Teaching for thinking in clinical education: Making explicit the thinking involved in allied health clinical reasoning

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Abstract

Aim: This study had two main aims: to make explicit some of the thinking involved in allied health clinical reasoning and then to reframe this thinking so it is easier for clinical educators to teach and assess and for students to master.

Background: Clinical reasoning is central to health professional practice. Therefore, there has been much research to identify the complex thinking process involved in clinical reasoning. There has been less examination, however, of effective approaches for teaching students how to access and adopt the thinking processes that have been identified.

Methods: Our survey asked a group of experienced allied practitioners to identify some of the questions they pose to themselves when thinking about a challenging patient scenario and then to reformulate those questions for students to use when engaging in similar clinical reasoning. We categorised their questions according to their fit with established processes of clinical reasoning.

Results and conclusion: The questions identified by participants align with established processes of clinical reasoning. They can be used by clinical educators as scaffolds to enable students to think and reason like expert clinical practitioners and used by students to practice and eventually master clinical reasoning.

Keywords: allied health, clinical reasoning, clinical education, visible thinking, critical thinking.

Introduction

Clinical reasoning is central to health professional decision making (Higgs, Jones, Loftus, & Christensen, 2008; Norman, 2005). One description of clinical reasoning is: a hypothetico-deductive process where clinicians generate and then test hypotheses on the basis of clinical data and knowledge (Barrows & Feltovich, 1987; Elstein, Shulman, & Sprafka, 1978). This is done either by drawing from specific
observations to frame a clinical picture or diagnosis (inductive reasoning) or by taking a general hypothesis and testing it through specific observations (deductive reasoning) (Higgs & Jones, 2008). Other models of clinical reasoning are described as moving between empirico-analysis and interpretive, socially constructed thinking or between identifying and testing clinical hypotheses and considering patient narratives and sociocultural, political and economic factors (Ajjawi & Higgs, 2008; Chapparo & Ranka, 2000; Edwards, Jones, Carr, Braunack-Mayer, & Jensen, 2004; Fleming & Mattingly, 2008).

There has been a large body of research aimed at uncovering the bases of clinical reasoning, especially the ability of expert clinicians to ‘just know’ a diagnosis after asking a few questions (Ajjawi, Loftus, Schmidt, & Mamede, 2009). Particular attention has been paid to the experts’ sources of knowledge and experience (Ajjawi et al.; Boshuizen & Schmidt, 1992; Norman, 2005), the information they regard as important, how they hypothesise and formulate clinical decisions and the types of mental representations involved in the reasoning process (Loftus & Smith, 2008; Norman; Schmidt & Boshuizen, 1993).

There has been less research, however, about how to teach the thinking processes that have been identified. Whilst much is known about the factors that impact on the development of clinical reasoning skills (Ajjawi et al., 2009), the dynamics of reasoning in action (Edwards et al., 2004) and its value in effective assessment and diagnosis (Ryan & Higgs, 2008), few studies have examined how to enable students to understand and engage in clinical reasoning. Ryan and Higgs argue that there has been little discussion about strategies for integrating the teaching of clinical reasoning into clinical education curricula. McAlister and Rose (2008, p. 398) suggest that the thought processes leading to clinical decisions are “rarely explicated” by educators and so there is a “black box” for students between the data gathering process and the clinical decision concerning diagnosis and treatment. Furthermore, even when students demonstrate a degree of technical proficiency in clinical reasoning in a ‘safe’ clinical scenario, they still have to learn to engage in clinical reasoning in the less certain scenario of real practice (Brookfield, 2008).

This literature suggests that identifying the type of thinking involved in clinical reasoning is not sufficient to make the “black box” accessible to students (even though it may be necessary). Clinical reasoning may remain “black” and inaccessible for the students even if they have labels for the types of thinking needed. Second, even if students know what to do or say in a technical sense, this may not be enough for them to be clinical reasoners. A clinical reasoner does not just know how to engage in clinical reasoning, they engage in this reasoning as a matter of course whenever it is useful. Clinical reasoners have what Perkins, Jay and Tishman (1993) might call clinical reasoning dispositions as well as clinical reasoning skills.

Research in other areas of education indicates that learning to be a thinker (or in this case, a clinical reasoner) requires that the expert thinking—typically complex, abstract and tacit—be made explicit, concrete and “visible”
(Ritchhart & Perkins, 2008). One way to make expert thinking visible is to present students with the underlying questions involved in expert thinking, in particular, the questions that expert thinkers ask themselves and others. After all, to a large extent, thinking is asking and answering questions, so if we identify the questions, we identify the thinking (Golding, 2011). If appropriately refined, these questions provide a scaffold for novices to use to begin to master clinical reasoning. These ‘simplified’ thinking questions allow students to access their health discipline’s ‘community of clinical reasoning’ which would otherwise be an inaccessible black box to them (see Egan & Jaye, 2009, and Wenger, 1998, for further details of learning to participate in a community of practice).

Having students use the same sorts of questions posed by expert thinkers has been shown to have educational value in other educational settings. Paul’s (1994, 1995) method of Socratic questioning has been employed widely in primary and secondary schools, as has the similar method of using questions to foster critical thinking from Browne and Keeley (2007). Golding has employed this method to teach students to think, scientifically and historically, and to think like marketers and zoologists, for example, in the different disciplines in higher education (2011) and also in primary and secondary schools (2005).

The aim of this study is to examine whether clinical reasoning can be expressed as a series of questions that could be adopted for clinical education. We asked: Could questions be used to make clinical reasoning visible, to scaffold student thinking and to give students access to the expert community of practice? As this study is a pilot for further research, it does not attempt to be comprehensive of all aspects of clinical reasoning nor does it attempt to apply the questions in clinical education practice.

We surveyed allied health clinical educators and first asked them to make explicit some of the specific questions they pose (usually to themselves ‘inside’ their head) when faced with a clinical challenge in order to make visible and accessible some of the thinking that is usually invisible within the ‘black box’ of clinical reasoning. Next, we asked the allied health clinical educators to reframe the thinking processes in ways which students might employ as novices to clinical reasoning and which educators could use to facilitate students to think and reason like expert clinical practitioners.

**Methods**

*Participants and survey procedure*

Allied health clinical educators from three metropolitan public hospitals in Melbourne, Australia, were invited to attend a series of three clinical education seminars in March 2010. These seminars introduced the approach to ‘teaching for thinking’ described in this study. They were funded from a small government seeding grant to enhance the capacity and skills of allied health clinical educators and were developed and delivered by the first two authors (CD and CG). Ethics approval to conduct the study was obtained from the University of Melbourne, Human Research Ethics Committee.
Participants in the seminars were asked to complete a survey of five sections. Section one asked respondents to indicate their views on where and how students learnt clinical reasoning. Using a 5-point scale from strongly agree to strongly disagree, respondents were asked to indicate their agreement to each of the following questions. Do students learn clinical reasoning through: 1) patient exposure, 2) self-reflection, 3) clinical supervision, 4) case studies, 5) university education, 6) clinical reasoning sessions, 7) thinking skills sessions?

Section two asked how confident they were in teaching and assessing clinical reasoning, rated on a scale of 0 to 100%. The third and major section of the survey asked participants to record responses to the following questions:

1. When you have a challenging patient scenario, and you cannot rely on experience or background knowledge:
   a. What are the steps of thinking that you use?
   b. How do you make decisions in each step of the thinking process? For example, what questions do you ask to decide:
      i. What to do?
      ii. How to proceed?
      iii. When you have finished?
2. How would you formulate these questions so they were simple enough for novices to address?

The fourth section collected demographic data. The final section, completed after the seminars, asked respondents to indicate if their level of confidence had changed following their participation in the seminar series.

Statistical analysis

The response rate was calculated as the number of completed surveys returned divided by the number of participants enrolled in the workshop. Descriptive statistics were used to summarise the data gained from all sections of the questionnaire. We analysed respondents’ views about where and how students learn clinical reasoning by identifying the percentage of “agree” and “strongly agree” responses to each of the seven choices. Written responses to section three were analysed by collating the questions listed by participants and categorising them according to how they related to established processes and models of clinical reasoning. The clinical educators’ mean self-efficacy ratings for teaching clinical reasoning prior to the seminars was compared with those following the completion of the seminars using paired t-tests. The level of significance was set at \( p=0.05 \).

Results

Respondent characteristics, demographics and experience (Section 4)

From a total of 70 seminar attendees, 53 returned the survey (76% response rate). The majority of participants were female (n=50, 94%) and were aged, on average, in their early 30’s (mean age (SD)=31 (11) years). Sixty-nine percent (n=36) of the sample practiced in the areas of occupational therapy, physiotherapy or social work. On average, the participants were experienced in their field of allied health, with (on average) 9 years (SD=7 years) of clinical experience since graduation. Six of these years, on average, involved experience as clinical educators (SD=6 years). The majority
of participants worked fulltime (n=47, 89%) and, on average, they spent 12% of their workload on clinical teaching (SD=8%, range: 5–30%). All participants reported that they supervised up to two students at one time (Table 1).

**Methods of teaching and learning clinical reasoning (Section 1)**

The majority of participants (98%) responded that students learn clinical reasoning by gradual exposure to patients as part of their clinical placement (Figure 1). However, there was also strong agreement that students learn clinical reasoning in other ways, with ‘thinking skills sessions’ scoring the lowest level of agreement.

Insert figure 1 about here

**Clinical educators’ self-efficacy in teaching clinical reasoning (Sections 2 and 4)**

The clinical educators in this study indicated they were already moderately confident in their ability to teach clinical reasoning, including confidence in their ability to: identify required thinking, use questions to facilitate student thinking and assess their students’ abilities in clinical reasoning. Confidence increased following the participation in the three seminars and was statistically significant in all of these areas (Table 2). However, one participant whose confidence fell over the course of the seminars suggested that “they felt more confused than at the start … but in a good way. I need to process all the learning this afternoon.”

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**Table 1: Respondent characteristics**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean</th>
<th>SD</th>
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</thead>
<tbody>
<tr>
<td>Age (years)</td>
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<td></td>
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<tr>
<td>Average age</td>
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<td>11</td>
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<tr>
<td>Years in practice (years)</td>
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<td></td>
</tr>
<tr>
<td>Clinical practice</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Clinical educator</td>
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<td>6</td>
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<tr>
<td>Division of workload (%)</td>
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<td></td>
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<tr>
<td>Patient care</td>
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<td>18</td>
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<tr>
<td>Clinical education</td>
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<td>8</td>
</tr>
<tr>
<td>Administration</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Service improvement</td>
<td>9</td>
<td>8</td>
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<tr>
<td>Research</td>
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<td>4</td>
</tr>
<tr>
<td>Other</td>
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<tr>
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<tr>
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<tr>
<td>Speech therapy</td>
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<tr>
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<td>2</td>
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<td>Highest degree gained</td>
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<tr>
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<td>51</td>
<td>96</td>
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<tr>
<td>Nonresponder</td>
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<td>4</td>
</tr>
</tbody>
</table>

n= number; SD=standard deviation
Identifying thinking steps for clinical reasoning (Section 3)

Listed below are examples of the questions the clinical educators recorded as responses to “what they asked themselves when faced with a challenging clinical reasoning scenario”. We categorised the responses into three types of questions by examining their fit with established models of clinical reasoning. Our aim was to categorise these questions in a meaningful framework, and we do not suggest that this is the only categorisation or that it is exhaustive. The first category of questions was concerned with the clinicians’ role; the second category was for questions about the professional and experiential knowledge that clinicians use to generate clinical hypotheses. These questions broadly matched the initial stages of the hypothetico-deductive cognitive model of clinical reasoning with its emphasis on generating hypotheses grounded in clinical data and experiential knowledge. The third category was concerned with the patient’s particular context and background—their perspective, their goals and their relationships with others. These questions match the broader socio-cultural process of clinical reasoning.

Table 2. Clinical educator’s efficacy in teaching clinical reasoning before and after the seminars

<table>
<thead>
<tr>
<th>How confident do you feel to …</th>
<th>Efficacy (mean % (SD))</th>
<th>Change in efficacy (mean % (SD))</th>
<th>Paired t test (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify the thinking steps involved in clinical reasoning</td>
<td>Pre-workshop: 65 (21)</td>
<td>Post-workshop: 74 (15)</td>
<td>9 (28)</td>
</tr>
<tr>
<td>Use questions to facilitate clinical reasoning</td>
<td>Pre-workshop: 64 (18)</td>
<td>Post-workshop: 75 (14)</td>
<td>11 (23)</td>
</tr>
<tr>
<td>Assess students’ ability in independent clinical reasoning</td>
<td>Pre-workshop: 65 (15)</td>
<td>Post-workshop: 73 (15)</td>
<td>8 (22)</td>
</tr>
</tbody>
</table>

*Statistically significant at the p=0.05 level
1. Clinical role
   - What is the scope of my role with this patient?
   - What is the scope of my practice?
   - Is it appropriate for me to be involved?
   - Should I accept or decline this referral?
   - What options do I have to treat these problems?

2. Knowledge
   - What can I see?
   - What does not look right or not normal?
   - How does this deviate from normal?
   - What information do I have or what do I know about this condition?
   - What information or knowledge do I need?
   - What knowledge do I have access to?
   - How would I acquire extra knowledge about this condition?
   - Where can I get more information?
   - Who or what can provide this knowledge?
   - How can I confirm this knowledge is correct/reliable?

3. Patient perspective: Clinical reasoning questions based on the patient narrative and context
   - What symptoms does the patient present with?
   - What are the patient’s problems?
   - What effect is this having on eating/drinking/talking?
   - What are the patient’s goals?

   - How can I obtain more information about the patient?

When educators were asked to reformulate these questions in ways that students could grasp, they listed a pared down range of questions where the thinking behind the clinical questions is revealed. We have again grouped these questions according to the three categories identified above.

1. Clinical role: Questions students can address to determine their clinical role
   - Why am I here?
   - What is the purpose of my role for this person?
   - What can I provide?
   - What are the limitations of my role?
   - What do doctors think the prognosis will be?
   - After my intervention, will there still be ongoing issues for the patient?
   - Who do I need to refer to?

2. Knowledge: Questions students can address to isolate relevant clinical knowledge
   - What is the profile of the patient?
   - What do I need to know for this patient?
   - What information do I need before I start?
   - How does this relate to what I already know?
   - What is the priority?
   - What things about this patient problem will impact on my assessment?
• What information should I gather through my subjective and objective examination?
• What are the problems that need to be assessed?
• What has been done prior?
• What has been effective?
• Do I have enough social information?
• What have other members of the health team found?
• What tools do I have available to me?
• Which assessment or diagnostic tool is going to provide me with the best information?
• What anatomic structures are involved?
• What are the connections between the presenting problem, history and patterns?

3. Patient perspective: Questions students can address to integrate the patient narrative and context with their clinical knowledge
• Who is the patient? What are their concerns, medical conditions, social situations, culture and home environment?
• Why did the patient present at the hospital?
• Are there any other issues with vision/hearing/strength/balance/co-ordination/cognition/pain that impact the patient’s safety/ability to manage at home? What level of function did they have? Where are they now? Where do they want or need to get to?
• Is the patient/carer aware of my intervention?
• What would be the best outcome from the patient’s perspective? What actions do I need to take to achieve this outcome?
• Do I feel I have a full picture of the patient’s lifestyle?
• What level of questioning can this patient tolerate?

Discussion
This study showed that it is possible to identify and make explicit the thinking steps that underpin clinical reasoning and then to frame this thinking for clinical students. The questions listed provide concrete strategies for teaching the clinical reasoning processes identified in the literature. They give practical examples of how to ‘make visible’ or reveal the black box of clinical reasoning. By having their students ask and address these questions, clinical educators can be explicit about how they want the student to think in a given case and what they want the student to think about. The questions provide a structure for how to encourage the clinical thinking that is required in clinical reasoning.

A clinical educator can use the sorts of questions identified in this paper to enable their students to engage in clinical reasoning, as we illustrate in the following discussion between clinical educator and student. This example captures only a small range of clinical reasoning, similar to that described by Edwards et al. (2004), yet this illustrates how different questions might be used for different aspects of clinical reasoning.

**Teacher:** You have been asked to assess George who has been admitted to hospital with blurred vision,
a headache and difficulty swallowing. His diagnosis is a mild CVA. George is dishevelled, thin and has clearly not washed for many days. What do you think your role is when you first meet with George?

**Student:** My role is to assess George’s presenting symptoms and which of the symptoms is more urgent or problematic for George.

**Teacher:** Why do you need to do this?

**Student:** So I can develop an assessment and treatment plan.

**Teacher:** What information do you require before you commence gathering the information you need for the plan?

**Student:** I need to find out something about George’s history, where he lives, what sort of support he has and any previous medical history and treatment.

**Teacher:** How will you prioritise this type of information? How will you know what to focus on?

**Student:** I will assess which of his problems need hospital-based treatment and which of his problems require more long-term planning.

**Teacher:** How will you do this?

**Student:** I guess I need to assess his symptoms and his history.

**Teacher:** So first, what do you know about his symptoms so far?

**Student:** I know that blurred vision and difficulty swallowing are signs of a neurological deficit, and I need to assess how they are affecting his function.

**Teacher:** And second, what do you know about George? Why did he present to the hospital?

**Student:** I don’t know much about his history, but I need to ask about where he lives and what support he has.

This example of a teacher/student dialogue illustrates how the questions identified in our survey can be used to guide students to think for themselves. In this exchange, the clinical teacher used questions from the ‘knowledge’ and ‘patient context’ categories in order to guide the student through the initial stages of allied health clinical reasoning. The questions are used to enable the student to do the clinical reasoning rather than the teacher doing the clinical reasoning and then directing students to the ‘right answers’. The example illustrates how a clinical educator can scaffold independent thinking rather than ‘fishing’ for the answers they already have in mind.

Methods for teaching clinical reasoning frequently have focused on describing the steps involved, such as the need for students to: gather clinical and sociocultural information, form and test hypotheses, draw from theoretical knowledge and experience, recognise patterns and form a diagnosis (Kurtz, 1990; Ryan & Higgs, 2008; van der Vleuten, Norman, & Schuwirth, 2008). However, if clinical educators rely only on these broad and abstract frameworks, they may find themselves doing the thinking for their students because their students may still not know how to, for example, generate hypotheses or to sort and evaluate clinical information. If clinical educators instead use the sorts of questions described in this study, they can be clear and concrete about what is involved in particular phases.
of clinical reasoning, and they can give this ‘thinking work’ to their students so their students learn to be clinical reasoners. This process is similar to Pratt’s (1998) description of teaching by modelling practice rather than transmitting knowledge.

Although the questions described in this study might seem overly simple and generic and thus a poor reflection of clinical reasoning, this is not a flaw in our approach. We argue that the questions are a necessary tool for learning clinical reasoning. Because clinical reasoning is so complex and case-specific, it is impossible for students to grasp it immediately and directly. Instead, students need to practice with such refined or simplified questions so they can master the more complex, case-specific and seemingly intuitive reasoning of an expert.

We have argued that these questions are useful for teaching clinical reasoning, yet we also need to consider the different settings in which clinical reasoning is learned. Respondents believed that teaching clinical reasoning occurs both within the clinical setting and at university (see Figure 1), which concurs with the literature (Christensen, Jones, Higgs, J., & Edwards, 2009; Ryan & Higgs, 2008; Stenfors-Hayes, Hult, & Dahlgren, 2011) and that ‘experience with patients and clinical supervision’ is the most important setting for learning clinical reasoning, which also concurs with the literature that shows experiential and context-dependent learning is vital for the development of clinical reasoning (Norman, 2005). Further research needs to be conducted on the scope of responsibility for teaching clinical reasoning, as well as the effectiveness of questioning in these different settings. Nevertheless, we can hypothesise that the thinking questions described may be useful for creating a consistent approach across the different educational settings. Addressing the same sorts of questions at university and then in clinical placements is likely to be an effective method of teaching clinical reasoning.

Educators were asked to make their own clinical reasoning visible as a means of being explicit about the thinking that their students should employ. From this, it follows that a limitation of this study is that participants’ statement of their own clinical reasoning may not accord with how they actually think in practice (see Liamputtong, 2009, for further discussion of this kind of limitation). Nevertheless, this is not a major limitation of this pilot study. Given the main purpose of this study was to describe clinical reasoning in a way that is useful for students, it does not matter significantly whether participants gave a precise version of their own thinking; what is important is that the questions were appropriately formulated for novice students to adopt. This also needs further investigation.

A related limitation of this pilot study is that we have not exhausted all aspects of clinical reasoning. Further research needs to identify the questions underlying all aspects of clinical reasoning.

One final point for discussion is that for the majority of participants, attending the seminars and thinking about their thinking gave them more confidence to teach different aspects of clinical reasoning (see Table 2). This gives some support to our claim that using refined...
questions can be useful for educating for clinical reasoning; yet, there needs to be further research about the impact of teaching effectiveness on student learning. There also needs to be further investigation about the reasons why a small number of respondents indicated that they felt less confident (in a good way) after they were introduced to this model of educating for thinking. We interpreted this to mean that their confidence decreased because their usual practice or teaching was challenged by the method of ‘teaching for thinking’ introduced in the seminars. They may now require time to adjust their teaching practices—perhaps by first bringing their tacit teaching practices to a more explicit level (see Delany & Bragge, 2009; Taylor, Tisdell, & Gusic, 2007) or by making the questioning process a conscious ‘thinking routine’ or disposition (Ritchhart, 2002).

Conclusion

In this research, we asked a group of allied health practitioners to identify the questions they ask themselves when faced with a challenging clinical problem and to further formulate these questions in ways that students could grasp. We suggest that the questions ‘experts’ ask themselves when they are engaged in clinical reasoning have educational value because they provide concrete examples of the thinking steps underpinning clinical reasoning that are usually invisible to students. The questions identified in this survey research provide a means for students to develop both dispositions and strategies of thinking that are necessary for the complex process of clinical reasoning in different areas of health practice.

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References


