Clinical reasoning by veterinary students in the first opinion setting: Is it encouraged, is it practised?

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**Abstract**

A mixed-methods study was performed to investigate the perceived importance and efficacy of teaching clinical reasoning (CR) skills by students and faculty in a university first opinion veterinary practice, as this has not previously been described. Qualitative analysis of interview data, discussing objectives and factors considered important for effective learning and the understanding of CR, was performed, alongside quantitative analysis of the 'preceptor thinking promotion scale' (PTPS) and the 'learner thinking behaviour scale' (LTBS) (assessing the level of CR encouraged by clinicians and displayed by students) in peri-consultation discussions. Themes that emerged from analysis of the interviews regarding objectives were the desire for developing effective data acquisition, improvement in data manipulation and CR. Themes associated with effective learning were a positive student-centred learning environment and feedback. Type II CR was fairly-well described, but recognition of the importance of type I CR was poor by clinicians and students and, in some instances, was deemed to be inappropriate. Although many clinicians and students expressed a desire to develop student CR, there was little evidence of this actually occurring in the interactions analysed, with low PTPS and LTBS scores achieved. There was also poor understanding of whether effective teaching of CR had occurred, demonstrated by a lack of correlation between LTBS and the interaction score for development of student CR. Further training of clinicians and students of the value of type I CR in first opinion practice is required, as well as clinician education in how best to support the development of CR in students.

**Keywords:** Learner thinking behaviour scale, preceptor thinking promotion scale, analytical reasoning, non-analytical reasoning

## Introduction

Even in a developed country such as the United Kingdom, 70% of veterinarians working within the veterinary profession are engaged in first opinion practice and only 8% are working in referral practice.[1] Therefore the professional skills required to work as a general practitioner should be an important part of veterinary education. Clinical reasoning is one such skill, being recognised as 'critical and central to practice'.[2] Explicit teaching of clinical reasoning is receiving increased attention within veterinary education[3,4,5] but, when it is practised at universities, it is often in a referral context, despite many universities having first opinion practices where clinical reasoning can be taught. It is suggested that the level of supervision and the demonstration of high quality clinical reasoning is variable in the training of medical students[6] and this is probably also true for veterinary students. Case discussions between clinicians and students are essential for the development of clinical reasoning with the questioning technique used by the clinician being of major importance.[7] The lack of research into how clinical reasoning is taught in the first opinion setting means it is unclear whether the teaching provided is effective or appropriate for the cases seen, although veterinary graduates do report poor acquisition of these skills at university.[4]

This study aims to explore the teaching of clinical reasoning in a university-based first opinion practice setting. This has implications not only for university practice but also for extra-mural studies, given the huge reliance of UK veterinary schools on private general practices for student teaching (with the Royal College of Veterinary Surgeons stipulating that students should spend 26 weeks in clinical extra-mural studies placements during the final three years of their training).[8] The objective of this study was to investigate interactions between clinicians and students regarding first opinion consultations. The four research questions investigated were:

1. What are the objectives students and clinicians have for a rotation in first opinion practice?
2. What are the factors that students and clinicians consider important in their discussions about consultations?
3. What do clinicians and students in this environment understand by the term clinical reasoning?

4. Does clinician questioning technique affect the likelihood of displays of clinical reasoning?

## Materials and methods

A mixed-methods case study of students and clinicians at the Royal Veterinary College's (RVC's) Beaumont Sainsbury Animal Hospital (BSAH: a first opinion practice where all final year veterinary students spend a two week rotation) was performed. Clinicians and students assigned to routine patient consultations during the second week of the rotation were enrolled onto the study once consent was obtained. Prior to starting consultations, each student and clinician was privately interviewed. The students and clinicians were questioned on their aims for the clinical rotation and their thoughts on what makes a positive peri-consultation interaction between clinicians and students. They were also questioned about their understanding of the term 'clinical reasoning'. Transcripts were made of these interviews and the text was anonymised, then coded and analysed for themes and subthemes.

As is standard practice in veterinary clinical rotations, at the BSAH, the student performs the consultation with the client and patient without supervision, prior to presenting their findings to the clinician outwith the consultation room. The case is then discussed and a treatment plan decided upon before both student and clinician return together to the consultation room. These 'peri-consultation' interactions between clinicians and students were recorded and transcribed.

Each interaction was assigned a score by one non-blinded, experienced veterinarian (with a qualification in medical education) on the 'Preceptor thinking-promotion scale' (PTPS) (Table One) and the 'Learner thinking–behaviour scale' (LTBS) (Table Two), both of which have been previously validated in a medical setting.[9] Correlation between the PTPS and LTBS scores for each interaction was assessed using Spearman's rho.

After each peri-consultation interaction, both the student and the clinician gave the interaction a score (in private) from 0 to 3 regarding how beneficial they felt

that learning encounter was in terms of student development of clinical reasoning (with a definition for clinical reasoning provided). Data were assessed for normalcy and then the relationship between this interaction score for clinical reasoning and the PTPS and LTBS scores for the interaction was assessed using Spearman's rho with a p value of less than 0.05 deemed significant. All statistical calculations were performed using an on-line statistics package.[a]

Ethical approval for this study was obtained from the RVC's Ethics and Welfare Committee (M2014 0023).

## Results

*Qualitative data: Open Questions*

Six clinicians and 11 final year veterinary students (10 female and 1 male) were interviewed for the study. When considering the aims for the time the student spends at the BSAH and the factors that made the peri-consultation interactions between clinicians and students a positive learning encounter, 4 key themes were identified which are described below and contextualized with the participants' own words.

Theme 1: Effective data acquisition

There was a strong theme relating to the need to generate an improvement in the students' skills involved in effective data acquisition such as physical examination skills, history taking skills, client communication skills and time management. Every student and almost every clinician mentioned this aspect as a desired outcome of time spent in the first opinion practice. Often there was a recognition that improvement in multiple skills was required, such as with Student H:

'…communication skills is the top of my list and I think that would just be a bit of everything, so just welcoming clients, being able to get a good history, asking the right questions. And then trying to multitask and do a physical exam and …. let them speak at the same time and listen, I think that is what I want to do.'

Clinician A also emphasized the requirement to develop these skills:

'I think for me it's about client rapport because I think that's probably the most important thing….. Then just to see their clinical exam skills and just time management as well is quite important'

Theme 2: Data manipulation and clinical reasoning

Some of the clinicians showed a desire to improve the students' consideration and analysis of a case, including aspects of clinical reasoning, as described by Clinician B:

'I think mostly their ability to logically problem-solve, so that's the biggest thing, that they often are quite good at jumping to conclusions rather than actually sitting and logically working things through, so I generally aim to try and get them to problem-solve even for straightforward things so they just get into the habit of doing it, really.'

Processing and manipulating the data obtained from a consultation was mentioned by some of the students as something they desired to develop. In several cases students recognised that help from clinicians would allow them to progress to this stage as with Student A:

'I think when the clinician sort of asks you your opinion and what your sort of thought process was, maybe to do with defining and refining the problem and thinking about where you'd start going either with differential diagnoses or what other tests or further investigations you'd need to do to get to your differentials. I think ... and then obviously sort of helping to steer it a bit was really helpful.'

Theme 3: A positive student-centred learning environment

When considering what made a positive learning encounter the majority of the clinicians discussed how important they felt their attitude and approachability was. Clinician E stated:

'It can be really, really scary being in this kind of a situation and it's hard for them not to feel like we're scrutinising their every move. So if I can have a bit of a joke and a bit of fun with them while we're doing that and do everything I can to make them not feel like they're being judged, because I think people learn better when they're relaxed'

Students also felt a positive relaxed relationship between clinician and student was important such as Student C:

'I feel a bit of understanding, really, because we're not perfect….I feel if you come out and they're sort of positive and you've missed things but they kind of work with you to resolve them and go back and fill in those gaps, I find for me that gives me more confidence to keep going rather than if you come out and it's, oh, you've missed this, you've missed that, and sort of a bit of reinforcement, really, ideally.'

A comfortable and relaxed interaction was therefore seen as important. The discussion focused on the responsibility for this lying with the clinician. However, some students also mentioned their own emotions and behaviour as a factor they felt they wanted to learn to control or improve upon. They felt under-confident and nervous which clinicians recognised could impede their performance.

Aspects of student-centred learning, whereby the student is encouraged to develop autonomy and responsibility for their own learning, were also alluded to by clinicians. In a clinical teaching situation this is often accompanied by a sense of collegiality between learner and teacher allowing for a 'joint' approach and analysis of the case. Some students and clinicians recognised that a good interaction may involve the clinician asking the student's opinion, with them working as a team rather than as teacher and learner, or at least with the student's opinion being actively sought and discussed or critiqued.

Theme 4: Feedback

Feedback was a common focus for both clinicians and students. Clinician D particularly focused on this aspect:

'I think the clinicians having the ability to call up on that and say, no, that is not right, you need to work on this area, having good feedback which is constructive but also honest'

Many possible forms of feedback were discussed but questioning the students was commonly recognised as a way students could improve their understanding of a patient's clinical situation and recognise the limitations of their knowledge. Student J stated:

'…actually being asked questions you don't know the answer to or when you make mistakes, oddly enough, that's sort of when you remember it and you go back and you look it up … it's very helpful to actually have that sort of feeling of, I should know something and to go and look it up then later …'

Although both clinicians and students frequently discussed student questioning, the style of questioning was not mentioned by any participants.

*Qualitative data: Understanding of clinical reasoning*

Following the open questions about their expectations, the participants were probed further on their understanding of the term clinical reasoning. There were three recurrent themes that emerged from both students and clinicians.

Logical and methodical

A logical and methodical approach to a case was often referred to by both students and clinicians and there was also a strong focus on defining and understanding the patient's problem(s). Clinician C expressed this:

'…coming up with a logical list of potential problems and then reasoning through as to what could potentially be going on with the patient and why.'

Several students considered clinical reasoning as a process whereby the problem was approached by breaking it down to basic components aiding understanding whereas this was not described by clinicians. Student B stated:

'I understand it is going back to first principles and understanding what clinical signs you're seeing and developing those…'

Pragmatic

The importance of pragmatism in clinical reasoning was noted by several clinicians for example Clinician D:

'Now I think some people, especially the students, feel that they should be getting that answer and that their clinical reasoning has to go from A to Z as one fell swoop and that's it. But for me, I feel that often the reasoning is at least getting on that pathway and getting a good approach. You're not expecting to have the answer at the end of a consultation.'

This pragmatism was less frequently mentioned by students,

Pattern recognition

Two students specifically stated that clinical reasoning was not the same thing as pattern recognition, with an implication that the former was a good, and the latter a poor, technique. No clinicians used the term 'pattern recognition' when considering clinical reasoning.

*Quantitative data: Peri-consultation interactions*

Thirty peri-consultation interactions were recorded and transcribed. One clinician (Clinician F) was interviewed but did not take part in an interaction; all other interviewees did. The number of interactions for clinicians ranged from 0 to 8 and the number for students ranged from 1-4. Of the 30 interactions, 15 had a PTPS score of 1, 14 had a score of 2 and 1 had a score of 3. Fourteen interactions had an LTBS score of 1, 14 had a score of 2 and 2 had a score of 3.

A moderate positive correlation of $R=0.585$ was found between the PTPS and LTBS scores for the interactions ($p<0.001$), indicating a correlation between the

quality of the students' verbalization of their thoughts and the nature of the clinicians' questioning. The score the students gave the interactions for developing clinical reasoning correlated moderately (R=0.730) with the PTPS scores ($p<0.001$) but only weakly (R=0.373) with the LTBS scores (p=0.036). The clinicians' interaction scores only correlated weakly (R=0.394) with the PTPS scores (p=0.031) and did not correlate with the LTBS scores. This suggests that both students and clinicians were better at judging the quality of the teaching than the quality of the students' own thought processes, and that the students were more aware of their own learning than the clinicians.

## Discussion

The results of this study clearly answer the research questions posed in the introduction. Importantly, the use of the PTPS and LTBS allowed validated quantitative analysis of the teaching of, and student displays of, clinical reasoning, assessing whether clinical questioning technique affects the likelihood of displays of clinical reasoning. PTPS and LTBS were found to be moderately correlated in the interactions studied here (R=0.585 compared to 0.62 in the original study validating the PTPS and LTBS)[5], proving that clinician questioning technique is correlated with student displays of clinical reasoning. Although causation cannot be proven, it is likely that higher level clinician questioning stimulates greater displays of student clinical reasoning. Both the higher levels of promotion of thinking and the higher levels of student thinking (i.e. the top scores for both the PTPS and the LTBS) were rarely seen in this study with only 3 scores of 3 seen in total out of 30 interactions. Therefore, despite many clinicians and students stating they wanted to teach or learn clinical reasoning this was actually not commonly achieved. Clinicians and students were also unable to assess their performance, with clinicians in particular seeming to be poor judges of the quality of the learning experience for the learner (demonstrated by the lack of correlation between LTBS and the score given for how beneficial the interaction had been for students).

It is important to question why there was such a lack of insight. Both clinicians

and students stated that both data acquisition and manipulation (including clinical reasoning) were objectives for this rotation in first opinion practice. Understanding of the term clinical reasoning was explored revealing there was a clear concept of clinical reasoning which was similar between students and clinicians. The terms logical and methodical were commonly used which is likely to reflect the explicit formal teaching on clinical reasoning provided to both clinicians and students at the RVC.[5] However, the 'breaking down' of a problem into constituent parts as an aspect of clinical reasoning was mentioned only by students (not clinicians), although this fell within the realm of a logical and methodical approach. This could be due to the greater experience of clinicians, meaning that this stage of reasoning was easily performed and not worthy of mention, whereas for students it was still something requiring effort and thought. It could also be considered that the students were 'over-complicating' the problems being faced in a first opinion setting, which may not need this level of analysis. This was encouraged by some clinicians, with Clinician B, for example, reporting encouraging the use of a 'problem-solving' approach even for straightforward cases to ensure this method was generally used.

Consistent with this idea of over-analysis, both students and clinicians defined clinical reasoning as an analytical 'type II' practice by focusing on a model which requires cognitive effort and consideration of the problem prior to reflection on how to progress. Although type II thinking is an important part of clinical reasoning, as an individual progresses from novice to expert, type I rapid, non-analytical thinking, increases in frequency.[4,10] This aspect of clinical reasoning was not discussed by students (who are less likely to use it, although they may do so in more common conditions that they have encountered frequently in their training) or clinicians (who will regularly be using this method). In fact, two students discussed the fact that clinical reasoning was 'different' from pattern recognition, and suggested that type I thinking was not an appropriate strategy for clinicians. This is in contrast to the reality of clinical reasoning, whereby previous clinical experience and knowledge of the literature is used to interpret the case, and it is well recognised that 'pattern recognition' contributes to decision making processes in experienced clinicians in the form of 'type I' thinking.[4] This confusion

about what clinical reasoning entails has previously been reported in veterinary students and clinicians working in academia, particularly with regard to pattern recognition[11,12] and it is reported that veterinary preceptors desire increased training in clinical reasoning.[13] It is important to improve understanding in this area, as students can start to develop 'illness scripts' early in their training, which alongside analytical reasoning when required, will allow for optimal reasoning.[8] This may be particularly true in first opinion practice where students are exposed to commonly presenting clinical cases frequently in their 'extra-mural studies' allowing them to practise type I thinking. However, if they consider this type I thinking as inappropriate, or are told that it is, this will lead to confusion and impaired reasoning. This is supported by a study of veterinary undergraduates who reported confidence in their clinical reasoning abilities but a deficit in their abilities was recognised by those starting their first job.[14]

The pragmatic aspect of clinical reasoning was emphasized by some clinicians in this study, with a recognition that in a primary care setting definitive diagnosis and 'gold standard' treatment may not always be possible, but that clinical reasoning will aid reaching the optimum solution at least in part through pattern recognition. This is recognised in human medicine, where it is stated that clinical reasoning can be used to delineate a problem even if a specific diagnosis is not reached.[15] This pragmatism is particularly useful in a first opinion setting when clients may not have sufficient funds for extensive testing, and equipment and personnel may be limited. Breaking down the process of clinical reasoning into diagnostic and therapeutic reasoning can be seen to be part of this approach and the requirement to achieve competence in both components is recognised in medical students.[16] The greater proportion of clinicians (compared to students) mentioning pragmatism in this study may reflect their greater experience of first opinion veterinary practice and also the desire of students to understand every detail of a case. It is recognised that medical students require specific training in the use of clinical reasoning in a pragmatic approach to cases.[17] It is interesting though, that although type I reasoning would fit well with this pragmatic clinical reasoning approach, it was not described by any of the clinicians or students. It is almost impossible that the experienced clinicians are not performing type I

reasoning, but whether they do not recognise that they are doing so, or that they feel it is a method they should not disclose is unclear.

When considering the factors that students and clinicians consider important in their discussions about consultations, the desire for, and the recognition of the value of, a student-centred learning experience was noted by both clinicians and students. Clinicians also describing the necessity of a caring attitude to the students giving them support and a 'safe' environment. This has long been recognised as desirable for effective teaching with establishment of a comfortable environment for learners and treating the students with respect being major strategies for improving bed-side learning in human hospitals.[18] Interestingly, student attitude was rarely mentioned as an important factor in making a successful interaction by either students or clinicians. It could be argued then, that although there is evidence of student autonomy and the use of appropriate teaching methods for adults considering the desire for student-centred teaching, there is also a traditional pedagogical attitude being supported by both clinicians and students, with students being considered 'child-like' in their requirement for protection without any responsibility for, or perhaps ability to control, the relationship. The theme of feedback could also be considered a more passive pedagogical state, with clinician control of questioning and comment rather than active student self-assessment or reflection. Similarly, the quantitative analysis revealed that judgement of the success of the interaction was more strongly correlated with PTPS than LTBS, suggesting clinician teaching behaviour was judged to be more important and/or better recognised.

There are limitations with this study. The use of the PTPS and LTBS required a grading scheme which, although defined, had elements of subjectivity to it.[9] The number of interactions and participants, particularly clinicians, was small. Also, the focus on peri-consultation interactions means many aspects of teaching clinical reasoning in this setting are not examined. Modelling of effective clinical reasoning by clinicians can aid student understanding of the process and thereby enhance their development of the skill. Thinking aloud has been described as an effective way for clinicians to model clinical reasoning[19] and has been suggested

to be particularly useful in a 'general practice' setting,[20] analogous to first opinion veterinary practice. It is likely such methods are in use (whether consciously as a teaching process or not) and others but were not captured by this investigation.

It is also likely that the understanding of clinical reasoning displayed by the participants in this study is fairly context specific, to both veterinary medicine and a university-based first opinion setting. A study of final year physiotherapy students found they perceived clinical reasoning as an instrumental process which included aspects of the logical and methodical theme noted here but other themes differed.[21] Although there are methodological differences between the studies it is likely these differences are due to physiotherapy students differing in their attitude to clinical reasoning and utilising it in a distinct clinical setting.

In conclusion, this analysis has described a range of themes which can be used to understand the perspectives of both clinicians and students in terms of their objectives for the time the student spends in first opinion practice and the peri-consultation interactions in this situation. Clinical reasoning is theorised by the participants in this study in a way that does not directly align with what is known about reasoning in first opinion practice, with a strong focus on an analytical approach, negating the non-analytical type I thinking aspect despite suggestions by some clinicians of the importance of pragmatism. This is suspected to be due to a misunderstanding of what it is 'desirable' to teach in this university first opinion setting (likely due to continued confusion of the nature of clinical reasoning) combined with a lack of clinician self-awareness of how they practice veterinary medicine. Displays of clinical reasoning are not encouraged with appropriate questioning techniques, despite clinicians stating that its development is one of their aims. A traditional pedagogical attitude prevails which means that the students are disempowered from furthering their clinical reasoning skills themselves. As in medical education, it cannot be assumed that students will automatically develop this skill, so this study adds to the evidence that clinical reasoning, particularly type I reasoning that is relevant to primary care, should be taught more explicitly to students in first opinion practice, alongside training of clinical teachers in this area.

## Acknowledgements

With thanks to the staff and students of the BSAH for being so helpful and for giving their time to participate in the research, the educational research team at the RVC (particularly Kirsty Fox and Carrie Roder for their helpful advice and enthusiasm) and Yu-Mei Chang for her statistical advice. This project was completed as a part of the requirements for an MSc in Veterinary Education.

## Notes

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Table 1. Preceptor thinking promotion scale (PTPS)

| Score | Descriptor |
|---|---|
| 1 | The preceptor focuses on eliciting and clarifying the facts of the case and on testing the student's factual knowledge. The preceptor confirms or corrects the learner's knowledge and often gives advice or answers |
| 2 | In addition to eliciting the facts the preceptor asks questions the test or check the student's thinking, beyond just factual knowledge |
| 3 | The preceptor focuses on eliciting and helping the student clarify his or her thinking about case related uncertainties or difficulties. These interactions have a collegial tone; the preceptor may share his or her own uncertainties about the case or suggest that the learner and preceptor together look into a question or concern. |

Table 2. Learner thinking behaviour scale (LTBS)

| Score | Descriptor |
|---|---|
| 1 | The student focuses on giving the facts of the case, or on answering the preceptor's questions about the case or about his or her knowledge |
| 2 | The student explains his or her assessment or decisions, usually in response to a preceptor probe but sometimes self-initiated in the context of the case discussion; the learner may seek information or advice from the preceptor. |
| 3 | The student explores uncertainties or difficulties about the case with the preceptor; the focus is on 'thinking out loud' about problems, sorting them out. The learner may ask for information to help clarify his or her thinking or raise questions about ideas or issues that arise during the encounter; he or she may also rethink an earlier position as the discussion with the preceptor goes along. |