



Physiotherapy Management of a Patient with Diabetic Neuropathy Through Different Clinical Reasoning Process

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Abstract: Background: Clinical Reasoning is the judgment method by this process therapist communicate with the patients, family members and others professional person. Moreover, clinical reasoning is valuable for assess patient assessment, diagnosis and treatment or complete management that's why it makes a relationship between theory and clinical practice. Clinical Reasoning continually support a professional therapist to decide the best achievable management guide line through logical point of view. Aim: Aim of this study is to making professional judgment about a single case using hypothetico deductive reasoning (HDR), three track reasoning, narrative reasoning approaches with typical a cervical radiculopathy case. Method: A case of typical diabetic neuropathy managed by using clinical reasoning process such as hypthetico deductive reasoning, three tract reasoning, and narrative reasoning for clinical judgment. Result: After completing of treatment program improvement was notice based on, pain and numbness was reduced with improvement in balance and functional ability with change in disability. Now patient can lead in activity of daily living. Conclusion: Clinical reasoning is the foundation in our clinical practice. It enables the therapist to take the best- judged action for individual patients and make sure quality service. It was very difficult to be strict in a single reasoning process during solving this case. I have to go one reasoning process to another reasoning process.

Keywords: Diabetic Neuropathy, Clinical Reasoning, Hypthetico Deductive Reasoning, Pattern Recognition, Three Track Reasoning, Narrative Reasoning

1. Introduction

Clinical reasoning is the base of professional clinical practice. Clinical practice becomes a technical operation in the absence of sound clinical reasoning and needing guidance with decision-making producer. It is the act of the skilled health-care professional to use through a method which illustrate professionally independence, skill as well as liability to involve in life-long knowledge acquisition and to provide to the improvement of the perception foundation of their field of study [1].

It is very valuable for a Physiotherapist to respect the personal framework of patients and environment where he remained during the diagnostic procedure. The personal contexts obtain patients physical, psychological, social and

cultural subject and it varied from one to another. Hypothetico deductive reasoning is predominantly used by novice practitioners and in a problematic case by expertise [2]. The initial phase of this model is cue acquisition, the second phase is hypothesis generation, 3rd one cue interpretation and finally hypothesis evaluation. In the initial phase, it is about acquiring and selecting appropriate necessary data [3]. According to Fleming [4], the therapist has three tracks in their mind. This model consists of procedural, interactive and conditional reasoning. Procedural reasoning consists of 3 phases. Initially identification dilemma, then objective establishing and finally plan of treatment. Interactive reasoning considers the client as individual involving the knowing of the inability from the perspective of the patient. Pattern recognition is a model for

the expert practitioner because it requires experience and expertise. It is efficient because it is faster [5]. In the field of physiotherapy practice, narrative reasoning considers the patient experience and understanding about his or her sufferings or pain and inside such as their own beliefs, feelings and behaviors [6].

The aim and objective in the present study to interpret the single case of Diabetic neuropathy by the use of different type of reasoning process such as hypothetico deductive reasoning, pattern recognition, three tracks reasoning and narrative reasoning. Competent health care professionals capable of sound clinical decision making and effective patient management.

2. Literature Review

Diabetic neuropathy is a usual neuropathy as well as disease related information. The most generally known problem of Diabetes Mellitus (DM) is Diabetic neuropathy, influencing at least 50% of patients with type 1 and type 2 DM. A study in 1993 by Dyck PJ *et al.* in American population it was assumed that 47% of DM patient have symptom with peripheral neuropathy. The population with DM raises the possibility of neuropathy and foot ulcer is the significant contributing factor to this enhanced risk. In 20% of patients exposes painful neuropathy and it independently predicting in all the causes and DM related mortality. Malik (2014) stated that, neuropathies are marked by a gradual losing of nerve fibre activity. Above 220 million persons globally suffer from Diabetic Mellitus. DPN affects more than half of the person with DM and in most cases begins with lesions on peripheral sensory nerves and progression to motor nerve as well as autonomic nervous system. The frequencies of DM for every age group globally were approximately 2.8% in 2000 which will be progress 4.4% in 2030. Wild S., Roglic G., Green A., Sicree R., King H., (2004) stated that, the overall figure of population affect with DM is extend to increase about 171 million in 2000 to 366 million in 2030. It makes gradual reduction of vibratory sensation, tactile, thermal, and proprioception, after this progression of extent. Atrophy of muscle, musculo-skeletal disablement, and inadequate function of autonomic nervous system may be settled at more advanced stages of the condition, especially as a result of damage of the greater diameters of neural fibers. Even though few numbers of inability and comorbidities may develop from diabetic peripheral neuropathy, very usual symptoms are numbness, pain, tingling and weakness in the foot and hand. The foot is the key targeting point of utmost of the sensory and motor problem individually with diabetes are exposed. Restriction of movement of the joint of foot and ankle are common in patients with DM and modified plantar pressuring at the time of walk. Dysfunction of intrinsic foot muscles have been observed in patients with DPN by Boulton and also can be present in diabetic patients without polyneuropathy. The connection between range of motion (ROM), strength, and functional losing may guide to change of foot rollover at the time of walk, as their integrity is needed to enable proper load

absorption. Sartor C. D., Watari R., Pássaro A. C., Picon A. P., Hasue R. H., and Sacco I. C., (2012).

The intrinsic foot muscles weakness presents an independent risk factor for plantar ulcer progression, probably because it causes to a changed foot rollover at the time of gait and, consequently, a less effective plantar weight placement [7]. For maintaining the condition, yet its intervention remains challenging in this study is to review and understand different Clinical Reasoning frame with a single case Diabetic neuropathy.

Medial longitudinal plantar arch the intrinsic foot muscle mass are valuable, collectively with plantar aponeurosis. During walking this arch has a great feature in foot dynamics, deliver a maximal function of the joints of foot and assuring a steady lever on the time of the push-off phase. Headlee *et al.* (2008) found that in their study it's been proven that lower limb power muscular tissues can be improved via progressively improve resistance, via a specific muscle tissue strengthening program in healthful adults. While we take into account DPN patients, the overview published by means of White *et al.* (2004) factors out that there isn't evidence to support the outcomes of lower limb strengthening and cardiovascular education at the improvement of their high-quality of lifestyles. But, all of the rehabilitation protocols of the various observe generalized muscular strengthening exercise program, without the specificity of selecting the most impaired muscle groups due to the neuropathy: the ankle and foot intrinsic muscle groups. A particular strengthening exercise for these muscle group (intrinsic and extrinsic foot muscle tissues).

All the motor at the side of functional limit due to Diabetic peripheral neuropathy (DPN) bring about imbalance of posture and modified locomotor biomechanics, growth the possibility of drops, plantar ulcer, and amputation of the lower limbs (Menz HB, Lord SR, St George R, Fitzpatrick RC., 2004). These sluggish increasing barriers normally worsen person quality of life. Usual physical activities for balance improvement is efficient in DPN sufferers. Allet *et al.* (2010) confirmed a massive development in time-space gait parameters, specific training together with balance exercise and circuit gait training. It is possible to improve purposeful and confidence gait, even with sensory and motor impairments. Some development in balance and unsupported gait improve confidence in a population with DPN turned into shown by Richardson *et al.* (2001). The physiotherapy treatment was together at one arrange of ankle and foot strengthening exercise program in a closed kinetic chain and balance sports in single and double assist positions, accomplished day by day for three weeks. Muscle power improve due to neural adjustments, that is probable because of synchronization of motor unit activation, in place of muscle hypertrophy. Diabetic peripheral neuropathy was skilled to decrease of plantar pressure whilst walking with instrumented insoles. And use of the Charcot restraint orthotic walker (CROW) to relieve neuropathy problem [7].

3. Methodology

As a case below:

The affected person, named Mr. X (false name), elderly of sixty-seven years male, and has been running as a businessman. He's suffering with Diabetes Mellitus with mildly overweight, he spends sedentary lifestyles style. This patient is now retired from his work 1 year back. Different medical problems include high blood pressure and hypercholesterolemia. He has referred for diabetes education, found out home glucose monitoring and observed a food regimen and exercise program counseled by using the diabetes educator. Approximately 7 months ago, this affected person observed a numbness, burning and tingling sensation with mild pain in his fingers and toes. The patient also felt that his sense of balance was diminished however notion it become merely a sign of ageing and become reluctant to peer a health practitioner. The patient had no open lesions foot and intact protecting sensation on both feet. Reflex of lower limb are normal. Numbness, burning and tingling sensation with moderate pain in his palms and foot. Problem on balance & gait. Problem with function and transition. VAS scale, Berg balance test and "Timed Up and Go test" has been done.

Diabetic peripheral neuropathy physiotherapy intervention is included balance training [8], non-weight-bearing [9] and weight-bearing strengthening [10], aerobic exercises [11], counselling and TENS.

3.1. ICF Model

The problems of the patient structured in the model of ICF. Body structure & function: Diabetic Mellitus, burning sensation, numbness, problem on balance & gait. Activities limitation: Limited standing and walking ability. Unable to sustain prolonged physical activity. Difficulty with function and transition. Difficulty in daily activities, gripping difficulties, walking. Participation restriction are can't participate family program, social program. Environmental factor is poor support from family member, poor ergonomic home environment. Environmental factor is poor support from family member, poor ergonomic home environment. Personal factor is patient worried about his condition, lack of confidence.

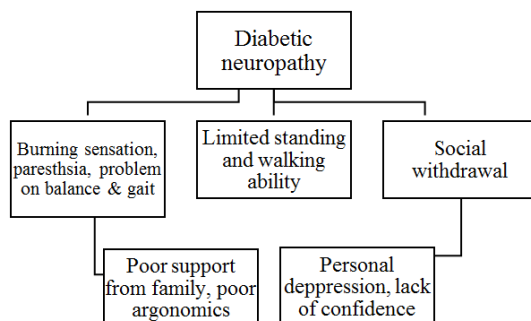


Figure 1. International classification of functioning, disability and health.

3.2. Hypothetico Deductive Reasoning (HDR) Relates to the Above Case

For producing an appropriate diagnosis, it should be

composing the problem first and for solving the problem required cognitive skills, decision making skills and clinical reasoning skills that is adjusted as deductive and inductive approach. Deductive approach arise as earlier theory assist to create attainable hypothesis and after notice the circumstances it would form a confirmation of the clinical issues for any application orderly.

Edwards, et al., (2004) stated that the HDR occurs in four stages as cue acquisition, hypothesis generation, cue interpretation and hypothesis evaluation appropriately.

3.3. Cue Acquisition

Typically cue acquisition in terms management of patient means accumulate as much attainable sources in order to create a specific for patients. Literally cue acquisition means the beginning information-gathering level during the method of clinical reasoning. It includes perceive data required for a specific case [12].

- 1) Where is the pain and numbness?
Localized upper and lower limb pain and numbness, especially on both hands, fingers, foot and toes.
- 2) When did begin experiencing symptoms?
Suddenly onset and gradually increased.
- 3) What are the probable predisposing factors?
There is a history of carrying weight on this hand and patient is DM and Hypertension.
- 4) Is there anything that appears to worsen the symptoms?
Carrying weight, lie down on affected side and cold weather.
- 5) Are there anything that improves the symptoms?
Pain killers and hot compression.
Have he experienced any other symptoms?
- 6) He has no other vital visceral or any other symptoms.

3.4. Hypothesis Generation

Generally, the term hypothesis generation for the management of patient means create achievable guess in order to acquire the best possible statement to follow on patients treatment planning. In fact, hypothesis generation is valuable part of the systemic problem-solving method. This is an inductive reasoning that is brings a set of precise observation to generalizations (Elstein. et al., 1978).

After cue acquisition of the case therefore slight confusion for the diagnosis so I have some additional possible diagnosis, this is known as hypothesis generation and these are the as follows:

- 1) Carpal and tarsal tunnel syndrome.
- 2) Spinal nerve root compression.
- 3) Peripheral neuropathy.

3.5. Cue Interpretation

Hypothesis generation was proceeded by cue interpretation. This is involved the interpretation of cues produced from the primary 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 [15].

Elastein [16] state that three-point scales for cues interpretation. Such as-

+1 Cue confirms hypothesis

-1 Cue disconfirms hypothesis

0 Cue does not contribute to hypothesis evaluation.

Table 1. Outcome measurement.

Cues	Carpal and tarsal tunnel syndrome	Peripheral neuropathy	Spinal nerve root compression
Location of pain	Sharp pain on hand finger, foot and toes	Hands, fingers, foot and toes	Neck pain & radiating to shoulder or arm
ROM	Painful at 70-120 degrees of abduction	Painful & restricted all movement	Painful and restricted
Onset of Pain	Sudden onset	Gradual Onset	Gradual
Special test	Phalen's Maneuver test negative	NCV Test- Positive	Cervical compression/ detracton negative
Interpretation	0	+1	-1

So the cue two that is Diabetic neuropathy is more favorable for my case, there are the positive NCV test.

3.5.1. Hypothesis Evaluation

However, hypothesis evaluation was practically difficult in the case. Firstly, I have taken risk-benefit balance the pros and cons of every available declaration for the patients sign and symptoms & choosing the favored one by proof. Following achievement every concept, I would like to say the hypothesis endorses the evidence. According to evaluated hypothesis I made a plan and implemented the treatment as manual therapy as Joint mobilizations of the shoulder girdle, Mobilization-with-Movement, Ultrasound, Hot compression, muscle stretching & strengthening exercises. I also planned to refer the patient to diabetologist and neurologist to manage his DM and HTN.

The hypothetico-deductive clinical reasoning strategy is used by students and novice practitioners in clinical decision making [13]. [14] consider HDR approach to be a 'weak' method due to the practitioner concentrating on very superficial formal academic issues. Students and novice practitioners apply this strategy as it is best suited to their limited non-propositional knowledge.

3.5.2. Knowledge, Cognition and Meta Cognition in Clinical Reasoning

Clinical reasoning is the foundation of professional clinical practice. Clinical reasoning is the essential approach in physiotherapy as it conducts the practitioner in decision making, presenting the most suitable treatment plan and deal with all aspects of the individual. Practitioners require an in-depth propositional and non-propositional knowledge, a wealth of experience, together with psychological and sociocultural knowledge. This ensures a sound clinical reasoning approach in clinical practice. Clinical reasoning is the thinking that guides practice and without it we would implement treatment programs for no set purpose.

Knowledge achievement involves the complex cognitive processes of perception, communication, association and reasoning. Additionally, knowledge is connected to the ability of acknowledgment in human beings. Knowledge is gained through learning of the facts, information, concepts and principles. Knowledge is highly valuable for clinical reasoning besides it situated at the middle of the professional practice [17].

Cognition is the system of thought like data analysis and

synthesis besides looking into strategies as hypothesis testing and compiling information as a whole as abstract [18]. Cognitive skills and knowledge are autonomous and it perform independently.

Metacognition is the unifying component between knowledge and cognition. Metacognition is differentiated as "cognition about cognition", or "knowing about knowing". It can take a lot of forms; it consist of knowledge about when and how to consume specific strategies for learning or for problem solving (Metcalf and Shimamura, 1994). Generally there are three elements of metacognition as Knowing-in-action which means the activities, acknowledgments and verdicts of professionals are often a work of indirect knowledge that sometimes explained as institution besides Reflection-in-action means as the thinking about what doing while do it. At the time of occurring difficulties clinician involved in a process of critical analysis for self-correction and adaptation of practice, another one is Reflection-about-action, which happens retrospectively as clinician thinks previous issues about the happening in practice that leads to appreciation of unseen patterns within the doubt of the staging and acquisition of new patterns which not previously appreciated.

3.5.3. Pattern Recognition Relates to the Above Case

In physiotherapy, clinical reasoning observed in this time as the recognition that based on previous experience besides it refers to patterns derived from experience with similar case or conditions which would form a prototype model as categorization in a clinician's non-propositional knowledge base. The pattern is elicited while comparable case features are confronted and a hypothesis relating to the presenting case is consequently formed besides HDR and PR is a diagnostic reasoning strategy [18] which could be activated at a suitable time within problem solving and that also associated with inductive and forwards reasoning [19] and that state to the drive from cues to hypothesis. In contrast, backwards or deductive reasoning travels from hypotheses back to clinical data for furthermore examination of every hypothesis besides it is induction from cues and deduction from hypotheses [20] that generates a simple departure of forward and backward driving through clinical reasoning.

Experts have the ability to recognize all other essential characteristics besides cogitate these findings while applying a therapeutic program for the patient [21]. The focus on Mr. X (False Name) Pain, numbness on foot and hands and

decrease functional activity. An experienced would have examined Mr. X's critical point of view from the early assessment while development his treatment plan and recommend the most convenient intervention. Regards the subjective and objective assessment it was relatively confirmed that it's a Diabetic neuropathy case besides the NCV test, characteristics of pain pattern and numbness, limitation of functional activities and X-ray finding is also support this so I choice the balance training, stretching and TENS. There was instant result and the patient was satisfied for this and treatment was continuing for this case.

It was possible because I used the pattern recognition model and instantly I recognized the specific problem from my previous professional knowledge, practical skills and succeed case as abstract in my brain then I categorized the specificity of the problem and treatment as exemplar-based model and used the decisional treatment efficiently and accurately that helps to get the better result. Exemplar-based model is the trial process design that engage every particular being memorized. The exemplar-based model has also been indicated to as instance-based realization where a new illustration is categorized by correspondence to recognition of a previous cases [22].

It was possible that I had seen the HTN & DM patients a lot who also had physiotherapy related problem. So it was easier for me to recognize instantly and categorized with the prototype model and finally referred by using the pattern recognition. Norman, [23] emphasized in radiology that a visible cue individually may provoke a diagnostic hypothesis. This propose that PR is highly possible to relate to visible or verbal cues within the initial stage of a clinical meet even so probably arrive at certain stage within an assessment.

3.5.4. Three Tracks Reasoning Relates to the Above Case

Three tracks reasoning generally relevant with the subject and / or concerned that the professional practitioner focusing on, in a reasonable manner the thought process. There are various methods of thought for various determination or in reaction to specific characteristics of the clinical problem that the therapist engaged in studies.

The insight of every kind of reasoning appeared to be engaged to resolve various traits of total issues. Ultimately, we understood that the therapist and patients' attendance to the patient in three levels: (a) the bodily ailment, (b) the patient as a person, and (c) the person as being social in the framework of family, environment, and culture. Fleming (1991) described physiotherapy practitioner as having mind of a three track. We have pictured the three tracks as the stripe on our therapist's coats. Titled of these tracks are procedural, interactive, and conditional. These are the three main tracks that lead a physiotherapy practitioner thinking processing. Home environment modification. Use tripod walking stick to maintain balance and use the Charcot restraint orthotic walker (CROW) [24].

Each track has different attention on the patient's management in different condition as every the "how to" drives within procedural track besides the connection to

realize the person right drives on the interactive track moreover the future view is established on the conditional track.

Regarding Mr. X's (False Name) case I assessed him subjectively and objectively with a detailed procedure of mixed type of assessment form including sensation assessment, Berge balance test, NCV test. Moreover systematically I concluded a list with some specific problem besides I made the final diagnosis as Diabetic neuropathy and DM. According to the problem and diagnosis I made a short & long term goal besides upon the goals I made a treatment plan as stability training, aerobic exercise, TENS and self-stretching etc. accordingly. The above diagnostic and treatment planning systems was derived from the procedural track of clinical reasoning.

Procedural reasoning is the process of "how to" fix up the therapeutic issues besides while seemed somethings are incorrect then we try to fix it. The attention is on the incapacity itself moreover we describe on our understanding of diseases and conditions to fix it. Matters matching problem identification, goal setting, and treatment planning completely fall within this kind of reasoning [25].

Usually the therapist used whole of these three tracks collectively to visualize a comprehensive vision of the person besides to identify whereby to allow the patient to achieve his or her functioning goals. Moreover the therapist applied different strategies to progress the degree of functional abilities and have to have complete knowledge of the client for planning the effective interventions.

Track to track bouncing and pull up all of the tracks simultaneously reach with knowledge. Attaining these line are promoting besides it likes mostly proceeding and take place at various proportions in various person moreover obviously the progress of these tracks is not as black and white as we've made them sound (Mendez and Neufeld, 2003).

3.6. Narrative Reasoning

Narrative reasoning is the necessary clinical reasoning to look at and understand the mind of others. The patient state the story about their illness and therapists understand their stories that assist to build realistic judgment about what to do the therapists. Ekman and Skott (2005) state that, the entire text is attentively read through and full elements that particularly narrate to their actual conditions are marked. This is essential to define the appearance of remaining people and to take movement rightly to the community framework. According to observation of the patient's, to form right assumption regarding their action and motive of different based on their apparent behavior and the social circumstances and in this framework that they activity are done. Narrative reasoning is the procedure we utilize to perceive the social life around us according to difficult to understand flow of action are done. Occupational Therapists are reasoning in narrative way, clinical problems and intervention action are organized in their thoughts according to an evolving drama, cast of characters and motives supposed. They perform the

patient's description and create a likeness in a picture defenses the stories and detect the cause and following reason analyze because of examination. Narrative reasoning responsible with the relation of purposes, actions, and result as they employ in response in a few particular circumstances. Involvement of a analyze for the correct purpose that led to convinced essential acts and how those urgently important actions created a few other set of consequences.

The method of treatment assist, therapists to understand an achievable and possible fortune for the subject and dream up as they can supervise intervention to lead regarding that future. Therapists responsibility is to assist patient connection with their past to the present and to futurity value following. It will be mentioned that, kind of treatment action and goals would be most appropriate and valuable in the current circumstances and after finishing the treatment which process to lead their life in future in their society. Potential prospective stories are helpful into making a rational beginning in the treatment instead of in providing absolutely authentic prognosis. Nonconformist within the experience of working with the patient and the anticipated story direction to retrospect. Fleming and Mattingly [26] stated that, narrative reasoning is exact significant concept of the health professionals like rehabilitation therapists, where strong fruitful practice need developing a strong combination with the patients.

I shall be explained the narrative reasoning that make me knowledgeable while treating my patient. In the first appointment of my patient's, he explain his view (thought, beliefs and emotions) of physiotherapy as even I aspire to label his problem which were pain, paresthesia and numbness due to diabetic neuropathy with balance problems and functional limitation. Exhausting the judgment into and identify of his previous experiences of treatment about physiotherapy and fundamental ideology, thoughts and emotion is stated as narrative reasoning. To find out patient's perception I had done narrative reasoning for regarding problems during the assessment session. Narrative reasoning allow me to find out his negative point of view towards physiotherapy treatment at hospital at Dhaka. He had expectation and trust in the physiotherapy treatment at our clinic. He had understand and believe that his condition improved by physiotherapy treatment. I had favor his emotions, experience, believes and attitudes to plan of his treatments- stretching, balance exercise, aerobic exercise and TENS. Several treatments, his pain & numbness reduce, improve balance capacity and functional ability.

The patient achieved his confidence, belief & faith in physiotherapy treatment due to progress better of his condition. It was necessary to contribute the mostly relevant treatment for the patient, as this could probably impact their beliefs, leading in an individual's alteration in attitude. He take part in activity in his social life comfortably.

I have accomplished that narrative reasoning broadly donated to updating the therapist respecting sensibility of patient, ideology, feelings and attitudes can directly influence treatment and patient outcome.

4. Conclusions

Clinical reasoning is very essential process in physiotherapy practice such as the design the physiotherapist's in useful decision making, suggesting mostly relevant plan of treatment and discuss total stages of the particular. Physiotherapy professionals needed propositional and non-propositional knowledge in-depth and also richness of knowledge in extension together with sociocultural and psychological knowledge which assure a reasonable clinical reasoning method in clinical practice. Clinical reasoning is the thought process which leads practice and absent of it the professionals would achieve intervention process for no set intend. Overall Mr. X's treatment it was important that I fundamentally determined good therapist and patient relationship to allow myself to promote a connected procedure in his treatment and care.

I acknowledge that I made a right propositional physiotherapy knowledge. Even though, I grant me as a limited knowledgeable physiotherapist with attention to my present non-propositional knowledge furthermore I attain additional knowledge and experience that I want propositional knowledge transferred into non-propositional knowledge which would build up my necessary capability becoming effective and efficient in the clinical reasoning strategies of clinical physiotherapy practice.

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