Teaching Clinical Reasoning in General Practice
Clinical reasoning has been defined as ‘the sum of thinking and decision-making processes associated with clinical practice ... it enables practitioners to take ... the best judged action in a specific context.’

Simply put, clinical reasoning is the process of making sense of the breadth of (often ambiguous and/or conflicting) clinical information regarding a patient’s presentation, in order to decide on the optimal plan of management. It is a core skill of the competent general practitioner and a fundamental learning objective of GP training.

Clinical reasoning encapsulates skills in:

- Data gathering.
- Synthesis and interpretation.
- Communication and consultation.
- Patient-centred care and shared decision-making.
- Managing uncertainty.
- Evidence-based medicine.
- Reflective practice.

Effective clinical reasoning requires a balance of the art and science of general practice. While development of clinical reasoning skills is based on accumulated experience, it is also a skill that can be taught. GP supervisors therefore play a key role in the development of clinical reasoning skills in their GP registrars, in particular how to ‘think like a general practitioner’.

This guide aims to support GP supervisors to assess, and facilitate development of, their GP registrar’s clinical reasoning skills in the general practice setting. In particular, this guide will focus on diagnostic clinical reasoning.

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GPSA produce a number of relevant guides for GP supervisors and practices, visit www.gpsupervisorsaustralia.org.au to view additional guides.
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The good GP never stops learning
Clinical reasoning may be tricky to define, but for most GP supervisors, ‘you know it when you see it’. Having a basic understanding of a number of useful clinical reasoning concepts will provide the GP supervisor with a ‘language’ to better assess, communicate and facilitate the GP registrar’s development of this skill.

**Dual process thinking**

The international literature on clinical decision-making describes a so-called ‘dual process’ model of thinking and reasoning – an interplay between analytic (type 2) thinking and non-analytic (type 1) thinking. The analytic (or hypothetico-deductive) method of reasoning involves deliberate, often repeated, hypothesis generation and testing, and is more the domain of the novice clinician. In practice, type 2 thinking manifests as detailed history taking, the specific seeking of confirmatory and contradictory information, and a deliberate, conscious analysis of the data.

On the other hand, non-analytic reasoning, or type 1 thinking, is defined by rapid, intuitive, and automatic processing, and relies on the use of cognitive tools – ‘pattern recognition’, illness scripts (see below) and heuristics (rules of thumb). Examples include ‘spot diagnoses’ e.g. the herald patch of pityriasis rosea, and ‘Murtagh’s triads’ e.g. dizziness + hearing loss + unilateral tinnitus = acoustic neuroma. Non-analytic thinking is the usual decision-making method of the ‘expert’, although a challenging or atypical presentation often will lead the experienced clinician to revert back to more deliberate, analytic thinking. Non-analytic reasoning is fast and efficient, but, unsurprisingly, is also prone to error.

**Illness scripts**

Illness scripts are mental prototypes, or categorisations, of the important distinguishing features of an illness. They are used by clinicians to compare a current presentation to those in a previously collected ‘library’ of scripts, to see whether there is a ‘match’. Examples of typical illness scripts include the uncommunicative depressed adolescent, or the elderly patient with BPPV. Illness scripts are the basis of non-analytic thinking and pattern recognition behaviour.

**Cognitive biases**

Errors in diagnosis more commonly result from flaws in thinking rather than a lack of clinical knowledge. Clinical reasoning and decision-making can be compromised by a myriad of factors, including fatigue and time pressures. Another well-described contributor to diagnostic error, however, is the suite of so-called ‘cognitive biases’ or ‘cognitive dispositions to respond’, flawed (and often embedded) patterns of thinking or processing particular to the individual clinician. Dozens of forms of cognitive error and bias have been described, though many are inter-related and more than one often features in a case of diagnostic error.
### COMMON COGNITIVE BIASES

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<td>Premature closure</td>
<td>The tendency to end the decision-making process too early, i.e., the diagnosis is accepted before it has been fully verified.</td>
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<td>Availability bias</td>
<td>The tendency to judge things as being more likely if they readily come to mind or have recently been encountered.</td>
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<td>Anchoring bias</td>
<td>The tendency to ‘fix’ key features of the patient’s presentation and not adequately consider additional information that may contradict the diagnosis.</td>
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<td>Representativeness bias</td>
<td>The tendency to look for prototypical manifestations of a particular disease and fail to accept atypical variants.</td>
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<tr>
<td>Confirmation bias</td>
<td>The tendency to only seek information to support the diagnosis and not look for evidence to counter the hypothesis.</td>
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<tr>
<td>Overconfidence bias</td>
<td>The tendency to believe that we know more, or perform better, than we actually do.</td>
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<tr>
<td>Patient self-labelling</td>
<td>The tendency to favour a diagnosis suggested by the patient rather than entertain other possibilities.</td>
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<tr>
<td>Diagnostic momentum</td>
<td>The tendency to adhere to a previous diagnostic label, despite evidence to the contrary.</td>
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Adapted from Croskerry’

“Another well described contributor to diagnostic error, however, is the suite of so-called ‘cognitive biases’ or ‘cognitive dispositions to respond’, flawed (and often embedded) patterns of thinking or processing particular to the individual clinician. Dozens of forms of cognitive error and bias have been described, though many are inter-related and more than one often features in a case of diagnostic error.”
Premature closure has been described as the most common cognitive bias leading to diagnostic error.\textsuperscript{8}

Availability bias is common in GP registrars with their relatively limited experience in clinical practice, and often narrower scope of practice.\textsuperscript{9} Examples include misdiagnosing the coughing child as having pertussis instead of having an URTI (registrars see a lot of colds!) or, at the other extreme, diagnosing tension headache as a space occupying lesion and inappropriately referring for imaging.

Self-labelling is also common and occurs when the patient tells the GP what they think is the diagnosis. An example is the young woman with dysuria complaining of ‘a urinary tract infection’, and in doing so steers the GP away from the correct diagnosis of chlamydial infection.

A longer list of cognitive biases can be found at http://lifeinthefastlane.com/ccc/cognitive-dispositions-to-respond/

Reflective practice and metacognition

Reflection in medical education has been defined as ‘a metacognitive process that occurs before, during and after situations with the purpose of developing greater understanding of both the self and the situation so that future encounters with the situation are informed from previous encounters’.\textsuperscript{10} Reflective practice forms part of self-regulation, a deliberate process of professional development and life-long learning.\textsuperscript{11} Reflective practice is an important element of the safe and competent GP.

Metacognition can more simply be described as ‘thinking about thinking’, and refers to the ability to monitor one’s own cognitive processes.\textsuperscript{2} Reflective practice and metacognition are both critical to effective clinical reasoning, by allowing the clinician to ‘step back’ from the immediate problem and consider the presentation more broadly.\textsuperscript{12}
There are a number of approaches that the GP supervisor can use to assess their GP registrar’s clinical reasoning skills and improve their approach to decision-making.

STRATEGIES FOR ASSESSING AND TEACHING CLINICAL REASONING IN THE PRACTICE SETTING

- Make clinical reasoning an explicit element of teaching
- Ensure broad clinical exposure
- Incorporate clinical reasoning into consultation analysis
  - Consultation observation (including video review)
  - Problem case discussion
  - Random case analysis
  - Scenario-based discussion/ role plays
- Incorporate clinical reasoning into corridor teaching
  - One-minute preceptor
  - WWW-DOC model
- Employ specific diagnostic strategies
  - Restricted rule-outs (Murtagh’s process)
  - Clinical prediction rules
  - Diagnostic pause
  - Checklists
  - Gut feelings
- Teach reflection on practice
- Use diagnostic error for teaching clinical reasoning
- Encourage use of clinical guidelines
Make clinical reasoning an explicit element of teaching

The concept of clinical reasoning and its application to general practice may be very unfamiliar to GP registrars. The GP supervisor should therefore explicitly articulate the nature and process of clinical reasoning as an integral part of teaching, including related concepts like dual process thinking and illness scripts. In particular, GP supervisors need to reflect on, and understand, their own clinical reasoning processes and be able to (or at least attempt to) communicate them to their GP registrars. This can be considered as ‘thinking aloud’. Examples of this include describing the use and transition between type 1 and type 2 thinking, highlighting ‘key features’ of history and examination, and discussing the ‘weighting’ of individual items for relevance and importance.

Similarly, the GP supervisor should explicitly discuss the nature of undifferentiated illness and support their GP registrars to better manage uncertainty. A number of practical strategies have been described. This topic is discussed in detail in the accompanying GPSA Managing Uncertainty guide.

Ensure broad clinical exposure

Development of sound clinical reasoning skills, in particular pattern recognition, requires exposure to a sufficient number and a wide breadth of clinical presentations. Exposure to prototypical features of specific clinical cases allows the registrar to develop illness scripts for future reference and facilitates the development of pattern recognition. However, the incongruity and cognitive dissonance of atypical presentations, e.g., the AMI presenting with epigastric pain, is equally important to experience and learn from.

Practically, GP supervisors should strive to ensure an adequate number and broad diversity of patient presentations over the course of a training term. Complementing opportunistic clinical exposure, the GP supervisor can also call their GP registrar into the consulting room to see typical (or atypical) presentations of common conditions or discuss such presentations as part of teaching.

Incorporate clinical reasoning into consultation analysis

Assessment and teaching of clinical reasoning skills can be performed as part of standard supervision methods such as problem case discussion and direct observation. Another form of consultation analysis is random case analysis (RCA), which is discussed in detail in the GPSA Random Case Analysis guide.

There are a number of ways that consultation analysis allows assessment of clinical reasoning skills both during and after the encounter. Direct consultation observation allows evaluation of history taking skills including responding to cues, seeking the patient agenda, identifying relevant key features and red flags, and the overall consultation structure and flow. The comprehensiveness and appropriateness of clinical examination can be assessed as well as appropriate incorporation of additional clinical information, e.g., investigation results, specialist letters, medication list. Finally, the GP supervisor can assess the appropriateness of the management plan and its relationship to the working diagnosis.

Murtagh lists the first point in patient management as ‘Tell the patient the diagnosis’. It is vital for effective clinical care to formulate and deliver a simple and clear explanation, including the provisional and differential diagnosis, their likelihoods, and the clinical reasoning underpinning this. Ideally, the explanation...
should link the pathophysiology of the disease to the patient’s symptoms, and specifically refer back to the patient’s ideas, concerns and expectations where possible. GP supervisors should specifically assess and give feedback to GP registrars on the comprehensiveness of explanations to patients, in particular, how well they articulate their reasoning in reaching the diagnosis.

Video-consultation review is a particularly powerful technique of consultation observation. Joint review and then pausing the tape at critical points of the encounter allows the learner to directly observe their own practice and the GP supervisor to facilitate a moment-to-moment ‘unpacking’ of the GP registrar’s clinical reasoning processes.

Role modelling has a strong influence on GP registrar behaviour and previously has been described as ‘the primary teaching strategy of clinical education’. Clinical reasoning skills can also be effectively taught by having the GP registrar sit in on the GP supervisor’s consultations. This provides an excellent opportunity for the GP supervisor to role model their diagnostic approach, demonstrate involvement of the patient in the decision-making process, deal with uncertainty and afterwards, to discuss their own reasoning by ‘thinking aloud’.

In all methods of consultation analysis, GP supervisors can and should overtly discuss the use, benefits and potentialdownfalls of pattern recognition and heuristics in diagnosis. As well, GP supervisors should be on the lookout for cognitive bias, e.g., premature closure, and point these out when they occur. Additionally, GP supervisors can further explore their GP registrar’s clinical reasoning by appropriate probing and posing hypothetical scenarios.

Incorporate clinical reasoning into corridor teaching

Ad hoc, or corridor teaching, provides an excellent opportunity to assess a GP registrar’s clinical reasoning skills, particularly when a simple structure is applied. Described most simply, this means ‘ask before tell’, i.e., the GP supervisor should ask the GP registrar what they think is going on and why, before proffering their own thoughts. This can be performed very briefly and significantly enhances the learning from such opportunistic teaching moments.

A number of more formal frameworks have been developed for assessment and teaching of clinical reasoning as part of case discussion. In the one-minute preceptor model, the GP registrar is asked to ‘commit’ to a diagnosis and outline their reasoning, before the GP supervisor teaches general rules. Another model, WWW-DOC, has been developed specifically for use in GP training, especially for the situation when the GP supervisor enters the GP registrar’s consulting room while the patient is still present. This model emphasises the importance of leaving the GP registrar in control of the consultation and centres on the use of ‘thinking aloud’ to explore clinical reasoning.

The common approach across all these models is to ask the GP registrar to summarise the clinical scenario into two or three sentences, including the most important positive and negative features and the working diagnosis. This is an excellent way of briefly appraising critical elements of the reasoning process – data gathering, weighting, and synthesis. It is also a useful way of seeking the GP registrar’s understanding of the most discriminating items of the clinical assessment and mirrors the college examination processes (especially the FRACGP Key Feature Paper).
MODELS OF CASE DISCUSSION

- One-minute Preceptor
  - Summarise the case
  - Get a commitment – What do you think is going on?
  - Probe understanding – What led you to that conclusion?
  - Reinforce what was done well
  - Teach general rules
  - Correct errors

- WWW-DOC
  - Who is present- introductions?
  - Why has the GP supervisor been called in?
  - Pause for questions?
  - Discuss the case by ‘thinking aloud’
  - Opportunities for learning
  - Conclusion
Employ specific diagnostic strategies

A number of specific strategies in diagnosis have been recognised and described. These provide very useful teaching tips on clinical reasoning and GP supervisors can refer to them in their teaching.

**RESTRICTED RULE-OUT (MURTAGH’S PROCESS)**

The restricted rule-out, or Murtagh’s process, is a diagnostic strategy based on identifying the most common cause of the presenting problem and a list of serious diagnoses that must be ‘ruled out’. This formulation is the basis of Murtagh’s ubiquitous textbook. GP supervisors can use this model in teaching, in particular, elaborating on differential diagnoses and ‘worst case scenarios’ and how these can be excluded.

**CLINICAL PREDICTION RULES**

There are a number of well validated clinical prediction rules that can support the diagnostic process. Clinical prediction rules are essentially formal versions of intuitive pattern recognition processes, based on research evidence and validated scales. Commonly used examples include the Ottawa ankle and knee rules for exclusion of fracture, Wells criteria for diagnosis of pulmonary embolus and streptococcal sore throat rules.

**JUDICIOUS USE OF TESTS**

Ordering investigations is an important element of the diagnostic process. Tests can also be unhelpful and on occasion, even harmful to the patient. A low tolerance to uncertainty has been described as a causative factor in over-testing. GP registrars should be discerning in the tests they order and avoid a ‘scattergun’ approach, particularly in the context of the undifferentiated presentation. Indeed, time has been described as the ‘best investigation in general practice’. GP supervisors can encourage GP registrars to substitute watchful waiting for test ordering where appropriate.

**RED FLAGS**

Red flags are specific symptoms or signs that can help to identify or rule out a serious condition (for example, night pain in patients with back pain). They are a critical element of comprehensive clinical assessment and sound clinical reasoning. GP supervisors should identify whether red flags are comprehensively sought, and appropriately weighted, in their GP registrar’s clinical assessment and decision-making.

**DIAGNOSTIC PAUSE**

The diagnostic pause, or diagnostic time-out, has been described as a useful tool to improve clinical reasoning and help minimise diagnostic error. The diagnostic pause means deliberately taking time out from the encounter, by pausing for a short period in order to synthesise the clinical information and reflect on the likely diagnoses. The diagnostic pause is particularly useful to overcome the inherent biases of type 1 thinking. Practical ways of implementing a diagnostic pause are to ‘excuse’ oneself from the encounter to take some notes or look something up, or to ask the patient to collect a urine specimen. One useful question to pose as part of the diagnostic time-out is ‘Why can’t this be something else?’
CHECKLISTS

Checklists have been used for decades in high-risk professions like the airline industry but only recently have become commonplace in clinical medicine. Checklists have been described as a valuable tool in clinical reasoning and reducing diagnostic error, in particular to reduce the reliance on intuition and force the consideration of ‘competing hypotheses’. Three types of checklists have been described – general checklists to enhance the clinician’s cognitive approach, differential diagnosis checklists for particular clinical scenarios, and checklists of pitfalls.

EXAMPLES OF CHECKLISTS

GENERAL CHECKLISTS

Obtain your own medical history
• Perform a focused physical exam
• Generate initial hypotheses and differentiate these with additional history, physical exam, and diagnostic tests
• Pause to reflect – take a diagnostic time-out
  - Was I comprehensive?
  - Did I consider the inherent flaws of heuristic thinking?
  - Was my judgement affected by any other bias?
  - Do I need to make the diagnosis now, or can I wait?
  - What is the worst-case scenario?
• Embark on a plan
• Acknowledge uncertainty
• Ensure a pathway for follow-up

Adapted from Ely.

GUT FEELINGS

Responding to gut feelings (a ‘sense of reassurance’ or ‘a sense of alarm’) has been described as playing an important role in managing uncertainty. GP supervisors can foster the use of such ‘gut feelings’ in their GP registrars and encourage appropriate action. For example, if the GP registrar feels a sense of unease or alarm, even in the setting of an unremarkable clinical presentation, they should be encouraged to act on this by seeking appropriate advice.
Teach reflection on practice

There is strong evidence that effective reflection is most likely to occur when it is well supported by good supervision. GP supervisors can play a role in encouraging GP registrars to ‘slow down’ and build reflection into their daily practice in the form of diagnostic pauses, structured medical record-writing, regular case review, or portfolio use. ‘Mindful practice’ has been postulated to give doctors the capacity to observe the patient while also observing themselves during the clinical encounter.

Use ‘near misses’ and diagnostic error for teaching clinical reasoning

Diagnostic error is common in general practice and has the potential to cause significant harm to patients. Diagnostic error can also lead to significant emotional responses including guilt, for the GP. There is evidence, however, that diagnostic error and ‘near misses’ provide valuable teaching and learning opportunities. GP supervisors can facilitate an environment of ‘open disclosure’ around near misses and diagnostic error in the practice and use critical incidents as teaching opportunities, in particular, to discuss how clinical reasoning may have played a role.

Encourage use of clinical guidelines

Clinical evidence is an essential plank of quality decision-making. Clinical information in the form of evidence summaries and guidelines, can and should be sought during the consultation where appropriate. Junior doctors overestimate the negative effect on patient confidence of information seeking – indeed, there is evidence that looking up appropriate sources of information in front of the patient is not only acceptable but positively regarded in some cases. As well, GP registrars should be encouraged to seek help through their GP supervisor, specialist colleagues or laboratory staff to discuss diagnostic challenges.
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The following case of fatigue, a typical undifferentiated illness in general practice, illustrates the type of questions that a GP supervisor could use in assessing and facilitating development of their GP registrar’s clinical reasoning.

Case Study

You are sitting in with your GPT2 registrar as part of their quarantined teaching time. The GP registrar is seeing a 34-year-old female teacher who complains of being ‘tired all the time’ over the past six weeks. She describes lack of energy and fatigue, but is not overly sleepy.

She describes frequent headaches and occasional abdominal pain. The GP registrar identifies that she has lost about 2kg of weight over the past few months that was unintentional.

There are no other significant symptoms but the GP registrar does not explore the patient’s mood in any detail.

The GP registrar checks the BP and HR, and performs a brief CVS, respiratory, ENT and abdominal examination, including dipsticking the urine.

The GP registrar tells the patient that the tiredness is ‘non-specific’ and that he needs to order ‘some blood tests’ to ‘exclude serious disease’. Follow-up is made for one week.

SUGGESTED QUESTIONS

- **Overview**
  - Can you please summarise the patient’s presentation and your differential diagnosis in two or three sentences?

- **Data gathering**
  - What other aspects of history might have been worth pursuing?
  - What are the key features of the history that reassure/worry you?
  - Are there any other red flags that you could have sought?
  - Why did you choose to do the blood tests that you did? How will they change your management?

- **Weighting**
  - Does 2kg of weight loss make serious disease significantly more likely?
  - Do the headaches make a depressive illness more likely?
SYNTHESIS
- Have you seen this type of presentation before? How does fatigue typically present in this type of patient?
- What is the most likely diagnosis?
- What diagnoses are important to rule out?
- Do you think that your explanation adequately conveyed your understanding of the likely causes of her tiredness?
- Where might you seek guidance on how to investigate and manage this patient?

• Alternate scenarios
  - What if the patient were 70 years of age?
  - What if the weight loss had been 5kg?
  - What if you hadn’t seen that lady with pernicious anaemia a couple of weeks previously?

UNCERTAINTY
- Fatigue is a typical undifferentiated illness. What strategies did you use in this case to manage the uncertainty of the presentation?
- How do you think you could involve the patient more in the decisions around testing?
References


43. Kahane S, Stutz E, Aliarzadeh B. Must we appear to be all-knowing? Patients’ and family physicians’ perspectives on information seeking during consultations. Can Fam Physician 2011; 57: e228-e236.