al. (2004) recommended that physiotherapy practitioners were required to consider diagnostic process as well as the personal context of individual patient and the environment where patient stayed [6]. However, Jones, et al. (2000) stated that the personal context of patients should be different from one to another [7]. As a result the context predominately focused on patient's physical, psychological, social and cultural concerns which in turn would be regarded as good physiotherapy practice.

The aim of the study was to interpret hypothetico deductive clinical reasoning model with a single case which we already saw previously. Now we are discussing the clinical reasoning procedures that we gained while treating a patient with neurovascular injury of ankle. We think the discussion regarding case study would help physiotherapy practitioners during clinical practice.

As this was a complex case to detect initially we carried out diagnosis and management plan steps by steps. Jones (1992) stated that novice as well as expert practitioners would like to go through some steps while they were dealing with unfamiliar cases [3]. This process was known as hypothetico deductive reasoning. In fact, it is a model of clinical reasoning oriented in medical research. There are four stages of this type of reasoning: firstly cue acquisition, secondly hypothesis generation, thirdly cue interpretation and fourthly hypothesis evaluation.

Generally cue acquisition means the initial information-gathering stage during the process of clinical reasoning. It involved recognizing data needed for an individual case [8].

We asked a lot of questions to patient and among those here only writing the some of them for example:

i) What was the mechanism of injury?

The reason for asking the question was to identify which structure of ankle could be damaged. Patient told that the

mechanism of injury as an inversion ankle sprain while playing basket ball at school.

ii) Was pain in the injured site or referred from other parts of body?

The reason for asking the question was to detect the source of symptoms. Sometime, sympathetic source might have an influence over the neuro vascular injury of ankle [9].

iii) Which activities of your ankle provoke pain?

iv) Were you feeling pain during resting position?

The reasons for asking the se questions were to identify the nature and severity of injury. Patient told that, pain was 0/10 at rest but with any weight bearing or pressure the pain became very intense just to the injured area.

v) Any change of skin color in foot and ankle.

vi) Were there any abnormalities of skin temperature?

vii) How did you recognize cooler foot?

The reasons for these questions to ask were to determine any neuro or vascular involvement with ankle injury. Patient answered that she was feeling cooler, dryer foot and purple color of skin in compare with the left side. All those questions answers helped to format generation of hypothesis.

Hypothesis generation was important part of the systematic problem-solving process. It was an inductive reasoning which provides a set of specific observation to a generalization [8].

After cue acquisition about the patient and answering the reason, few hypotheses were generated which are written as follows:

i) There was relationship between mechanism of injury and ankle sprain.

ii) An inversion injury of ankle was more responsible to cause complex regional pain syndrome along with vascular structure involvement than typical ankle sprain.

iii) There was relationship between neural impingement and vascular injury of ankle.

Hypothesis generation was proceeded by cue interpretation. This stage involved the interpretation of cues generated from the initial encounter and focused on the confirmation of cues. This significantly contributed to the original hypothesis or alternatively, the rejection of cues unrelated to the original hypothesis [8].

Our primary aim to take the history was to help us to understand all the factors leading to her current state of disability. It helped us to detect clinical examination. Secondary aim included understanding the mechanism of injury, the state of inflammation and the possible pathobiological mechanism causing pain and movement impairment. We did not consider any psychological implication as she and her mother were curious about the condition. The history and clinical presentation of signs and symptoms suggested a more complicated problem than just a lateral ankle ligamentous sprain. On physical examination, she had decreased sensation to touch in the superficial peroneal nerve distribution. She was actually surprised to discover the fact. Dorsiflexion of the left ankle was 8 degrees but only

2 degrees on the right side. Planter flexion was also limited on the right side (20 degree) compared with a left (45 degree). In contrast eversion was normal. We found positive neurodynamic examination of peroneal nerve whereas tibial or sural nerve did not show any discomfort. She also had no history of ankle injuries or any history of spinal complaints. She complained of cooler right foot and leg. The planter and dorsal aspects of the lateral part of right foot appeared dryer than left foot. The history was unusual for a sprained ankle which typically heals more quickly. The possible problem we considered for this patient is neurovascular injury and we discussed patient condition with her mother. These cues really match the hypothesis two and three. Therefore, it required hypothesis evaluation to identify the most valid one.

The final stage of hypothetico deductive approach was hypothesis evaluation. In this stage, the evidence collated was evaluated in relation to its relative merits, advantages and disadvantages and possible contribution to the confirmation or rejection of the original hypothesis [8]. In this stage, we made weighing up the pros and cons of each possible explanation for patient's signs and symptoms and choosing the one favored by the evidence. After completion of all ideas, we would like to say the hypothesis number two supports the evidence. Ivins (2006) stated that neurovascular injury should be as a part of differential diagnosis for ankle sprain [10]. A simple inversion injury of ankle can cause physical impairments and associated structure/tissue source, delays healing process. World Health Organization (2002) describes any injury causes not only physical impairments, but also causing limitation in activities, restriction in participation and contextual factors which have been perfectly described by ICF [11]. Conversely, ICF gives a standard language and framework for the description of health and health-related conditions. According to ICF, patient showed disease/condition as ankle sprain, impairments as pain, muscle weakness, swelling, changes in skin color, temperature, decrease range of motion and kinesthetic sensation. Activity limitations were walking, schooling, playing basket ball and running. Participation restrictions were unable to participate in social gathering, personal factors were 15 years old girl and psychologically depressed about prognosis. Environmental factors were living in 4<sup>th</sup> floor and school was 20 kilometer (km) away from house.

**PHYSIOTHERAPY TREATMENT**

The atypical natures of symptoms actually force us to discuss the condition in a case conference where we set goals for her depending on ICF. The short term aim of treatment was to minimize pain, swelling, to increase neuromobility, to increase range of motion, to increase thoracic mobility and to improve weight bearing ability within 2 weeks. In addition, the long term to make her independent and return to sports with 4 weeks. The treatment we provided ice for 10- 15 minutes every 2 hourly. In addition, we advised her to perform 10 repetitions of knee extension exercise and advised her to continue it at home. After five days of

treatment, there was no satisfactory result. At that time, we changed our treatment option and provided her neurodynamic mobilization for sciatic and peroneal nerves, and thoracic rotation as a home exercise program. Hunt (2004) stated that thoracic rotation would have effects on sympathetic nervous system [12]. This in term had an effect to improve the fluid dynamics of the vascular supply and the axoplasmic flow in the affected area. This might have a positive blow on the nutrition of sympathetic fibres. This ultimately would help to minimize the dry and cooler foot signs and improve ankle joint range of motion. A leg hind foot orthosis was provided, partial weight bearing was advised and static bicycling exercise was also advised for 10 minutes three times daily. The patient responded well to treatment as she could bear more weight on foot, skin becomes warmer, decrease pain (9 cm decreased on 10 cm VAS scale). The outcomes swelling decreased to zero, pain to 1/10 cm, muscle strength in all directions grade V, improvement of gait parameters and weight bearing abilities by 95% and participate in basket and social gathering was also improved by 80% (Table – I).

Variables	Day-1	Week 1	Week 2	Week 4
Pain	9/10	6	6/10	1/10
Swelling	Grade 2	Grade 1	Slight	Zero
Dorsiflexion (Rt)	2°	8°	10°	Full
Planter flexion	20°	23°	25°	Full
Manual muscle testing in inversion, eversion, DF & PF	3/5	3+ / 5	4/5	5/5
Weight bearing ability	Nil	Walk 6 minutes	Running	Jumping
Self-reported function	30% ADL	60% ADL	80% ADL	95% ADL
Participation in sports	Nil	Throw, passing drills	Throw, dribbling Half court	Full court

**Table-I:** Four weeks Treatment and Rehabilitation Flow-chart

**CASE REPORT**

Ms. X is a 15 years old girl injured her right ankle approximately 3 to 4 weeks ago. She described the mechanism of injury as an inversion ankle sprain while playing basket ball at school. She described as if she heard a pop sound at the time of injury. She also experienced severe pain and was unable to place any weight on the right foot. Her coach advised her to take rest, apply ice, elevation and a compression bandage wrap. She was also advised to walk with axillary crutch while bearing as much as weight as tolerated. Following two days of this approach, she was not improved. Patient and her mother became anxious. X was not able to walk with crutch. Her uncle and aunty who were living with her thought it might be her psychological expressions of pain. Regarding these issues, her mother brought her to general physician (GP) and he suggested X- ray and there was no evidence of fracture. Then GP diagnosed as right lateral ankle sprain. GP prescribed medication and non-weight bearing gait and advised her to perform ankle dor-

siflexion and planter flexion exercise with pain tolerance. She was not improving after 2 weeks of treatment. Thereafter, Ms. X and her mother both became worried about the prognosis and future life of Ms. X. GP decided to refer her at Centre for the Rehabilitation of the Paralyzed (CRP) for physiotherapist evaluation and management.

## DISCUSSION

Clinical reasoning is the thinking and decision making process that helps practitioners to use judgment and decision making during clinical practice. Conversely, appropriate use of clinical reasoning skills help to deliver quality of service. As the case was atypical in nature we selected HDR model in diagnosis and treatment which was based on developing hypothesis and progression and refining those based on observations and outcome. The physiotherapy practitioners in future time would draw conclusion by using HDR model of clinical reasoning while treating of an unfamiliar case.

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