

# Limited clinical reasoning skills used by novice physiotherapists when involved in the assessment and management of patients with shoulder problems: a qualitative study

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The aim of this study was to explore the clinical reasoning process used by novice physical therapists in specific patient problems. Nine physical therapists in the UK with limited experience of managing musculoskeletal problems were included. Semi-structured interviews were conducted on how novice physical therapists would assess and manage a patient with a shoulder problem; interviews were transcribed and analyzed using framework analysis. To be included as a final theme at least 50% of participants had to mention that theme. A large number of items ( $n=93$ ) were excluded as fewer than 50% of participants referred to each item. Included items related to seven main themes: history (16), physical exam (13), investigations (1), diagnostic reasoning (1), clinical reasoning process (diagnostic pathway) (3), clinical reasoning process (management pathway) (5) and treatment options (1). Items mostly related to information gathering, although there was some use of hypothetico-deductive clinical reasoning there appeared to be limited understanding of the clinical implications of data gathered, and clinical reasoning through use of pattern recognition was minimal. Major weaknesses were apparent in the clinical reasoning skills of these novice therapists compared to previous reports of expert clinical reasoning, indicating areas for development in the education of student and junior physical therapists.

**Keywords:** Decision making, Physiotherapy, Problem solving, Qualitative research, Shoulder pain

Clinical reasoning is the decision-making process involved in the diagnosis and management of patients' problems.<sup>1,2</sup> Several models of reasoning based on analysis of clinician and patient interactions have been described as relevant to physiotherapy, which include pattern recognition, hypothetico-deductive or diagnostic reasoning and narrative reasoning.<sup>1,3-5</sup> In short, hypothetico-deductive reasoning involves information from the patient that is gathered and used to construct a hypothesis; which is then tested out or a further hypothesis is constructed. The hypotheses should be confirmed by responses to treatment, thus the process involves repeated reassessment. Pattern recognition is an alternative model of clinical reasoning that is based on recognition of patterns of clinical presentations. In this model, if the present patient has a similar presentation to patients seen previously, and the previous encounters involved a successful outcome, the management strategy is

used again. Lastly, narrative reasoning involves collaborative discourse between clinician and patient, so that the clinician understands the patient's perspective and a management plan is agreed upon together.<sup>4</sup>

It has been theorized that clinical reasoning patterns differ between expert and novice clinicians. Pattern recognition is thought to be possible only with a well-organized knowledge base and plentiful clinical experience, and consequently, is generally not used by inexperienced clinicians. It is suggested that non-expert or inexperienced clinicians use the hypothesis testing clinical reasoning model more frequently.<sup>3</sup>

Evidence about differences between expert and novice physical therapists' clinical reasoning has been previously demonstrated. Expert physiotherapists have been shown to use pattern recognition, hypothetico-deductive and narrative reasoning,<sup>6,7</sup> whereas novices used hypothetico-deductive reasoning only and were not always able to evaluate a hypothesis and their reasoning contained some errors.<sup>7</sup> Novice

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therapists have been shown to spend less time than experts on taking the history and more time on the physical examination.<sup>7</sup> Experts rank items from the history as very important to the diagnostic reasoning process<sup>6</sup> and were deemed to have a patient-centered approach to care, characterized by collaborative reasoning about management and encouragement of patient empowerment.<sup>6,8,9</sup> During inter-reactions with patients, expert physical therapists gave more explanation and information during the history taking, built their questions on the patient's responses, had more social inter-reaction, and were generally more skilled communicators than novice therapists.<sup>10,11</sup>

Novice therapists, just like experts, go through the same process of gathering information through an interview, which then informs a structured physical examination process and hopefully culminates in a diagnosis or classification; which in turn informs management. However, the history-taking appears to be more focused and fruitful in terms of diagnostic reasoning and produces a more focused physical examination in the hands of the expert. Most of the previous work on clinical reasoning has used an observational study design and has not explored specific clinical problems. A better understanding of the limitations or weaknesses of inexperienced therapists may be useful to improve the education of both physical therapy students and junior therapists. The aim of this study was to explore the clinical reasoning process of non-expert or novice physical therapists in assessing and managing patients with shoulder problems as an example of clinical reasoning in a complex area of clinical practice.

## Methods

### Design

Semi-structured interviews were conducted individually with one participant at a time; interviews were recorded, and then transcribed by the team. A *Topic Guide* was used to provide some structure to the interview, but the interview was responsive to any new ideas provided by the participants. The *Topic Guide* was derived from textbooks that included history and physical examination for musculoskeletal shoulder problems. A standard preamble was used to describe the process and prepare the participant. Then participants were asked what questions they would ask in the history taking and which of these would be most helpful in making diagnostic and management decisions. The participants were then asked what physical examination procedures they would use always or some times, and why they might use them; and which would be the most useful (*Topic Guide* available from corresponding author). It was decided *a priori* that recruitment would continue until interviews appeared to produce no new themes or

items; after which two further interviews would be conducted to ensure saturation.

### Participants

Non-expert or novice physical therapists were recruited from two NHS trusts in one city in the UK. In the United Kingdom, after qualification (that is being licensed to practice) therapists typically rotate through different specializations, such as care of the elderly, stroke rehabilitation, and musculoskeletal out-patients; each rotation usually lasts 3 or 4 months. About 40 therapists in the city met those criteria at the time of the study. Such therapists were invited to participate in the study by email and those expressing an interest were provided with an information sheet giving more detail. Those who provided consent were recruited for the study.

The inclusion criteria were therapists who see or have seen patients with a range of musculoskeletal problems that included shoulder pain, but did not specialize in treatment of these patients. Specifically they were recently qualified therapists with limited musculoskeletal experience, having done only a few rotations in musculoskeletal out-patients. More senior therapists working full-time on musculoskeletal out-patients were not included. Consenting therapists completed a brief questionnaire to provide some detail about their demographic characteristics. The Leeds (East) Research Ethics Committee approved this study (REC ref. number: 07/Q1206/12). Informed consent was gained from all participants before data collection.

### Data analysis

Data analysis was done using framework analysis;<sup>12</sup> the stages of which are as follows:

- familiarization with the data – through transcribing and reading interviews;
- identification of a thematic framework – this evolved over a number of interviews, with discussion amongst the research team;
- indexing of data according to this framework;
- charting the dimensions of the main themes;
- mapping and interpreting the interplay between the themes.

Framework analysis is an explicit and visible qualitative research methodology in which analysis and final themes are grounded in the interview data, but also permit a dynamic process in the selection and definition of those themes.

As interviews were conducted and transcribed, each was read by the research team to begin familiarization with the data. After the first few interviews the initial themes and items within those themes were mapped out. These initial themes were then used to code further data, so these themes were tested for their comprehensiveness; where appropriate themes were retained or new themes added. New themes and items were added with subsequent interviews, until no new themes and items appeared. As

themes were established the definitions of each theme was decided to ensure consistency and ease of identification of sections belonging in that theme. Identification of themes and the items within those themes was initially done independently by the research team and any disagreements were resolved at consensus meetings. Disagreements were unusual and quickly resolved; discussion very quickly led to unanimous decisions about a particular issue. The thematic framework thus evolved out of the topic guide, emergent issues from the respondents, analysis of the data, and the aims of the study.

It was decided *a priori* that in order for themes or items mentioned by the participants to be included in the final data analysis at least 50% of participants had to have mentioned the themes. Themes or items not meeting this cut-off point were excluded from the final presentation of data. In other words, the final themes would represent what the majority of novice physical therapists considered important in the evaluation of a patient with shoulder pain. It was expected that the data would consist largely of discrete themes and the relevant items, such as items from the patient’s history or physical examination, and also of clinical reasoning processes; such as items that were used in the process of making decisions about diagnosis or management.

**Results**

Nine therapists were recruited, interviewed and had their interviews transcribed. The mean age of the therapists was 28 years old, they were three male and six female, had been qualified a mean of 3 years, and had a mean of 6.5 months experience in musculoskeletal out-patients, four were from primary care and five from secondary care. It was noted that the last two participants provided no items that were new and therefore recruitment was stopped after the ninth interview.

In total the nine therapists identified 133 separate items that related to seven discrete themes. However, a large number of items, 93 out of 133 (70%), were excluded as they were raised by less than 50% of participants.

The seven themes contained items that related to: history-taking, physical examination, investigations, diagnostic reasoning, clinical reasoning (diagnostic pathway), clinical reasoning (management pathway), and treatment options. The definitions of these

themes are given in Table 1 and examples of key items that survived in Table 2. There were 40 items identified by 50% or more of the participants, with the majority of these in the history (16, 40%) and physical examination (13, 32.5%) themes. Other items related to investigations (1), diagnostic reasoning (1), clinical reasoning process (diagnostic pathway) (3), clinical reasoning process (management pathway) (5), and treatment options (1).

The difference between themes 4 and 5 is subtle, but paramount. Diagnostic reasoning was the recognition that a constellation of signs and symptoms could indicate a particular diagnosis. Enough participants mentioned this for it to become a theme, but not enough for any particular diagnosis to survive. This was distinct from the theme clinical reasoning (diagnostic pathway), which simply indicated that a single item, rather than a pattern, might be suggestive of a particular diagnosis. Examples of items that failed to survive are given in Table 3.

**Discussion**

We interviewed nine inexperienced physical therapists about how they would go about an assessment of a patient with a shoulder problem. There was general agreement about a wide range of items to be included in the history-taking and the physical examination. There was some linkage between some of these items and diagnostic or management reasoning. However, this linkage only occurred in 11 items and tended to be reasonably simplistic, displaying a limited understanding of the meaning or clinical implications underlying many items from the history. Diagnostic reasoning which is the ability to suggest a constellation of signs and symptoms that were suggestive of a particular diagnosis, just survived as a theme, but no single diagnosis was suggested by enough therapists to become a separate item.

The therapists’ clinical reasoning was clearly dominated by a hypothetico-deductive reasoning model. For instance this type of reasoning process was sometimes apparent: ‘that item from the history might make me think of such a diagnosis or such a management strategy, and I would test out the diagnosis by doing such a test’. Whereas pattern recognition clinical reasoning model, in which a number of specific signs and symptoms are suggested as indicating a specific diagnosis or classification, was virtually absent.

**Table 1 Definitions of themes defined in the study**

Theme	Definition
History items	Items from patient interview
Physical exam items	Items from physical examination
Clinical reasoning process (diagnostic pathway)	Linkage between an item and a hypothesised diagnosis
Clinical reasoning process (management pathway)	Linkage between an item and a management strategy
Diagnostic classifications	Items used to diagnose or classify patient’s problem
Investigations	Para-clinical imaging
Treatment options	Possible methods for managing patients

**Table 2 Themes with examples of items from semi-structured interviews (>50%)**

Themes	Items from themes
History	Trauma or insidious onset Previous episodes and treatment Pain location and pattern Aggravating/relieving factors Neurological symptoms Previous medical history Symptoms from the cervical spine Social history
Physical examination	Observation Functional marker Active and passive range of movement Strength/power Palpation Other joints Specific impingement tests
Investigations	Acknowledge if investigations had been done
Diagnostic reasoning	Constellation of signs and symptoms could indicate a specific pathology
Clinical reasoning process – diagnostic pathway	Gradual or traumatic onset Sign and symptoms indicating cervical involvement Impingement tests
Clinical reasoning process – management pathway	Irritability Goal setting Loss of range of movement Management based on physical findings Patient commitment to treatment
Treatment options	Stretching exercises

This study confirms a previous study that showed that novice therapists use hypothetico-deductive rather than pattern recognition clinical reasoning.<sup>7</sup> The themes revealed in that study were: cue acquisition, hypothesis generation, cue evaluation, hypothesis evaluation and treatment. Some of the themes from the present study were similar to their themes: history being equivalent to cue acquisition, clinical reasoning (diagnostic pathway) equivalent to hypothesis generation, clinical reasoning (management pathway) and treatment options equivalent to treatment. The participants of our study also demonstrated hypothesis evaluation as they talked about testing out diagnostic hypotheses by performing particular physical exam procedures.

Previous studies have identified some of the characteristics of expert clinical reasoning, or compared expert and novices, and we used this previous literature as a comparison with our findings.<sup>6-11</sup> There were some instances of sophisticated clinical reasoning, such as the use of impairment-based decisions in management and consideration of the personality of the patient. However, what is most

clear from our study is the weakness in clinical reasoning displayed by these novice therapists. Most items related to cue acquisition from the history and physical examination with a reasonably limited number of links from these items to diagnostic and management decisions. A high number of items that the authors considered important in the clinical reasoning process, though mentioned by some of the therapists, failed to register as a final item as they were mentioned by less than 50% of participants in all. These included items such as duration and status since onset, pain on resisted tests, capsular restriction, diagnostic implications of painful arc, differentiating muscle, capsule and joint source of symptoms, and the use of markers to judge treatment effectiveness.

The study findings have a number of implications. Retrospectively it was apparent that our ‘novice’ therapists actually contained two groups – those who had had only one musculoskeletal outpatient rotation and those who had two or three. As the data were anonymous it was not possible to determine if it was those with more experience were those suggesting the more sophisticated clinical reasoning aspects in the

**Table 3 Examples of items mentioned by some therapists but not selected as final themes (<50%)**

Themes	Items form theme
History	Time since onset Status since onset
Physical examination	Pain on resisted tests
Clinical reasoning process – diagnostic pathway	Specific tests depend on presentation Capsular restriction Painful arc linked to impingement syndrome Differentiating muscle, capsule and joint Hypothesis based on whole clinical picture
Clinical reasoning process – management pathway	Markers to judge treatment effectiveness Strategies to ease pain even if diagnosis unclear

excluded items not identified by the majority. Future research could investigate what amount of clinical experience or number of musculoskeletal outpatient rotations is necessary to obtain a competency in clinical reasoning. In other words, at what point does a novice become, if not an expert, at least competent in their clinical reasoning.

Another important area of research and of educational policy within physiotherapy is how clinical reasoning can be improved. Is clinical experience, the only source of more sophisticated clinical reasoning patterns? Or are there educational methods at undergraduate and post-graduate levels to sharpen clinical reasoning skills? It would be hoped that educational tactics such as use of problem-solving and case study activities would have improved clinical reasoning, but this did not appear to be the case amongst these relatively recent graduates.

### Limitations

A number of limitations should be recognized in this study. The therapists recruited were from a single city in the UK, and so there should be caution about generalizing our findings. Only nine therapists were recruited into the study, and with a small sample using proportions may lead to inaccurate estimations of themes. However although the numbers were small, two methodology tactics support the validity of the findings. Recruitment ceased when no new items were being raised by participants, so it was decided that we had reached saturation point as far as new items were concerned. Furthermore, as established beforehand, to become a final theme, or item within that theme, this had to be mentioned by at least 50% of participants. This ensured that additional items not mentioned by this proportion of participants would not go through to the final data analysis, and therefore the final results represented a consensus of the participants' views. Increasing participant numbers would not have increased the number of themes if the same proportion of therapists had referred to the same themes. Qualitative research can have the potential to produce bias data, but several methodological strategies helped defend against this. The authors independently read the data prior to consensus meetings at which there were no serious disagreements, the data were returned to several times as

themes evolved and were defined, and the authors all have previous experience of qualitative data analysis.

### Conclusions

In a small group of inexperienced physiotherapists who were interviewed about their assessment and management of a patient with a shoulder problem most items related to data gathering about history and physical exam. Therapists made fewer but some linkages between history and physical exam items and hypothetico-deductive reasoning towards diagnostic or management decisions. Pattern recognition was virtually absent, and the majority of these inexperienced therapists lacked a sophisticated clinical reasoning process.

### Acknowledgements

The authors thank all the participating therapists who contributed their time so generously to this study.

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